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1-бөлім  
**КАРТОГРАФИЯ ЖӘНЕ  
ГЕОИНФОРМАТИКА**

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Section 1  
**CARTOGRAPHY  
AND GEOINFORMATICS**

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Раздел 1  
**КАРТОГРАФИЯ  
И ГЕОИНФОРМАТИКА**

**Sh. Burlibayeva<sup>1</sup>, R. Bexeitova<sup>1</sup> , R. Shults<sup>2</sup>**

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## **ROLE AND IMPORTANCE OF GEODETIC SURVEYS IN GEODYNAMICS**

In science geodynamics has been actively developing as a new direction recently, especially in the last decade. For the first time this term was described in A. Liyav's monograph 90 years ago. A. Liyav himself formed this term as a relationship of the Earth and space factors, as well as a legal regmatic formation of cracks-light grid on the entire surface of the bottom and the entire planet surface. In the last 20 years, the meaning of geodynamics is often used in a slightly modified version, so geodynamics has become understood as the whole complex of development processes inside the Earth. In the foreign literature, geodynamics is understood to be a branch of geology engaged in the study of forces and processes that occur only in the interior of the Earth and cause the formation of disorderly structures and deformations in its shells. Subsequently, E. Og considered geodynamics as a section of tectonics, studying the forces affecting the planet and phenomena occurring on its surface. In other foreign sources, modern geodynamics is the science of Earth's movements in real time, which can be measured, identified and explained in the language of fundamental sciences. The purpose and task of this work is to make a general overview of the results of geodesic research in geodynamics, considering geodynamics as a new direction of science.

**Key words:** geodynamics, geodesy, geology, quarries, mineral extraction.

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### **Геодинамикадағы геодезиялық ізденістердің рөлі мен мәні**

Ғылымда геодинамика жаңа бағыт ретінде соңғы уақыттарда, әсіресе соңғы он жылдықта белсенді дамып келеді. Ең алғаш рет бұл термин А. Лявтың монографиясында 90 жыл бұрын қолданылған болатын. А. Лявтың өзі бұл терминді Жер мен ғарыштық факторлардың өзара байланысы, сонымен қатар түбіндегі ағын мен планетаның барлық жоғарғы бетіндегі сызат-жарық торының заңды регматикалық түзілуі деп қалыптастырған болатын. Соңғы 20 жылда геодинамика сөзінің мағынасы біршама өзгеріске ұшырады. Кейбір мәліметтер бойынша, Э.Ог геодинамиканы Жерге әсер ететін күштерді сипаттайтын тектониканың бір бөлімі ретінде қарастырған. Геодинамиканың астарында Жердің ішкі қабатындағы процестердің кешенді дамуын қарастыруға болады. Басқа шетелдік дерек көздерде қазіргі геодинамика – бұл уақыттың нақты масштабындағы Жердің қозғалысы туралы ғылым, яғни іргелі ғылымдар ретінде өлшеуге, анықтауға және түсіндіруге болатын қозғалыстарға сілтеме жасау. Соңғы 30 жылдарда әлемдік ғылымның қалыптасуымен әр түрлі болжамдар мен ескертпелердің орнына литосфералық тақталар тектоникасы теориясының, мазмұнды термині көптеген көп қырлы монографияларда, сөздіктерде және кітаптарда айтарлықтай өзгерді. Шетел әдебиеттерінде геодинамика негізінде Жердің ішкі бөліктерінде болып жататын процестер мен оларға әсер ететін күштер арқылы геология саласы туралы түсінік пайда бола бастады. Бұл жұмыстың мақсаты мен міндеті – геодинамиканы ғылымның жаңа бағыты ретінде қарастыра отырып, геодинамикадағы геодезиялық ізденістердің нәтижесіне жалпы шолу жасау.

**Түйін сөздер:** геодинамика, геодезия, геология, карьерлер, пайдалы қазбаларды өндіру.



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### Роль и значение геодезических изысканий в геодинамике

Наука геодинамика активно развивается как новое направление в последнее время, особенно в последнее десятилетие. Впервые этот термин был описан в монографии А. Лява 90 лет назад как взаимосвязь Земли и космических факторов, а также законное регматическое образование трещин – световой сетки на всей поверхности дна и всей поверхности планеты. В последние 20 лет определение геодинамики часто используется в несколько ином варианте, так под геодинамикой стали понимать весь комплекс процессов развития внутри Земли. В зарубежной же литературе под геодинамикой стала пониматься отрасль геологии, занимающаяся изучением сил и процессов, происходящих только во внутренних частях Земли и обуславливающих формирование разнопорядковых структур и деформаций в ее оболочках. Впоследствии Э. Ог рассматривал геодинамику как раздел тектоники, изучающий силы, воздействующие на планету и явления, происходящие на ее поверхности. В других же иностранных источниках современная геодинамика представляет собой науку о движениях Земли в реальном масштабе времени, то есть ссылаясь на те движения, которые можно измерять, идентифицировать и объяснять на языке фундаментальных наук. Цель и задача этой работы – сделать общий обзор результатов геодезических изысканий в геодинамике, рассматривая геодинамику как новое направление науки.

**Ключевые слова:** геодинамика, геодезия, геология, карьеры, добыча полезных ископаемых.

### Introduction

Geodynamics was first used in the monograph A. Liyav 90 years ago. A. Liyav formed it as a relationship between the dynamics of the Earth and space factors leading to the formation of tides in the crust and the formation of regular regmatal grid of cracks and ruptures across the surface of the planet. Over the past 20 years, geodynamics has often been used in a slightly modified way. Under geodynamics began to understand the whole complex of development processes inside the earth, at that moment in the foreign literature under geodynamics began to be understood the branch of geology engaged in studying of forces and the processes occurring only in internal parts of the earth and causing formation of various structures and deformations in its shells (Yudin, 2005:21-24).

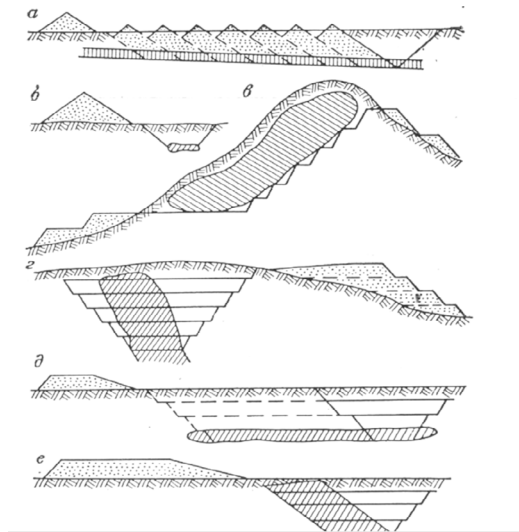
The current geodynamics of the continental lithosphere should be considered as a result of the interaction of a complex of natural endo-dynamic and outside dynamic processes (geological processes that occur in the Earth's interior depending on the internal energy, gravity, and forces that occur when the Earth rotates), the elucidation of causal links between which often represents an independent scientific problem. Its solution opens the way for revealing regularities of geodynamic processes variations in time and space. The most important is the medium-term forecast of socially dangerous phenomena, which are often catastrophic in nature. Integrated information on the geodynamic state of large regions is usually reflected in geological maps.

At present, they are practically the most popular documents, which are the basis of the exploited and planned for the development of social and economic protections.

Fully completed tasks on the integration project, their generalization combined with some results of work on other projects, allowed to get a new idea of the geological structure of Asia and to draw a map of modern geodynamics of Asia. It is based on the data on the stress state of the lithosphere, which provides an opportunity to consider the relationship between the formation of structures and processes in the lithosphere of Asia from a new angle of view. At the current level of knowledge, only a comprehensive analysis of geological and geophysical observations allows us to create a model of geological development of the continental lithosphere that is close to reality. On its theoretical basis, socially important works on the forecast of natural, including cataclysmic, processes can be continued (Levi, 2005: 254-261).

### Materials and methods of research

Geodynamics is a subfield of geophysics dealing with the Earth's dynamics. It applies physics, chemistry and mathematics to the understanding of how mantle convection leads to plate tectonics and geologic phenomena such as seafloor spreading, mountain building, volcanoes, earthquakes, faulting and so on. It also attempts to probe the internal activity by measuring magnetic fields, gravity and seismic waves, as well as the mineralogy of rocks and their isotopic composition. Methods of geodynamics are also applied for exploration of other planets.



**Figure 1** – Relief, which forms during the open-pit development of various types of fields. These measures lead to the most significant changes in terrain. The amplitude of heights between the bottoms of the deepest excavations and the highest dumps has now exceeded 1100 m. Information on changes in the relief of land during the extraction of solid minerals is systematized by V. A. Ovchinnikov

V. A. Ovchinnikov's data testifies to the fact that the peculiarities of the developed relief forms during the quarry production are determined by the conditions of the deposit occurrence (Figure 1). At the same time, the shape of accumulating bodies depends to a certain extent on the waste rock dumping technology.

Having analyzed the known maps of geodynamics (Zonenshain, et al., 1988: 112; Map of Newest Tectonics..., 1998), other editions and having taken all the best of them, the authors have come to the conclusion that on maps of modern geodynamics it is necessary to display only the main complex of various components of endogenous and exogenous situations. This allows, on the one hand, to reveal the regularities of spatial distribution and variations of one process, and on the other hand, to determine the areas of "superimposition" of different processes, where their interaction can lead to the initiation of other processes, including catastrophic ones.

The most important endo-dynamic components that determine the state of the lithosphere at the present stage of its evolution have been estimated: the thickness of the lithosphere, its stress state, active faults and their density, seismicity, volcanism and kinematics of horizontal movements of large blocks.

The thickness of the lithosphere  $L$  (km) was estimated by the equation  $\ln L = 320.4e^{-0.017q}$ , where  $q$  is the heat flux ( $\text{mWt/m}^2$ ) averaged over a grid of  $50 \times 50$  (Levi, 1991). The correlation ratio

determined for this equation is 0.9 with a sample size of about 200 pairs of values. Variations in the thickness of the lithosphere reaches 200-250 km or more abruptly decreases to 70-100 km under the modern mobile belts. Variations in the thickness of the lithosphere within different geodynamic regions cause changes in its stress-strain state, the de gradient of tectonic motion speed and density of active faults, without which the manifestation of block tectonic movements is impossible (*layer 1*). The density of active faults was determined by honoring their number  $N$  in a window of  $5^\circ \times 5^\circ$ . Within Asia, it varied from 0 to 40 units: the minimum on cratons is maximum in modern submerged areas. An increase in the number of active faults in the regions of the relatively thin lithosphere is clearly visible. The growth of their number leads to an increase in heat outflow from the bowels, additional heat due to the deformation of the lithosphere layers and friction on the fracture planes in the process of tectonic blocks movement. All this causes relative overheating of the upper lithosphere and changes in its rheological properties.

### Results and discussion

Let's briefly characterize the active faults of Asia. They are usually understood as breaks with signs of tectonic movement in historical time or, more broadly, during the Holocene - the late Pleistocene. They reflect the manifestation of modern tectonic

activity. The undisputed signs of movement are the observed surface deformation and displacement of Late Pleistocene and Holocene sediments and relief elements (Fault Activity Map..., 1987; Geodynamics..., 2000). Rift activity indicators include geodetic data on modern movements in their planes, linear location of Holocene volcanoes and earthquake epicenters. Active faults are mapped by ground-based observation and interpretation of aerospace materials.

Taking into account the peculiarity of the stress-strain state of the lithosphere, they are often classified by morphogenetic accessories. The known data on the size and age of Holocene displacements made it possible in many cases to estimate the velocity of movements along the fault plane. At impulse movements connected with earthquakes, the average speed for large time intervals was calculated taking into account the frequency of occurrence of seismic events.

Here is a brief regional overview of the largest active fault zones and their main parameters. In the Caucasus, Late Pleistocene – Holocene and modern active movements are carried out mainly through the already known modern faults. At the present stage the most active ruptures of the “Caucasian” (Western from the North-Western) and “anti-Caucasian” (North-Eastern) stretches are the most active (Koshelev, 1991).

### Mining relocation activities

**Pit mining.** This way of extracting mineral resources, due to the possibility of its progressive cheapening, is increasingly replacing the competitive underground mining operations. According to E. P. Doronenko, the cost of extraction of 1 ton of

raw ore by open-cut method is 3-3.5 times higher in comparison with the underground method of extraction of the mineral resource.

The open-pit mining method achieves a mere complete extraction of minerals. The possibility to create deep quarries (some of them have depths of more than 700 m) is associated with the use of highly profitable equipment. For example, in Canada, in preparation for open pit mining, a copper-nickel ore deposit for overburden removal of 11.5 million tonnes of overburden is being prepared.  $m^3$  a hydraulic suction dredge is used. Water for it was supplied from the nearest lake and there was also sucked rock. The elliptical excavation reaches a length of 1.1 km and a width of 0.6 km. Recently, Arizona (USA) began mining copper ore from the open pit, with a total of 113.3 million tonnes of open pit material  $m^3$ . Currently, the share of open-pit mining in the global mining industry is 66%. The share of ores of different metals extracted by this method is 57%, coal -34% and construction materials – 97%.

In the United States, the share of open pit mining in mineral production is 84%. The open-pit mines receive 85% of the total number of ores mined and 42% of the coal.

In the USSR, the development of mineral deposits by quarrying is rapidly increasing. In 1975, the volume of stripping work in the USSR amounted to 2.2 billion and by 1990, it's increasing several times. The share of open-pit mining with the production capacity of up to 1 billion tons is decreasing. In 1975, as compared to 1970, the number of such quarries in the USSR Ministry of Economic Development and Trade decreased and amounted to 39.3% of the total number of quarries, with a specific weight of 3.1% of production volumes.

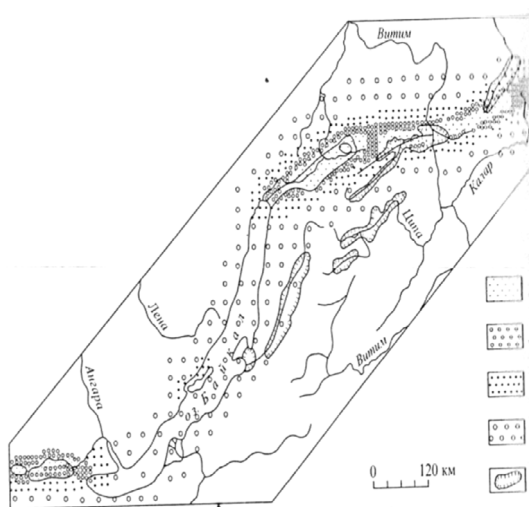
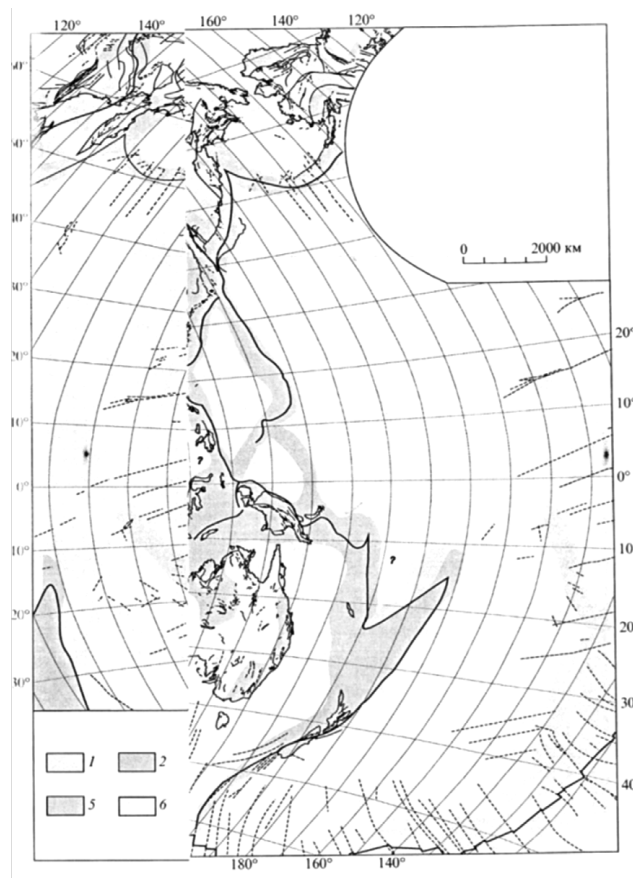


Figure 2 – The scheme of zoning of regional voltage fields in the Baikal rift zone (Sherman, 1989)

The depth of the quarries increased by 30-50 m or more from 1970 to 1975 at an average annual rate of deepening from 5 to 12 m. Thus, in 1975, the share of quarries with depths from 100 to 250 m increased from 28.3% to 36.1% in the USSR Ministry of Culture. According to N.A.Bykhover, the share of the open-pit mining method in its total volume is now 81% for iron ores and for others; for manganese ores – 78.7%, for ores of non-ferrous metals -64%, for mining and space raw materials -82% and for other non-metallic minerals

and building materials – almost 100%. According to V. N. Novozhilov, as of the end of the 1970s, there were more than 3500 quarries in the USSR, of which more than 30 are over 150 m deep, the height of dumps in some quarries reaches 100 m (in the project - 400 m and more); the volumes of separate tailings dumps 100-250 million  $m^3$  (in the project 500 million,  $m^3$ ). The deepest are the Korkinsky coal pits in the Chelyabinsk Region - 470 m. The design depth of some quarries exceeds the mark of 600 and 700 m (Morgan, 2017).



**Figure 3** – International tectonic map of the world 1-6 – types of intense; 2 – shear tensile,  $\sigma_z = \sigma_y > \sigma_x$ ; 3 – shift,  $\sigma_x > \sigma_z > \sigma_y$ ; 4 – shear compression; 8 – the boundaries of the major plates of lithosphere; 9 – faults (a)

In case of quarry mining, the following operations are carried out: 1) removal of overburden rocks and formation of dumps, 2) construction of ditches for drainage of surface waters and accumulation of dumps, 3) extraction of mineral resources, 4) formation of dumps from tailings and ore concentration.

Geodynamics is a broad field which combines observations from many different types of geological

study into a broad picture of the dynamics of Earth. Close to the surface of the Earth, data includes field observations, geodesy, radiometric dating, petrology, mineralogy, drilling boreholes and remote sensing techniques experiments

These measures lead to the most significant changes in terrain. The amplitude of heights between the bottoms of the deepest excavations and the highest dumps has now exceeded 1100 m. Information about

changes in the relief of land during the extraction of solid minerals is systematized by V. A. Ovchinnikov. Here are some of the data relating to the results of the quarrying and processing of mineral resources.

Geo ecological studies of the formation of very dangerous for mankind natural soufflars have shown that their geodynamic development depends on both the peculiarities of the geological and tectonic structure of the mine fields (positive plicative structures, faults in the kernels of anticlines, gas weathering and other factors). Keywords: soufflars, geo-ecology, geodynamics, anticline nuclei, gas saturation. Kuznetsk coal basin (Kuzbass) is one of the largest coal deposits of the Russian Federation and is administratively located in the south of Western Siberia, in the territory of the Kemerovskaya oblast (Levi, 2005: 254-261). The practice of coal mining shows that almost all underground mine workings of the Kuznetsk basin connected with mines of various depths, in which methane with impurities of hydrocarbons, hydrogen and helium are mainly renewed everywhere, belong to explosive on gas. The most dangerous types of catastrophes associated with the presence of soufflars in the rocks and coals of the described basin are given from the point of view of geo-ecology:

- sudden methane emissions,
- the explosion of methane soufflars together with coal dust,
- the soufflars and the underground fire connection with them. This article will focus on the nature and dynamics of the early Permian soufflar formation.

In the Kuznetsk Basin, there are three types of disturbance of the horizontal occurrence of rocks. plicated (folded), disjunctive (explosive) and injectable (amagmatic) dislocations. The most widespread, almost everywhere, are various, mainly with block movements of the ancient crystal bed of the basin in the category with horizontal movements of the Earth's crust of the collision type. Folded dislocations are represented by a wide range of structures of different orders – folds with the length of tens of kilometers and amplitude up to 1000 and more meters, up to microforms with the size of the first the early Permian soufflar formation. In the Kuznetsk Basin, there are three types of disturbance

of the horizontal occurrence of rocks. plicated (folded), disjunctive (explosive) and injectable (amagmatic) dislocations. The most widespread, almost everywhere, are various, mainly with block movements of the ancient crystal bed of the basin in the category with horizontal movements of the Earth's crust of the collision type (S.P.Gorschkov, 1996:184-197). Folded dislocations are represented by a wide range of structures of different orders – folds with the length of tens of kilometers and amplitude up to 1000 and more meters, up to microforms with the size of the first meters. Breaking dislocations are also excellent in shape and size - from regional faults with a length of more than 100 km and an amplitude of up to 1-3 km to subtle hollow cracks. Almost all large and overwhelming majority of ruptures with different amplitudes are represented by the structures of discharges and overthrust discharges formed, as our studies have shown, in the geodynamic conditions of large-scale compression and collision of the coal basin as a whole, especially in the mountainous Salaira part of it. Up along the section, the deep faults slowly fade out, which is well observed in the predominantly thick Paleozoic deposits of the roof of the composite section of the productive Paleozoic (S.P.Gorschkov, 1996:184-197).

### Conclusion

This article was written according to theoretic materials and it gives general explanation of geodynamics. In conclusion, the current geodynamics of the continental lithosphere should be considered as a result of the interaction of a complex of natural endo and exo dynamic processes, the elucidation of causal links between which often represents an independent scientific problem. Its solution opens the way for revealing regularities of geodynamic processes variations in time and space. The most important is the medium-term forecast of socially dangerous phenomena, which are often catastrophic in nature. Integrated information on the geodynamic state of large regions is usually reflected in geological maps. At present, they are practically the most popular documents, which are the basis of the exploited and planned for the development of social and economic protections.

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2-бөлім  
**МЕТЕОРОЛОГИЯ  
ЖӘНЕ ГИДРОЛОГИЯ**

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Section 2  
**METEOROLOGY  
AND HYDROLOGY**

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Раздел 2  
**МЕТЕОРОЛОГИЯ  
И ГИДРОЛОГИЯ**

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**HUMAN ACTIVITIES IN THE SYRDARYA RIVER BASIN**

Changes in land use and water use can greatly impact the cycling of water and water-borne substances. Increased redistribution of river water to irrigated fields can cause enhanced evapotranspiration and decreased river discharge. Additionally, the water quality can be affected by the external input of fertilisers and pesticides, and by changed pollutant transport pathways in expansive irrigation canal systems. This work examines basin-scale changes in water use, land cover/use change (LLUC), water quality under conditions of intensified irrigated agriculture, development water constructions. When considering land use in the basin, it can be noted that most of the land is grassland (about 42%) and cropland (about 28%). A comparative analysis of 1992 and 2015 revealed that bare land and forestland area decreases. The percentage of the urban area during the increased to 1.0% during the study periods. The urban area expanded most rapidly mainly by encroaching into the agricultural area and grassland. Moreover, it revealed that over the long-term period the water construction was intensively taking placed in the basin. Especially since the 1960s. The construction of reservoirs and the increase in water withdrawal from rivers significantly changed their water regime, especially in the downstream. In fact, due to agricultural, industrial, and urban development's, such as irrigation and drainage, hydraulic structure across a river, the elements of the hydrological cycle have changed in terms of quantity and quality, both in time and space. In this work, an attempt is made to analyze the effect of human activity on river runoff.

**Key words:** human activities, land cover/use, irrigation, water withdraw, water construction.

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**Сырдария өзені алабындағы адам әрекеті**

Жерді пайдалану мен суды пайдаланудың өзгеруі су айналымына және суда тасымалданатын заттарға қатты әсер етуі мүмкін. Өзен суын суармалы егістікке қайта бөлудің артуы бұланудың жоғарылауына және өзен ағынының азаюына әкелуі ықтимал. Сонымен қатар, сырттан тыңайтқыштар мен пестицидтердің енуі, сондай-ақ кең суармалы каналдар жүйесіндегі ластаушы заттардың тасымалдану жолдарының өзгеруі судың сапасына әсер етуі мүмкін. Бұл жұмыста өзен алабы масштабында суды пайдалану, жер жамылғысы мен жерді пайдалану, интенсивті суармалы егіншілік жағдайындағы су сапасы және су құрылымдарының дамуы өзгерістері зерттелінеді. Өзен алабындағы жерді пайдалануды қарастырған кезде, жердің көп бөлігі жайылым (шамамен 42%) және егіншілік жерлер (шамамен 28%) екенін атап өтуге болады. 1992 және 2015 жылдардағы салыстырмалы талдау көрсеткендей, пайдаланылмайтын және орманды жерлер ауданы азайып келеді. Зерттеу кезеңінде қалалық жердің үлесі 1,0% дейін өсті. Әсіресе, елді-мекен аймақтары тез өсіп келеді, негізінен ауылшаруашылық жерлері мен жайылымдар есебінен. Сонымен қатар, ұзақ уақыт бойы су құрылыстары өзен алабында қарқынды түрде жүргізілген болатын. 1960 жылдан бастап су қоймаларының салынуы және өзен суын алудың көбеюі олардың су режимін айтарлықтай өзгертті, әсіресе өзеннің төменгі ағысында. Шындығында, суару және дренаж, гидротехникалық құрылыстар сияқты ауылшаруашылық және өндірістік кешеннің дамуына, сондай-ақ елді-мекендердің ұлғаюына байланысты гидрологиялық цикл элементтері уақыт бойынша да, кеңістікте де саны мен сапасы жағынан өзгерді. Бұл жұмыс адам іс-әрекетінің өзен ағынына әсерін талдауға тырысады.

**Түйін сөздер:** адамның іс-әрекеті, жер жамылғысы, жер суағару, су алу, су құрылысы.



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### Человеческая деятельность в бассейне реки Сырдарья

Изменения в землепользовании и водопользовании могут сильно повлиять на круговорот воды и переносимых водой веществ. Повышенное перераспределение речной воды на орошаемые поля может вызвать усиление испарения и уменьшение речного стока. Кроме того, на качество воды может повлиять поступление удобрений и пестицидов извне, а также изменение путей переноса загрязнителей в обширных системах оросительных каналов. В данной работе исследуются изменения в водопользовании в масштабе бассейна, изменение покрова земли и их использования, качество воды в условиях интенсивного орошаемого земледелия, развитие водных сооружений. При рассмотрении землепользования в бассейне можно отметить, что большая часть земель – это пастбища (около 42%) и пахотные земли (около 28%). Сравнительный анализ 1992 и 2015 годов показал, что площадь неиспользуемых земель и лесных массивов уменьшается. Доля городской территории в период исследования увеличилась до 1,0% в период исследования. Особенно застроенные регионы росли быстрее всего, в основном за счет сельскохозяйственных земель и пастбищ. Более того, выяснилось, что в течение длительного периода водные сооружения интенсивно размещались в речном бассейне. Начиная с 1960-х гг. строительство водохранилищ и увеличение забора воды из рек существенно изменили их водный режим, особенно в нижнем течении. Фактически, из-за развития сельскохозяйственного, промышленного комплекса, такого как ирригация и осушение, гидравлические сооружения, а также увеличения населенных пунктов, элементы гидрологического цикла изменились с точки зрения количества и качества как во времени, так и в пространстве. В этой главе делается попытка проанализировать влияние человеческой деятельности на речной сток.

**Ключевые слова:** человеческая деятельность, земельный покров, орошение, водозабор, водное строительство.

### Introduction

Human activity has the potential to indirectly and directly affect water quantity and the natural flow regime of a river system. Indirect impacts to the hydrologic cycle can result from land cover/use changes. Direct impacts can result from water diversions, withdrawals and discharges, and from dams (flow regulation and water storage). In each river basin, if not all, then most of the factors mentioned can act. At the same time, in a specific basin, some factors are the main, while others are secondary.

Since the middle of the 21st century, dramatic changes in flow influenced by human activities (e.g., water diversion and land use/cover change) have been detected in many basins (Marengo, Tomasella, and Uvo 1998; Milly et al. 2008; Ma et al., 2010). Human activity, such as land cover/use change, urbanization, and water conservation projects have significant impacts on river water, altering the regional hydrologic cycle by changing runoff-generation conditions (Deng and Chen 2017). The existing extent of human-generated change to land cover has increased global runoff by 7.6% and reduced global annual average terrestrial evapotranspiration by 5%,

which is approximately equivalent in volume to annual global surface water withdrawals (3200km<sup>3</sup>/year) (Sterling, Ducharne, and Polcher 2013; Piao et al, 2007) indicated that land use change increased global runoff by 0.08 mm/year, which accounted for approximately 50 % of the reconstructed global runoff trend over the last century (Zhang et al. 2015). However, different human activities may have different roles in runoff change. Experimental studies indicate that the runoff modulus of grassland is 61.1%–75.8% of that of bare land; forest land has a lower runoff modulus as compared to that of bare land; while the runoff modulus in urban areas is much higher (Chen, Wang, and Xu, 2004). At the same time, industrial water consumptions and agricultural water consumptions have a direct impact on river flow, with agriculture accounting for over 70% of total water use (Zhang, 2005).

In arid and semi-arid zones (such as Central Asia), irrigation is the main anthropogenic factor. However, in these areas, there is drainage of waterlogged lands, regulation of runoff over time and territory, industrial and communal water consumption. Their role, in most cases, is secondary, although some of them in certain periods of time are of primary importance.

Assessment of human impact on water resources is most relevant for regions and river basins with developed irrigated agriculture, where water scarcity is already present. Several studies (Cai, McKinney, and Rosegrant, 2003; Petr, 2003) conducted to analyze the impact of irrigated agriculture and economic activity on the water balance and water resources of the main river watersheds in the arid zone showed that irrigation leads to a radical change in the ratio of the components of heat, water and salt balances both within the irrigated massifs and on adjacent lands and water bodies (lakes, rivers, reservoirs). Depending on the extent of irrigation, climatic and physical-geographical features of the territory, the trend of runoff reduction can be significantly different.

At present, a catastrophic water-ecological situation has developed in the Syr Darya river basin, which is explained, first of all, by its transboundary position, as well as by the confluence of the lower part of the basin to arid inland areas where the river almost does not accept tributaries (Dukhovny and Litvak, 1977). About half of the population of Central Asia is concentrated in the Syr Darya river basin. Agriculture in the river basin and the industry have obtained a high economic level, notably within Uzbekistan. Large reserves of thermal resources and the availability of fertile land, on the one hand, and a lack of precipitation, on the other hand, led to the widespread development of irrigation. Therefore, the water resources of the basin, especially river waters, which are mainly used for these purposes, undergo some quantitative and qualitative changes (Amirgaliev, 2007).

Since ancient times, the river basin has been used as irrigation land. But from 1950-1960 of the 20th century, irrigation lands grew 3-5 times. Which led to an increase in water intake from the river. Also, from the 1950s, water construction in the river basin began intensively. As we know, in the lower river, in the second half of the last century, the Syr Darya acutely felt a shortage of water, and about 30 years ago, runoff at its mouth was reduced to almost zero. But at the end of the 80s on the territory of the former USSR, people's views on the state of the environment changed significantly, and the population of the Syr Darya became more careful about water resources. As a result, already in the early 1990s, Syr Darya Basin water began to flow regularly into the northern part of the Aral Sea. Although the volume of this water was about 2-4 times less than the amount of natural runoff (14.9 km<sup>3</sup>), it was enough to flood a significant part of

the modern "Small Aral" and there the desalination process began. Currently, the annual runoff at the mouth of the Syr Darya river ranges from 3.6 to 9.0 km<sup>3</sup> (Sambaev 2017).

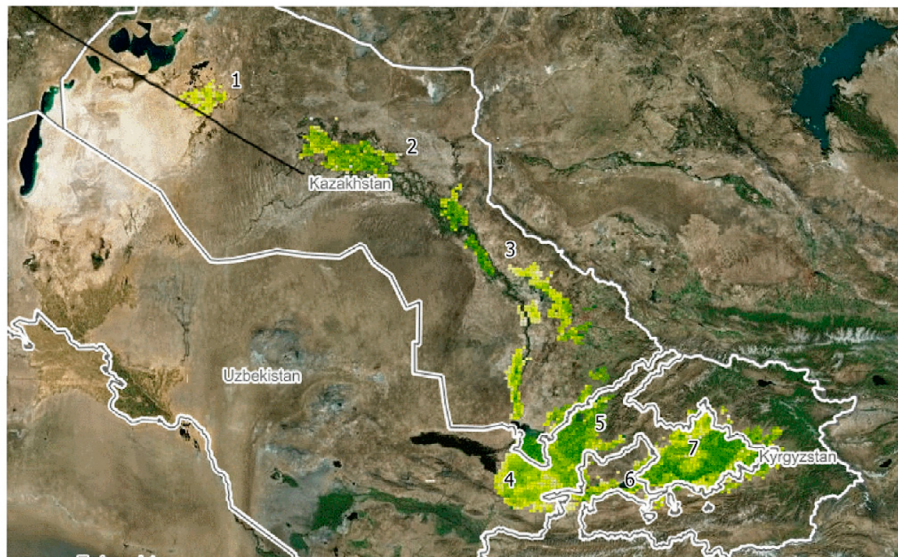
In the work we want to analyze human activity in the river basin by the dominant types of human activities: 1) to study the change of land cover/use; 2) consider the impact of irrigation on the water resources of the basin; 3) analyze the main and large water construction in the Syr Darya River basin.

### Study area

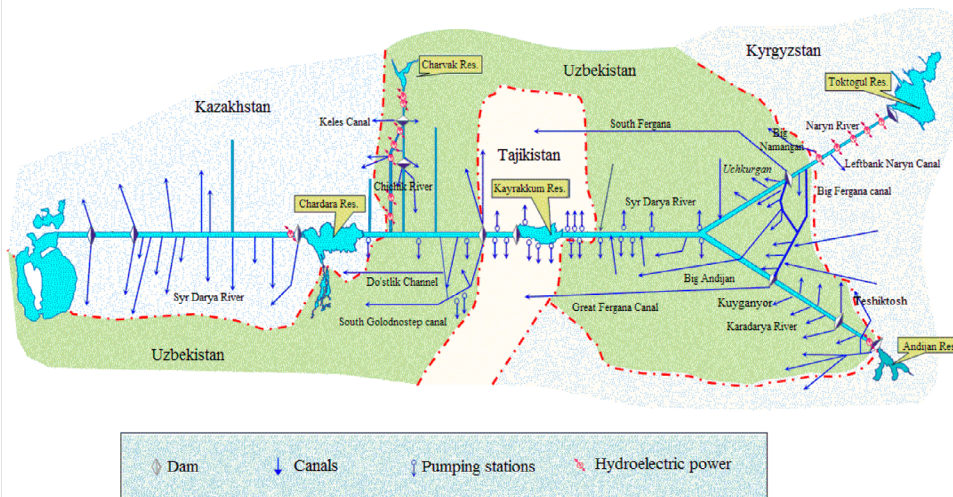
The Syr Darya River, the second largest river in terms of flow volume in Central Asia (catchment area 219,000 km<sup>2</sup>) is the result of the confluence of two big rivers: the Naryn (59,900 km<sup>2</sup>) and Karadarya (30,100 km<sup>2</sup>). Practically all flow of the Syrdarya forms in the mountains and foothills which border the cotton-growing regions: the Fergana valley, Chrchik-Ahangaran-Keles Irrigation Region, the Hungry Steppe, and the Dalverzyn steppe (Figure 1).

Downstream of Chardara Reservoir the river flow is spent for irrigation needs and evaporation losses from the flood plain. In the 800-km length up to Kazaly only one tributary flows into the Syrdarya – the Arys river (14,000 km<sup>2</sup>).

River basin The Syr Darya consists of six main parts: the river basin. Naryn – the main tributary of the Syr Darya, collecting water in the Central Tien Shan; Karadarya – the second most important tributary of the Syr Darya; Ferghana Valley, to the center of which more than 100 rivers flow from the surrounding mountains, mostly not reaching the Syr Darya; Western Tien Shan, where the rivers Akhangaran, Chirchik, Keles, Arys come from, which are the right-bank tributaries of the Syr Darya after it leaves the Ferghana Valley; The southwestern slopes of the Karatau ridge, from which numerous small rivers flow down, not reaching the Syr Darya; flat part of the pool. The Syr Darya basin is divided into two, from the point of view of economic use, parts: the first is the upper, mountainous zone of runoff formation (the whole of Naryn and the upper Karadarya), where there is practically no fence for irrigation, and the second part is the valley (Syr Darya channel), where the main irrigated land and water withdrawal prevails over the lateral inflow. Irrigated lands are concentrated in the valley regions, primarily in Uzbekistan and Kazakhstan (Sorg et al., 2014).



Water Management Scheme



**Figure 1** – Irrigation zones of the Syr Darya river basin (1 – Kazaly; 2 – Kyzylorda; 3 – Arys-Turkestan; 4 – Hungry Steppe; 5 – CHAKIR; 6 – Dalverzin and Fergana Irrigation Zones) and Water Management Scheme (Source: CAWa and BWO “Syrdarya”)

### Data and methods

For analysis land cover/use, we used several land cover products, including MODIS land cover products (MCD12Q1) ([https://lpdaac.usgs.gov/dataset\\_discovery/modis/](https://lpdaac.usgs.gov/dataset_discovery/modis/)), the global surface coverage data (GlobeLand30) (<http://www.globeland30.com>) and the Climate Change Initiative Land Cover (CCI-LC) project (<https://www.esa-landcover-cci.org>). Statistical data about irrigation, water withdraw and return water was obtained from the Regional Information System on Water and Land Resources in the Aral Sea Basin (CAWater-IS) (<http://www.cawater-info.net>) and Regional Research Network “Water in Central Asia” (CAWa) (<http://wuemoca.net/app/>).

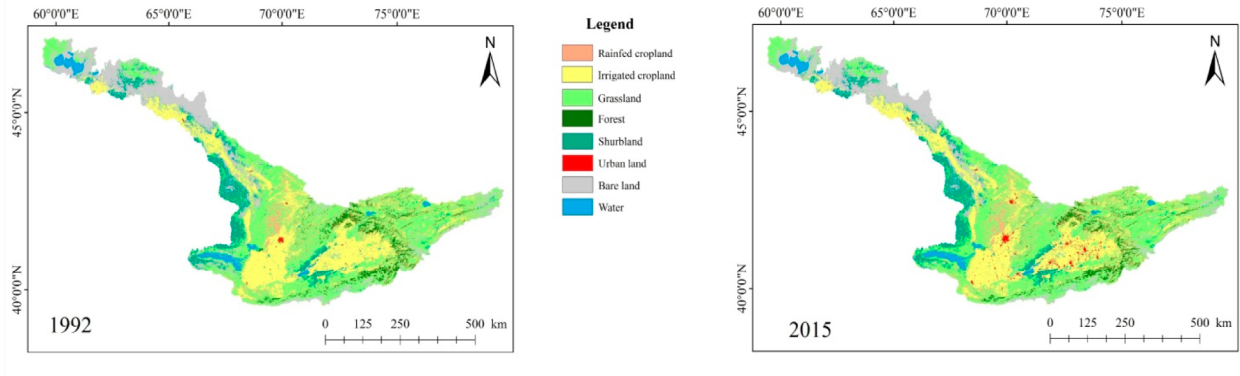
### Results and discussion

#### Land cover/land use change in basin

One of the most important signs of human activity is land cover/use change (Figure 2). To determine the land cover/use change induced by human activity, we used the Raster Calculator tool for ArcGIS to analyze the conversion condition between the year 1992 and 2015 land cover/use type. Table 1 describes the conversion percentage of each land cover/use type from 1992 to 2015 in the whole basin. In table 1, the total rates in 1990 and 2015 represent the amounts of each land use type during the first period and the second period, respectively.

Both the bare land and the urban areas increased, whereas the remaining types (e.g., forest, and grassland) decreased. The percentage of urban area

was 0.2 during the first period, and this percentage increased to 1.0 during the second period, indicating rapid urban expansion during the years.



**Figure 2** – LULC types in the Syr Darya River Basin in 1995 and 2015

Grassland is the predominant land cover/use type in the study area, respectively accounting for 41.9% and 42.6 % of the total land area of the river basin in 1992 and 2015, followed by bare land. However, bare land proportion is declining over time. The proportions of the cropland areas in the two periods are 27.7% and 28.1%, respectively, and they slightly increasing between these periods. Compared with the grassland area in 1992, that in 2015 increases by 2%. From 1992 to 2015, the land area for construction exhibits the highest interannual dynamic change. The forestland

area decreases by 0.5%, and the water area increases by 0.2%. According to some studies, a significant increase in precipitation could have affected the increase in grassland and water area. Over the past 17 years, the area of water bodies and wetlands in five countries of Central Asia has increased significantly (especially the areas surrounding the Aral Sea and Lake Balkhash). In addition, with a decrease in the drought index, pasture areas in southern Central Asia and natural vegetation increased significantly (Hu and Hu, 2019).

**Table 1** – The conversion percentage (%) of each land use type from 1992 to 2015

LULC type	R-land	G-land	I-land	F-land	S-land	U-land	B-land	Water	Rate % (2015)
R-land	4.56	0.42	0.00	0.20	0.00	0.00	0.01	0.00	5.2
G-land	0.37	40.26	0.13	0.33	0.00	0.00	1.52	0.01	42.6
I-land	0.01	0.72	21.86	0.15	0.00	0.00	0.18	0.00	22.9
F-land	0.08	0.13	0.01	2.88	0.00	0.00	0.01	0.00	3.1
S-land	0.00	0.00	0.00	0.00	7.29	0.00	0.00	0.00	7.3
U-land	0.08	0.18	0.60	0.00	0.00	0.17	0.01	0.00	1.0
B-land	0.02	0.17	0.02	0.01	0.00	0.00	14.88	0.02	15.1
Water	0.00	0.07	0.00	0.01	0.00	0.00	0.14	2.50	2.7
Rate % (1992)	5.1	41.9	22.6	3.6	7.3	0.2	16.7	2.5	

R-land-Rainfed Cropland; G-land-Grassland; I-land Irrigated-Cropland; F-land-Forest; Sh-land-Shrubland; U-land- Urban land; B-land-Bare land

### Water construction in the basin

The Syr Darya River Basin, the main cotton base, belongs to ancient irrigation areas. In 1913, 1073 thousand ha were irrigated in the Syr Darya river basin (up to the Chardara); including 743 thousand hectares in the Ferghana Valley, 219 thousand hectares in the CHAKIR, 50 thousand in the Hungry Steppe and 7 thousand hectares in Dalverzin (Chembarisov, 1988; Micklin and Williams, 1996).

In the period 1933-1938, construction of large hydraulic structures on the Karadarya River (Kampyravat Dam) and on the Chirchik River (Gazalkent Dam) began (Rubinova, 1979). This allowed us to switch to planned water use in the basins of these two largest rivers. At the same time, work was underway to increase the water availability of low-water systems by connecting them to high-water ones. However, a radical reorganization of the water economy of the Syr Darya river basin,

which allowed significantly expanding the size of irrigated lands and increasing their water supply, began in 1938-1940, when the Northern, Southern and Big Ferghana canals were built (Table 2). In the same years, the construction of the Sarysui, Fayzyabad, Rishtanbogdad collectors was started. In 1950, one of the largest collectors in the Ferghana Valley – North Bogdad entered service. Also, widely irrigation and drainage construction took place in the Hungry and Dalverzinsky steppes.

The construction of the largest hydroelectric facility on the Naryn River and a number of pumping stations on the Syr Darya River made it possible to significantly increase the size of the lands irrigated from these sources. As a result of this, the areas that feed from the Karadarya River and the side tributaries of the Syr Darya River within the Fergana Valley have somewhat decreased, and their water supply has increased (Antipova et al., 2002).

**Table 2** – Main Water construction in the Syr Darya basin

Year	Main Canals and Reservoirs	River	Feature
1913	Do'stlik	SyrDarya	Capacity of headworks -230 m <sup>3</sup> /sec
1922	Left Bank Karasu	Chirchik	Capacity of headworks -160 m <sup>3</sup> /sec
1930	North Fergana Canal	Naryn	Capacity of headworks -110 m <sup>3</sup> /sec
1930	Big Fergana Canal	Naryn and Karadarya	Capacity of headworks -200 m <sup>3</sup> /sec
1946	KazalyCanal	SyrDarya	Capacity of headworks -100 m <sup>3</sup> /sec
1947	DalverzinCanal	SyrDarya	Capacity of headworks - 75 m <sup>3</sup> /sec
1951	South Golodnostep Canal	SyrDarya	Capacity of headworks - 300 m <sup>3</sup> /sec
1959	Kairakum reservoir	SyrDarya	NominalVolume: 5200 mln.m <sup>3</sup>
1959	Kyzylorda Canal	SyrDarya	Capacity of headworks -226 m <sup>3</sup> /sec
1963	Charvak reservoir	Chirchik	NominalVolume: 2006 mln m <sup>3</sup>
1965	Chardara reservoir	SyrDarya	NominalVolume: 4000 mln m <sup>3</sup>
1968	Kyzylkum	SyrDarya	Capacity of headworks -220 m <sup>3</sup> /sec
1970	Big Andijan	Naryn	Capacity of headworks -200 m <sup>3</sup> /sec
1974	Big Namagan	Naryn	Capacity of headworks - 61 m <sup>3</sup> /sec
1978	Andijan reservoir	Karadarya	NominalVolume: 1900 mln m <sup>3</sup>
1982	Toktogul reservoir	Naryn	NominalVolume: 19500 mln m <sup>3</sup>
1992	Arnasay system	SyrDarya	NominalVolume: 1000 mln m <sup>3</sup>
2009	Koksaray reservoir	SyrDarya	NominalVolume: 3000 mln m <sup>3</sup>

The construction of the Kayrakkum, Chardara, Charvak and other reservoirs in 1950-1970 made

it possible to further expand irrigated areas and increase their water availability. The Toktogul and

Andijan and a number of smaller reservoirs on the tributaries of the Syr Darya River serve the same purpose. The increase in irrigated areas within the irrigation zone of the river basin is illustrated in the table 3. According to these data, in the first half of the 1970s, the irrigated area in the upper part of the basin (Fergana and ChAKIR) increased by 1.6, relative to the beginning of the 1930s, in the middle course by 5.6 and in the lower by 3.3 times. The increase in water intake from rivers and the

construction of reservoirs significantly changed their river regime, particularly in the lower reaches. In connection with the increase in the flow of collector-drainage (return) water into the rivers in the autumn months, water consumption in them is somewhat increased. In general, the hydrological conditions of the river basin deteriorated with the development of irrigation, especially in the downstream of the river (Chembarisov et al., 2013).

**Table 3** – The size of irrigated areas in the irrigation zone of the Syr Darya river basin, thousand ha

Periods	Fergana Valley	CHAKIR	Hungry Steppe	Dalverzin Steppe	Downstream
1925-1930	670	190	62,9	22	46
1931-1940	822	192	90.9	27	72
1941-1950	820	244	123	25.2	-
1951-1960	953	284	223	44.5	88
1961-1965	993	307	291	49.3	102
1966-1980	1102	346	486	50	199
1981-1990	1300	475	375	185	252
1991-2000	-	428	337	-	345
2001-2010	1600	450	351	-	365

Irrigation and irrigation and drainage construction in the Syrdarya river basin has turned it into a complex water management system that substantially transforms within its limits the river flow coming from the formation area.

#### **Irrigation and Water withdraw in the basin**

The increase in the size of the irrigated area (Table 3) was accompanied by an increase in its water supply. Both of these processes led to an increase in weaning from the river (Table 4, Figure 3). The lack of information on water withdrawal at the end of the 1930s in a number of irrigation areas limited the information content of table 4. However, the information provided in it allows us to appreciate how substantially the withdrawal of runoff from the rivers of the basin has increased.

The Syr Darya River and its basin belong to the areas of ancient irrigation. In 1913, in the upper and middle reaches of the Syr Darya river basin, 1073 thousand hectares were irrigated. The following years, the irrigation area only increased

(Table 3). Its water availability has also increased (Rubinova, 1979). These processes led to an increase in weaning flow from the Syr Darya river. The Syr Darya basin is characterized by greater pressure on water resources. Even in the 1930s, losses amounted to more than 60% of the flow. The influx of water into the sea began to stop in the mid-1970s. The use of irrigated agriculture is relatively higher here than in the Amudarya basin: at present it is 85%. At the same time, the share of natural losses decreased from 50% of total losses to 3%. Water supply of the population and industry plays an important role in the Syr Darya basin and accounts for more than 10% of the total losses (Belyaev, 1995).

The largest water consumer is irrigated agriculture. The largest irrigated area is located in the Fergana Valley; it is also significant in the Hungry Steppe and the Tashkent oasis. In the lower reaches of the river, the largest irrigated tracts are Arys-Turkestan and Kyzylorda. Within Kyrgyzstan, smaller areas are irrigated (Chembarisov et al., 2013).



**Table 4** – Specific withdrawal from surface water to irrigation zone of the river basin Syrdarya, thousand m<sup>3</sup>/ha

Periods	Ferghana Valley	CHAKIR	Hungry Steppe and Dalverzin Steppe	Downstream
1931-1940	11.7		13.9	
1941-1950	14.5		13.2	
1951-1960	15.7	16.1	12.3	38.6
1961-1970	17.3	16.7	13.9	45.1
1971-1980	16.1	16.6	13.5	35.1
1981-1990	17.1	15.1	13.5	35.7
1991-2000	-	16.1	-	35.2
2001-2010	-	16.2	-	-

From 1950 to 2012, the irrigated area in the river basin increased by 2 times and reached 10.14 million hectares. During this period, the area of irrigated land in the region increased by 94%; over the decades, these increases were: 1950-1965. – by 12%; 1965-1975 by 20%; 1975-1985 – by 44% and 1985-1995 – by 25%; this is an overload for ecological systems (Mustafaev and Kozykееva, 2012). Therefore, environmental degradation of the environment in the Aral Sea Basin is a direct consequence of the intensive expansion of irrigated areas in the river basin.

The dynamics of the expansion of irrigated land from 1950 to 2012 shows that the pace of the introduction of new areas in the region was very high. Every year, from 1.2 to 2.8% of new lands were introduced into economic circulation, and this indicator in Tajikistan and Uzbekistan reached a record level of 3.4 and 3.3% (Mustafaev and Kozykееva, 2012). In the Syr Darya river basin, between 1976 and 1980, irrigated lands of more than 280 thousand hectares were cultivated, in 1981–1985 and 1986–1990 over 180 thousand hectares.

According to the data of BWO «Syr Darya» and DB CAREWIB, the total water intake in the Syr Darya river basin was approximately 50,000 million m<sup>3</sup> on average in 1980–1990, of which 38,000 million m<sup>3</sup> was for irrigation. This means that more than 70% of the total water intake was taken for irrigation. In the period 1990-2000 this figure was 45,000 million m<sup>3</sup>, of which about 32,000 million m<sup>3</sup> were taken for irrigation. At present, it is about 41,000 million m<sup>3</sup>, of which 31,000 million m<sup>3</sup> for irrigation. This is 75% of the total water intake. A large amount of water intake from the rivers of the Syr Darya basin is passed in Kazakhstan and Uzbekistan. They take 80% of the

total water intake. Also, irrigation water intake is very high in these countries.

For the Kyrgyz Republic and the Republic of Kazakhstan, more than 90% of water intake goes to irrigation. For the Republic of Tajikistan, the water intake for irrigation is more than 70%, for the Republic of Uzbekistan, 60% (Figure 3).

As can be seen from Figure 3.4, the development of agricultural lands in the Syr Darya River Basin has a great influence, first of all, on the nature of the use of water resources of the basin. It is also clear that the river flow has decreased due to an increase in irrigation and water intake areas. In dynamics, it is clear that since the 1970s, the area of irrigated land has rapidly increased, reaching its peak in the period 1980-1990. Some of the reduction in irrigated area is due to the fact that land degradation processes in the region and the general economic downturn in agriculture in 1990-2000. Although, after independence, the area of irrigated land in the Central Asian states did not change much (with the exception of Turkmenistan, where the area of irrigated land increased in 1995-1996).

Over the past 20 years, the specific water consumption in the basin has gradually decreased as a result of water withdrawal limits set by intergovernmental organizations (1980 – 18,200 m<sup>3</sup>/ha, 1990 – 14,600 m<sup>3</sup>/ha, 1995 – 12 200 m<sup>3</sup>/ha and 1998 – 12,400 m<sup>3</sup>/ha)

A number of natural low-water years observed in recent years (2000–2001, 2010–2011), as well as anthropogenic changes in the flow of the Syr Darya River, cause significant damage to the national economy, including the agricultural complex. Due to drought and lack of irrigation water, rural residents also experience great difficulties and losses.

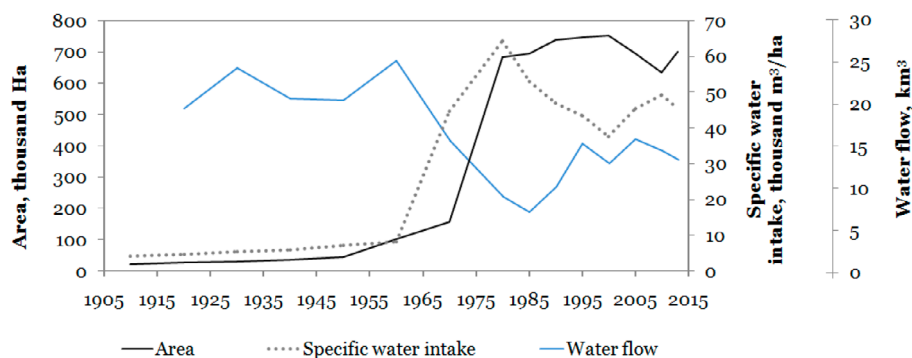


Figure 3 – Dynamics of changes in irrigation areas, river flow and specific water intake in the Syr Darya river basin

Taking into account channel losses and evaporation in watering the delta and natural-ecological systems, about 10 km<sup>3</sup> / year of water is limited to maintain the level of the Aral Sea, which sufficiently maintained the hydro-ecological state of the Aral Sea region. The deterioration of the situation occurred in the period from 1971 to 1985. First, in the region there was a long dry season. Secondly, although the specific water consumption decreased to 35.1 thousand m<sup>3</sup>/ha, but with the expansion of irrigated land to 199 thousand hectares, the amount of flow required for irrigation reached 7 km<sup>3</sup>/year. In dry years, only irrigated agriculture was maintained, the remaining water users experienced an acute shortage of water resources.

### Conclusions

In this chapter, we have analyzed the various types of human activity in the Syr Darya river basin. Considering the change in LCLU in the basin, we can be concluded that the main type of land use in the river basin is grassland, which mostly used for pasture and cropland; more than 80 percent are

irrigated. Moreover, during the consider period in the basin the population increasing. Population growth means increased water use, water supply and increased irrigation land to provide the population with food.

In addition, water management construction, such as reservoirs and water withdrawal canals, is considered in the work. Water construction directly affects the river runoff of the basin, thereby changing its hydrological regime. Especially large water construction occurred in the period 1960-1980. At the same time, irrigation area have grown significantly. The growth of irrigation area has led to even greater withdrawal of surface water resources. Currently, the most large irrigation region is located in Uzbekistan. Therefore, more than 90 percent of the water withdrawn here goes for irrigation.

The findings of this study provide useful information to water resource organization, environmentalists and other water resource specialist to the implementation of appropriate strategies for the improvement of water management efforts. Further studies are recommended to monitor other water quality parameters for trends.

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3-бөлім  
**РЕКРЕАЦИЯЛЫҚ ГЕОГРАФИЯ ЖӘНЕ ТУРИЗМ**

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Section 3  
**RECREATION GEOGRAPHY AND TOURISM**

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Раздел 3  
**РЕКРЕАЦИОННАЯ ГЕОГРАФИЯ И ТУРИЗМ**

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**TOURISM AND ECOLOGICAL PROTECTION STATUS OF THE AKSU-ZHABAGLY WORLD HERITAGE SITE OF KAZAKHSTAN**

Nowadays, the Protected Areas have become major destinations for rapidly growing tourism and recreational activities for its natural beauty, rare species of wildlife, and historical and cultural heritage sites. The article considers environmental issues of the Aksu-Zhabagly World Natural Heritage Site with high tourist and recreational potential. Objects of world heritage are widely known all over the world. It often attracts the attention of the tourism industry, especially travel agencies, tourism organizers and tourists. There is no doubt that following the relevant law on Specially Protected Areas, the development of some types of tourism in the buffer zones of the reserve is beneficial for the effective protection of the territory. The results of the analysis of materials related to the protection of the Aksu-Zhabagly State Nature Reserve show that the protected area has been efficiently protected under various laws of Specially Protected Areas. Besides, every year many events are held to preserve the original ecology of the reserve. One of them is the organization of various types of tourism, which, on the one hand, increases the importance of protecting the reserve, on the other hand, helps to raise funds for the protection of the reserve. We also noticed that sometimes international events are organized to protect the reserve, and sometimes financial support is provided by international organizations. We also found that sometimes international events are organized to protect the reserve, and sometimes financial support is provided by international organizations as well. One of the key issues identified in the article is the environmental safety of the reserve - the incomplete implementation of some projects for the protection of the reserve. This issue needs further study.

**Key words:** tourism, ecological protection, Aksu-Zhabagly, world heritage, events.

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**Қазақстандағы ЮНЕСКО-ның бүкіләлемдік мұралар тізіміне енетін Ақсу-Жабағылы қорығының туристік-экологиялық жағдайы**

Бүгінгі таңда ерекше қорғалатын табиғи аумақтар табиғи әсемдігімен, жабайы табиғаттың сирек кездесетін түрлерімен және тарихи-мәдени мұра орындарымен қарқынды дамып келе жатқан туризм мен рекреациялық іс-шаралардың басты бағытына айналууда. Мақалада туристік рекреациялық мүмкіндігі жоғары Ақсу-Жабағылы бүкіләлемдік табиғи мұра аумағының экологиялық мәселелері қарастырылады. Дүниежүзілік мұраның нысандары бүкіл әлемде кеңінен танымал. Ол туристік саланың, әсіресе турагенттіктердің, туризмді ұйымдастырушылардың және туристердің назарын өзіне жиі аударады. Ерекше қорғауға алынатын аумақтар туралы заңға сәйкес қорықтың буферлік территорияларында туризмнің кейбір түрлерін дамыту аумақты тиімді қорғауға пайдалы. Ақсу-Жабағылы қорығының туристік-экологиялық жағдайын зерттеу барысында оны қорғауға байланысты материалдарды талдау нәтижелері қорғауға алынған аумақтың Қазақстанның заңдарына сәйкес тиімді қорғалатынын көрсетеді. Жыл сайын Ақсу-Жабағылы қорығының өзіндік экологиясын сақтау мақсатында көптеген іс-шаралар өткізіледі. Солардың бірі туризмнің әр түрлі бағыттарын ұйымдастыру, бұл бір жағынан қорықты қорғаудың маңыздылығын арттырады, екінші жағынан, қорықты қорғауға қажетті қаражатты

жинауға көмектеседі. Тағы бір байқағанымыз кейбір сәттерде қорықты қорғау үшін халықаралық шаралар ұйымдастырылады, ал кейде халықаралық ұйымдар тарапынан қаржылай қолдау көрсетіледі. Мақалада табылған өзекті мәселелердің бірі – қорықтың экологиялық қауіпсіздігі мен оны қорғауға арналған кейбір жобалардың толық орындалмауы. Бұл мәселе әлі де болашақта зерттеуді қажет етеді.

**Түйін сөздер:** туризм, экологиялық қорғау, Ақсу-Жабағылы, әлемдік мұра, іс-шаралар.

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### **Туристское и экологическое состояние Ақсу-Жабағлинского заповедника Всемирного наследия ЮНЕСКО в Казахстане**

В настоящее время охраняемые территории стали основными направлениями для быстро растущего туризма и рекреационной деятельности благодаря своей природной красоте, редким видам дикой природы, а также объектам исторического и культурного наследия. В статье рассмотрены экологические проблемы территории Всемирного природного наследия, как Ақсу-Жабағлы с высоким туристско-рекреационным потенциалом. Объекты Всемирного наследия широко известны во всем мире. Они часто привлекают к себе внимание туристской отрасли, особенно турагентов, организаторов туризма и туристов. В соответствии с законом об особо охраняемых территориях развитие некоторых видов туризма на буферных территориях заповедника полезно для их эффективной охраны. В ходе исследования заповедника Ақсу-Жабағлы результаты анализа материалов, связанных с его экологией, показывают, что он эффективно охраняется в соответствии с законодательством Казахстана. Мы выяснили и наблюдали, что ежегодно в целях сохранения природы заповедника проводится множество мероприятий. Одним из них является организация туризма, что, с одной стороны, повысит важность охраны заповедника, с другой – поможет привлечь средства для природоохранной деятельности. Для защиты заповедника организуются международные мероприятия, а иногда оказывается финансовая поддержка со стороны международных организаций. Одной из актуальных проблем, рассмотренных в статье, является экологическая безопасность заповедника, неполное выполнение некоторых проектов, направленных на защиту заповедника. Эта проблема требует еще дополнительного исследования в будущем.

**Ключевые слова:** туризм, экологическая защита, Ақсу-Жабағлы, всемирное наследие, мероприятия.

## **Introduction**

### ***Tourism development and ecological protection of the world heritage sites***

Tourism has the potential to create a beneficial effect on the environment by contributing to environmental protection and conservation. It is the way to raise awareness of environmental values and it can serve as a tool to finance the protection of natural areas and increasing their economic importance. Tourism can significantly contribute to environmental protection, conservation and restoration of biological diversity and sustainable use of natural resources. Ecotourism is a type of tourism that supports all three elements of sustainable development, especially the protection of biodiversity, poverty reduction and business opportunities. It can be dedicated to environmental protection and the economic and social development of a country and

the entire world (KC, 2017). If an ecotourism project is to be started in rural areas, the nature, culture and society of the area should not be damaged, but priority should be given to raising living standards and improving the local economy (Anup, 2018). A new form of ecotourism (Natural World Heritage Tourism) can help tourists gain the benefits of viewing the beautiful scenery and at the same time obtain the opportunity to observe the rare wildlife and plant world. The inscription of a heritage site in the “World Heritage List” not only recognizes its outstanding universal value (OUV) and integrity, but also recognizes the need to conserve and govern it (Edroma, 2004). Together, these sites are a common heritage of mankind, contributing to the preservation of cultural and natural areas of global importance, as well as the processes associated with these sites. The name of the World Heritage Site is well known all over the world and always grasps the attention

of tourism actors, especially tour operators, tourism managers and tourists. World Heritage Sites are one of the most popular and well-known landmarks in different countries (Buckley, 2004). In addition, the development of tourism in such places may be of great significance to their protection. On the one hand, tourism may bring economic benefits to support site protection and regional economic development, but on the other hand, unorganized and poorly organized tourism may have serious consequences for the integrity of the site, reconcile its OUV (Bushell and Staiff, 2012). Governments of small countries give more priorities to the tourism industry than big countries to achieve socio-economic development (Louca, 2006), which helps maintain a culture of respect for the environment and environmental sustainability (Kozhokulov et al., 2019). The Government of Kazakhstan should adopt this trend to avoid environmental consequences.

The aim of this study is that through an increased understanding of tourism development opportunities, this study hopes to encourage the development of tourism in the buffer zone of the heritage sites. In this way, we can protect the integrity of the heritage site, bring income-generating opportunities to local communities near the Natural World Heritage Sites (NWHS), and offer financial support for the conservation of the site. To help achieve these purposes, the study has two major objectives:

- Provide an assertive analysis of regulation for organizing tourism in the territory of Aksu-Zhabagly Natural World Heritage site and show the tourism development process there.

- Illustrate the complexity of ecological protection of the vulnerable biodiversity heritage sites through the document analysis of the Kazakhstan National Committee for the “Man and Biosphere” UNESCO Program.

### A brief overview of the study area

Aksu-Zhabagly State Nature Reserve (SNR) is Kazakhstan’s second NWHS and it offers a stunningly diverse landscapes from semi-deserts to glacier zones. The Aksu-Zhabagly SNR was established in 1926 and located in the north-west of Talas Alatau and the south of Karatau in the West Tien Shan. The wild tulips, the unique natural apples, and the snow leopards (which roam the high mountains of this area) in the Aksu-Zhabagly SNR spread its name all over the world (Rakhimova et al., 2017). The main economic activities are agriculture, plant growing, and cattle breeding. The 59 km area of Tulkibas is located along the Western Europe-Western China (WE-WC) Highway (Figure 1), and it provides convenience to travel to village Zhabagly by car for visitors (AKBAR et al., 2020b).

The Aksu-Zhabagly SNR is located in four districts of two administrative oblasts in the most densely populated region of Kazakhstan, with a total population about 3 million people. Approximately 150,000 people live in the transition area of the SNR. In the last 10 years, ecological tourism has become highly popular in the reserve, mainly due to tourism for bird watching and plant research and wildlife seeing (Akbar et al., 2020a).

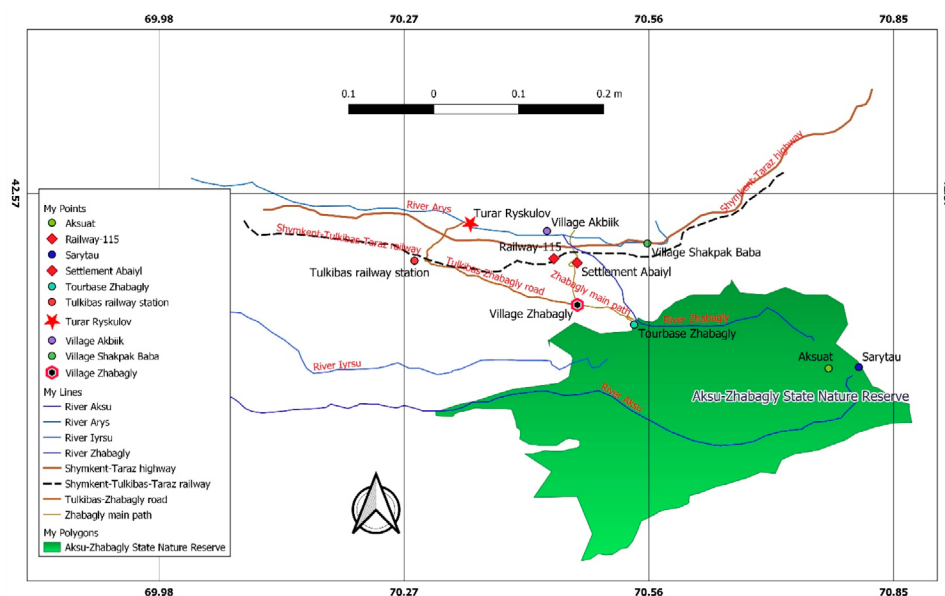


Figure 1 – The administrative map of the research area. © IMANALY AKBAR

***Some mysterious facts about Aksu-Zhabagly state nature reserve***

A new article by President of Kazakhstan Nursultan Nazarbayev titled “Seven Facts of the Great Steppe” is dedicated to the history and natural beauty of Kazakhstan. The apple trees and the tulips of Aksu-Zhabagly SNR are specially mentioned in the cognitive article of Kazakhstan’s President. The unique wild tulips and natural apples of the Aksu-Zhabagly SNR will spread its name all over the world (N.Nazarbayev, 2018). The territory of Aksu-Zhabagly recreation center owns the unique world of primitive nature. There are many things to do in Aksu-Zhabagly NWHS for tourists, for example, watch wild animals and birds, seeing flowers and plants, and of course, magnificent mountains and cool clean air attracts tourists from many countries of the world. The most popular tourist attracting points of this protected area are described in following sections.

**Wild red (Greig) tulips and Wild apples (Malus Sieversii)**

The Tien Shan mountains harbor many secrets, and they are the likely birthplace, not only of the apple but also of the tulip (Figure 2). The impressively beautiful tulips were discovered in some mountains

of Kazakhstan and on the central and western northern slopes of the Aksu-Zhabagly State Nature Reserve. The red tulips grow in the large, small, and individual communities at an altitude of 2200-2500 meter above sea level. The tulips of Aksu-Zhabagly grow in the rocky soils on the middle part of the mountain belts and the slopes of the foothills. And they easily adapt to nature and weather conditions. Greig’s and Kaufmann’s tulips are two wild species that grow in abundance in Aksu-Zhabagly SNR. They were instrumental in the establishment of the cultivated tulips that became the symbol of Holland in the Middle Ages (Hermans, 2013).

Appletree *Malus Sieversii* is endemic to the Tian Shan Mountains in the southern part of Kazakhstan, northern Uzbekistan and Kyrgyzstan, and western China. It grows in vast forests in valleys or isolated on hills (Gaëlle, 2016). There is general consent that our apples’ evolution began with *Malus Sieversii*, which constituted the bulk of the wild forests that stretched for more than a thousand kilometers north and south at low to middle elevations of the Tien Shan mountain.”. Genetic analysis shows that the domestic apple originated from the wild variety *Malus Sieversii*, which can be seen in the mountainous area of the Aksu-Zhabagly SNR (cmes.arizona.edu, 2015).



**Figure 2** – Wild tulips and Sieversii apple trees of Aksu-Zhabagly SNR. © JUMANOV SMATULLA ZHORAULY

***Wild rare animals, birds and petroglyphs***

At picturesque Aksu-Zhabagly SNR, visitors can see Tien Shan bears, Siberian mountain goats, roe deer and endemic redheaded titmouse on the Kshi-

Kaiyndy Gorge path, where Griffin vultures and Burkit (golden eagle) fly overhead (Figure 3). Walking on the dry meadow, a golden eagle nest can be found on the opposite bank of the Kshi-Kaiyndy riv-



er. Many colorful species inhabit the gardens of the village people in the village – enough to get anyone excited. In the open grassland, bee-eaters, warblers,

tits and blue rollers rollick, while the higher reaches are ruled by eagles and vultures, like the magnificently bearded lammergeyer.” (Gavrilov, 2014).



**Figure 3** – Wild animals, birds and petroglyphs of Aksu-Zhabagly SNR. © AKSU-ZHABAGLY.KZ

When we interviewed Jumanov Smatulla Zhorauldy (Deputy director of the Research department of Aksu-Zhabagly SNR), he said that the petroglyphs were discovered in the Boydaksay area and Peak Kaskabulak in the late of the 1950s. Since then, only around 300 people have visited them and they are still waiting to be formally cataloged and fully studied. Large herds of ibex can be seen on the rocky slopes in this area, and you can easily find the similarities between pictures on the stones and the ibexes.

### Material and methods

This study conducted in 2019, March and comprised two main components to address the aim and objectives. The first component of the study was to select a World Heritage Sites to research the development status of tourism products there in more depth. One natural world heritage site of Kazakhstan (Aksu-Zhabagly state nature reserve) was selected, where tourism is more developed compared to other natural heritage site of Kazakhstan (see: Figure 1). For gathering the relevant information about the selected research area, interviews of key experts were carried out and additional documents were analyzed. The second component was a desktop analysis of key documents prepared by the official site of Aksu-Zhabagly state nature reserve ([www.Aksu-Zhabagly.kz](http://www.Aksu-Zhabagly.kz)), the official site of UNESCO World Heritage Centre in Almaty ([whc.unesco.org](http://whc.unesco.org)), and Kazakhstan National Committee for the “Man and Biosphere” UNESCO Program: Aksu-Zhabagly. At the same time, we search for some materials on the site of the Forestry and Hunting Committee under the Agriculture Ministry of the Republic of Kazakhstan (<https://cites.org>). Because under the control of the Forestry and Hunting Committee, all questions and arising problems about biodiversity in the reserve are settled, and it defines the use of the World Heritage Fund. The review of documents included all general reports, mission reports and periodic reports produced in recent years as well as some documents dating further back. News and articles related to the theme of “tourism and world heritage” were also collected by using GOOGLE BROWSER and included into the research.

Zhabagly.kz), the official site of UNESCO World Heritage Centre in Almaty ([whc.unesco.org](http://whc.unesco.org)), and Kazakhstan National Committee for the “Man and Biosphere” UNESCO Program: Aksu-Zhabagly. At the same time, we search for some materials on the site of the Forestry and Hunting Committee under the Agriculture Ministry of the Republic of Kazakhstan (<https://cites.org>). Because under the control of the Forestry and Hunting Committee, all questions and arising problems about biodiversity in the reserve are settled, and it defines the use of the World Heritage Fund. The review of documents included all general reports, mission reports and periodic reports produced in recent years as well as some documents dating further back. News and articles related to the theme of “tourism and world heritage” were also collected by using GOOGLE BROWSER and included into the research.

### Results and discussion

#### *Tourism and ecological protection of the Aksu-Zhabagly natural world heritage site Aksu-Zhabagly nature reserve’s regulations for visitors*

In accordance with the Law of the Republic of Kazakhstan “On Specially Protected Natural Terri-



tories”, areas that do not include particularly valuable ecological systems and objects are allowed to organize ecological excursions under the observation of the authorized body, as well as excursion paths and routes for regular tourism are created by the licensed tourism sectors ([www.adilet.zan.kz](http://www.adilet.zan.kz)).

On the territory of Aksu-Zhabagly SNR, there are currently 3 ecological paths and 7 excursion routes for studying and observing the flora, fauna, and landscape, which are equipped with information boards, signposts, shelters. Ecological paths are developed for ecotourism and environmental education of the Kazakhstan population, being a special territorial form of nature conservation, intended for a general acquaintance with the nature of protected areas and educational purposes.

Before starting a route, each group or individual tourist is instructed, the rules of conduct on the route are issued and required to sign in a safety diary. Guides lead a tour of the trail and watch out the group. If necessary, unplanned stops are made.

Designed trails and routes in Aksu-Zhabagly SNR are classified: 1) by appointment: scientific, educational, and tourist excursion; 2) by type of movement: pedestrian, horse, and car. Tourists are divided into groups, hiking group must be no more than 10 people and the equestrian group must be no more than 6 people, every group should be accompanied by a tour guide. And there is a strict quota for the numbers of tourists to visit the nature reserve every day.

A) Pedestrian travel route. All routes can be reached on foot. A guide accompanying tourists tells the tour on the trail. Hiking tourists are divided into groups of no more than 10 people and are accompanied by tour guides. Each group must have a team leader.

B) Equestrian travel route. In the reserve, equestrian routes are conducted on the following routes: № 1, 2, 4, 5, 6, 7, 9. On the horse road, tour guides have to accompany tourists. If there are more than 6 people in a group the inspector must be accompanied because the guide should take care of the horses.

C) Automobile travel route. Some ecological routes are made for the delivery of tourists by off-road cars Uaz, Reed's Bus and Niva. Auto-routes: № 4,5,8,9. On the car road, the guide must accompany the tourists, sometimes the guide and the driver are the same person ([www.aksu-jabagly.kz](http://www.aksu-jabagly.kz)).

### ***In-depth review of Aksu-Zhabagly SNR***

The Aksu-Zhabagly state nature reserve at Talas Alatau has been preserved in the reserve for more

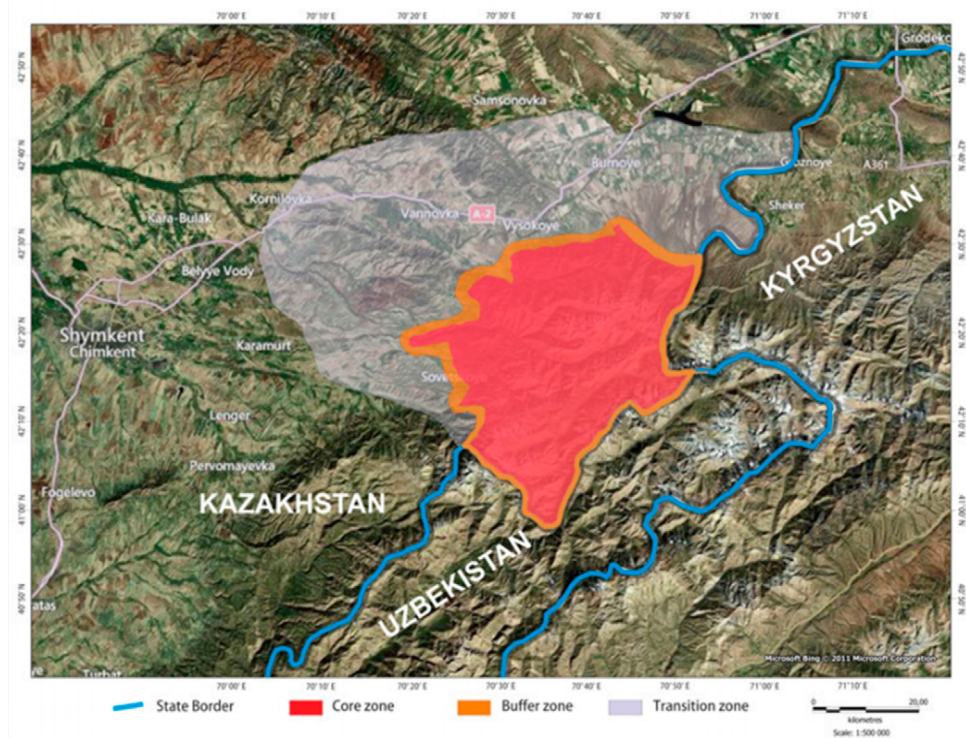
than 90 years, and over the past 30 years, a full conservation regime has stabilized in the reserve. The Aksu-Zhabagly, which was listed on UNESCO under the criteria of (vii) and (x) on 17 July 2016, is a unique wilderness experience where marmots, ibex, lynx, wolves, bears, argalis, and deer live ([whc.unesco.org](http://whc.unesco.org), 2016). It is home to 48% of regional bird species, 72.5% of vertebrates, 221 out of 254 fungi species, 63 out of 80 moss species, 15 out of 64 vegetation types, and 114 out of 180 plant formations found in the West Tien Shan. Approximately 2500 insect species have been recorded in the reserve (Kazakhstan National Committee, 2014). The total area of the territory of Aksu-Zhabagly SNR is 357,734 ha. The main core zone is 131,934 ha, a buffer zone is 25,800 ha (2-3 km border along the perimeter of the reserve), development zone – about 200,000 ha ([whc.unesco.org](http://whc.unesco.org), 2016). All three zones are connected and complement each other (Figure 4). The core zone is closed for visits and represents reference areas of regional natural complexes, as well as an important genetic reserve of wild flora and fauna species; this zone is control in long-term monitoring. The buffer zone is also under a protective regime, but limited human activity is allowed here (such as tourism, scientific research, educational programs, partial use of natural renewable resources, etc.). Both zones serve for the conservation of natural complexes and partially for sustainable development. The transition zone is used for the living of local people, development of economy, culture, and education. Here there is no strict protection regime of natural complexes, but there are some restrictions on the nature use, for instance, ecologically dirty production is prohibited (Kazakhstan National Committee, 2014). As a whole, this zoning provides conditions for the elimination of the conflict between social-economic development and protection of wild natural complexes and allows stable development of economy and culture. The main zone of the biosphere reserve is the strictly protected zone of nature reserve regime of Aksu-Zhabagly SNR, which represents the natural mountain complex of West Tian-Shan.

### **National level ecological protection events**

For the organization of partner relations a special Coordination Council of Aksu-Zhabagly Biosphere Reserve was created, and its participants include representatives of the state nature reserve, nature users, local authorities, and public organizations. At the same time, local communities are also involved in the development of the biosphere reserve's Management Plan. Complete management of the core and buffer zone is conducted by the administration

of Aksu-Zhabagly state nature reserve, but local NGOs, local communities receive full information on natural complexes of the zones that will be used

for an educational expedition, tourist routes in the buffer, and transition zones, and development of scientifically based sustainable nature use, etc.



**Figure 4** – Ecological zonation of Aksu-Zhabagly SNR (Kazakhstan National Committee, 2014).

According to Kazakhstan’s legislation, management of economic activity on some parts of the buffer zone (haymaking, cattle pasture) is carried out by agreement with state authority (Forestry and Hunting Committee under the Agriculture Ministry of Republic of Kazakhstan) and under the control of state nature reserve’s administration, all questions and arising problems are settled at the meetings of Coordination Council of the biosphere reserve. During the zonation of the buffer zone, a consultation with all land users was held. In the transition zone, the land users have their management plans, which are in accordance with the Management Plan of core and buffer zones. Therefore, the simple combination of all these plans is the Overall Integrated Management Plan of the entire biosphere reserve. All controversial issues are discussed at the sessions of Coordination Council of Biosphere Reserve.

The biosphere reserve is managed through Aksu-Zhabagly Reserve Coordination Council created in 2012. Before that, the territory of the core and buffer zones was managed by the Scientific-Technical Council of the Nature Reserve (until July 2012).

Coordination Council is a collegial public body created to introduce policies of effective management and sustainable use of biosphere reserve’s resources, alternative activities, resource-conserving and resource-restoring technologies. The Coordination Council of Reserve consists of representatives of state agencies (a territorial agency of forestry and hunting, oblast territorial agency of fishery), state nature reserve, Akimats (department of land resources, agriculture, etc.), local NGOs and land users, and is necessary for providing collaboration and problem-solving opportunities for all stakeholders.

There is current monitoring of the condition and conservation of natural complexes on the territory of the biosphere reserve, and monitoring of rare and threatened species to clarify the condition of the populations, ecological peculiarities of rare plant and animal species, providing a basis for evaluation of the species’ conservation and restoration perspectives. The goal of the monitoring is to obtain regular objective data about the condition of plants and animals on the territory of the biosphere reserve, as well as on the condition of their habitat. Based on

monitoring data it is necessary to conduct a current evaluation of the condition of populations and ecosystems, biosphere reserve's functioning effectiveness, and development of measures for critical and unfavorable situations' prevention. According to the Management Plan of Aksu-Zhabagly, scientific research on its territory focuses on innovation and study of the objects of state nature reserve fund, as well as the study of natural processes for the Nature Chronicles program. This scientific work includes observations of natural phenomena and processes and their study for the «Nature Chronicles» program, flora and vegetation innovation, research of rare and threatened vertebrate and invertebrate animals, monitoring of biodiversity condition and indicator species' population condition.

For cultural – educational activities in the Reserve, there is a department of ecological education. The staff of the Department consists of 5 people - museum chief, 4 instructors of excursionist and Reserve's Security Service (30 people). Cultural–educational work is also carried out by staff from the Department of Science, Information, Monitoring in the area of nature protection legislation. The main work on ecological education is carried out in the form of excursions on ecological paths in the protective zone, in Nature Museum, lectures, articles publication in mass media. There are environmental protection activities such as Parks' March, ecological scouts, etc. The goal of the Department's work is in raising ecological awareness of local people, their understanding of the key role of the protected territory, the importance of unique nature conservation, public support, and raising patriotism and responsibility for the environment, and, as the result, pressure decrease on region's biodiversity from local population. The main activity directions are: work with mass media, publishing activity, museum, ecological excursions, environmental tourism, interactions with teachers and educational bodies. Besides, the Department's staff develops posters, leaflets and other agitation materials, and takes part in providing practice for students on the base of the nature reserve. The most important activity that would enhance the sustainable development function of the site is the rapid growth of ecological tourism, development of the programs for ecological education of local people and the use of alternative sources of energy, such as solar and wind (Kazakhstan National Committee, 2014).

International level ecological protection events

The years 2001–2003 became a new milestone in the development of the oldest reserve in Kazakhstan and Central Asia. It was during these years that

the active working phase of the Central Asian Transboundary Project of the Global Environmental Facility for the Conservation of the Biodiversity of the Western Tien Shan in Aksu-Zhabagly State Nature Reserve started. The main results of the Central Asian Transboundary GEF / WB Biodiversity Conservation Project of the Western Tien Shan include the following:

The foundations were created for creating the Western Tian-Shan transboundary biosphere reserve based on the three PAs of the Kazakh part of the Western Tian Shan (Aksu-Zhabagly nature reserve, Karatau nature reserve and Sairam-Ugam national park).

The new Law of the Republic of Kazakhstan dated July 7, 2006, No. 175-III “On Specially Protected Natural Territories” introduced the rules governing the development of management plans for specially protected natural territories.

The natural science substantiations were updated and the feasibility studies for the creation of the Karatau Reserve on the basis of the ecosystem approach were developed. In 2004, the Government of the Republic of Kazakhstan dated March 1, No. 249 established the Karatau Reserve on an area of 34,300 hectares.

The ecosystem and biodiversity assessment of the Western Tian-Shan were used to create the Sairam-Ugam national park.

After constructing the first visitor center in Aksu-Zhabagly nature reserve, the construction of new visit centers to other protected areas of Kazakhstan: Korgalzhyn GPP-2009, Alakol Reserve-2010, Naurzum Reserve-2012, and in 2018 completed the design of the visitor center of Ile-Alatau Park, were launched.

For the first time in Kazakhstan, a mechanism has been tested for involving local residents in the matter of biodiversity conservation through economic incentives to replace traditional administrative measures against local residents.

During the GEF project “Conservation of biodiversity in the West Tian-Shan” in 2000 – 2004 complex research of the region was carried out. In the limits of this work, the influence of the environment and economic situation on the cultural and social life of local people was assessed, nature reserve's management plan was developed, etc. Social-economic conditions and historic-cultural peculiarities of the region are given in the first part of the Management Plan of 2008.

Supported by two UNDP/GEF Projects (Conservation of biodiversity of Western Tian-Shan and Wetlands Project) state nature reserve's staff had

an opportunity of exchange experience and raise their qualifications in Korgalzhyn Biosphere Reserve, Karatau Nature Reserve (Kazakhstan), Berezinskiy Nature Reserve (Belarus), Zapovedniki Ecological Center (Moscow, Russia), and at scientific-practical conferences inside Kazakhstan and abroad (Minsk, Belarus). In 2009-2011 training seminars were conducted dedicated to the preparation of management plan, biodiversity monitoring, state inspectors were trained in drawing up reports, complying with safety operating procedures and fire prevention (Kazakhstan National Committee, 2014).

### **Main objectives of Aksu-Zhabagly SNR in ecological protection**

With the strong support of relevant organizations at home and abroad, the Aksu-Zhabagly nature reserve has become the oldest scientific center in the former Soviet Union countries and will maintain an ecologically balanced base in Kazakhstan in the future. At present, one of the main objectives of the reserve is to conserve and restore the reserve's ecosystems both in the core and buffer zones of Aksu-Zhabagly reserve, at the same time maintaining the ecological balance in the Western Tian-Shan region. With the establishment of the international status of the biosphere reserve in the entire territory of the protective and transit zones, a basis will establish to research in terms of economic monitoring in areas with different economic management regimes.

The other main purpose of the Aksu-Zhabagly SNR is to protect the rare and unique natural complexes and its components in Western Tian-Shan and to support the sustainable socio-economic development and natural resources use of the territory based on ecological and economic principles. The short-term purpose of the Biosphere Reserve is to organize such mechanisms of the territory management that would prevent the depletion of natural resources and ensure sustainable use by the population. The local community hope to protect the natural beauty of the nature reserve for future generations. In this regard, one of the goals of this protected area is environmental education, which leads to the responsibility of environmental protection. Although the consumerism attitude towards nature reserves is not ruled out, the nature reserve system, which was established 85 years ago, has formed a special relationship in people's minds and the local residents respect the nature reserve to a certain extent (Kazakhstan National Committee, 2014). In general, development of the concept of

biosphere reserve will help local people to increase the level of environmental awareness, foster a sense of responsibility to our descendants in the conservation of biodiversity, establish environmentally friendly ways to use local natural resources and to find more effective mechanisms for biodiversity conservation in the region.

### **Conclusion**

To protect natural world heritage sites from threats, investment in their protection and management is urgently needed. Closely monitoring the status of sites, World Heritage-specific biodiversity targets, and adopting IUCN Green List standards for site management can also help (Satarat, 2010). By analyzing the second main content of our research article (the ecological protection of the Aksu-Zhabagly state nature reserve), we draw the following conclusions: according to the laws of specially protected areas in Kazakhstan, organizing some tourist activities on the territory of Aksu-Zhabagly nature reserve is allowed and which is requested to hold under strict control. It is generally recognized that many experiments have shown that the benefits of developing tourism in protected areas are more effective than the development of other industries. People often praise tourism for reconciling conservation and development goals in or near protected areas (Ashworth and van der Aa, 2006; Figgis et al., 2007). From a conservation perspective, tourism can raise funds to protect natural areas, increase local and tourist awareness of biodiversity and conservation issues, and discourage locals from getting out of unsustainable livelihoods (Borges et al., 2011). When we visited the study area, we found that every year from spring to autumn, tourists from home and abroad come to see the reserve every day. On some days, the number of tourists in the reserve exceeds the daily norm, and visitors have to wait for several days. This is one of the proofs that the reserve is effectively protected under the laws of specially protected areas. In short, although more than 90 years have passed since its establishment, this nature reserve has not lost the importance of its protection. The government of Kazakhstan has been organizing some activities to protect the area. For some poorly preserved biodiversity reserves in the world, Kazakhstan should serve as a model for the protection and conservation. However, it has its drawbacks compared to developed countries. As an example, when we interviewed the head of the research department at the nature reserve office, he

said that a lot of good work should have been done to protect the reserve, however, due to the ineffectiveness of the management, some projects will not be fully implemented, and some projects will even be stopped before they start.

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## ОЦЕНКА ПОТЕНЦИАЛА САКРАЛЬНОГО ТУРИЗМА КАЗАХСТАНА

Современный этап развития туризма характеризуется смещением акцента на развитие сакрального туризма, для реализации которого Казахстан располагает огромным потенциалом. Богатое историко-культурное наследие и вместе с тем возросший интерес к сакральным объектам со стороны туристов и паломников актуализирует вопрос оценки потенциала развития сакрального туризма. Оценка ресурсного потенциала сакрального туризма является основным инструментом регулирования развития данного направления и определения перспектив ее развития.

В статье представлены результаты оценки потенциала развития сакрального туризма Казахстана. Учитывая недостаток определенных статистических показателей в исследовании, на основании отобранных критериев оценки, путем применения общепринятого метода баланса и экспертного интервьюирования была предпринята попытка оценить потенциал сакрального туризма в разрезе административных областей Казахстана.

Проведенный анализ показал неравномерность распределения потенциала, подтверждающую, что наибольшей возможностью принять и обеспечить потенциальных туристов имеющими ресурсами (природно-климатическими, сакральными) и инфраструктурной обеспеченностью обладают области, расположенные на юге и в центральной части страны. Административные области, расположенные на западе, востоке и севере страны, характеризуются средним и низким значениями потенциала развития сакрального туризма.

Результаты исследования могут быть использованы для решения организационно-управленческих задач в целях развития сбалансированного развития сакрального туризма на региональном и локальном уровнях.

**Ключевые слова:** туризм, сакральный туризм, потенциал, оценка, Казахстан.

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## Assessment of the potential of sacred tourism in Kazakhstan

The current stage of tourism development is characterized by a shift in emphasis on the development of sacral tourism, for which Kazakhstan has a huge potential. The rich historical and cultural heritage and at the same time the increased interest in sacral sites from tourists and pilgrims actualizes the issue of assessing the potential for the development of sacral tourism. The assessment of the resource potential of this branch is the main tool for regulating the development of this kind of tourism and determining the prospects for its development.

The article presents the results of assessing the potential for the development of sacral tourism in Kazakhstan. Taking into account the lack of certain statistical indicators in the study, an attempt was made to assess the potential of sacral tourism in the context of administrative regions of Kazakhstan based on the selected evaluation criteria, using the generally accepted method of balance and expert interviewing.

The analysis revealed an uneven distribution of capacity, confirming that the areas with the greatest capacity to receive and provide potential tourists with resources (natural, climatic, sacral) and infrastructure, located in the south and center of the country. The administrative regions of the west, east and north of the country are characterized by the medium and low importance of the potential for the development of sacral tourism.

The research results can be used to solve organizational and managerial problems in order to develop a balanced development of sacral tourism at the regional and local levels.

**Key words:** tourism, sacral tourism, potential, assessment, Kazakhstan.

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### Қазақстандағы киелі туризмнің әлеуетін бағалау

Қазіргі кезең туризм саласында киелі туризмді дамытуға басты назар аударумен сипатталады және оны іске асыру үшін Қазақстан зор әлеуетке ие. Бай тарихи-мәдени мұралардың болуы, сонымен қатар қасиетті нысандарға туристер мен қажылар тарапынан деген қызығушылықтың артуы, киелі туризмнің әлеуетін бағалау мәселесін өзекті етеді. Киелі туризмнің ресурстық әлеуетін бағалау оның болашақ дамуын реттеудің және перспективаларын анықтаудың негізгі құралы болып табылады.

Мақалада Қазақстанның сакралды туризмін дамыту әлеуетін бағалау нәтижелері келтірілген. Статистикалық көрсеткіштердің жетіспеушілігін ескере отырып, мақалада жалпы теңгерім әдісі мен сараптамалық сұхбаттасуды қолдану арқылы таңдап алынған бағалау өлшемдерінің негізінде Қазақстанның әкімшілік облыстарында сакралды туризмнің әлеуетін бағалауға талпыныс жасалды.

Жүргізілген талдау нәтижесінде ресурстардың біркелкі орналаспағаны белгілі болды, туристерге қызмет көрсетуде елдің оңтүстігінде және орталық бөлігінде орналасқан ресурстардың (табиғи-климаттық, сакралды) және инфрақұрылымның ең жоғары мүмкіндігі бар екені анықталды. Елдің батысында, шығысында және солтүстігінде орналасқан әкімшілік облыстары сакралды туризмді дамыту әлеуетінің орташа және төмен мәнімен сипатталады.

Зерттелген талдау нәтижелері аймақтық және жергілікті деңгейлерде сакралды туризмнің теңгерімді дамыту үшін ұйымдастырушылық және басқарушылық мәселелерді шешу үшін қолдануға болады.

**Түйін сөздер:** туризм, киелі туризм, әлеует, бағалау, Қазақстан.

### Введение

Оценка потенциала сакрального туризма актуализируется тем, что имеется настоятельная необходимость в проведении оценки ресурсов сакрального туризма в свете реализации государственной программы «Рухани жаңғыру», предусматривающей не только изучение и охрану сакральных объектов, но и повышение ее туристской привлекательности. Как известно, туристская привлекательность определяется его потенциалом, а потенциал сакрального туризма представляется как совокупность туристских ресурсов, условий и возможностей для удовлетворения потребителей сакрального туризма.

Оценка потенциала развития сакрального туризма является новым исследованием в сфере туризма Казахстана. Проведение исследований в этом направлении даст возможность представить реальную картину развития и выделить особенности территорий расположения сакральных объектов. Результаты оценки потенциала покажут преимущества либо проблемные ситуации, связанные с развитием сакрального туризма на той или иной территории расположения сакральных объектов.

По мере того, как шло становление туризма в стране, совершенствовались методы оцен-

ки туристских ресурсов, расширялась сфера их применения. Изучая известные методы оценки туристских ресурсов, нами было выявлено, что в основном идет их изучение и исследование в границах административных и экономических районов, либо в границах природно-территориальных систем. На наш взгляд, оценку туристских ресурсов оптимально проводить в рамках административных границ, в целях того, чтобы результаты исследования были применены соответствующими инстанциями в своей управленческой деятельности.

Проблемам оценки ресурсного потенциала территории для развития сферы туризма в разные периоды развития посвящены научные разработки Д.Л. Арманда, М.В. Гудковских, Ю.А. Худеньких, Д.Г. Мамраева, А.В. Дроздова, А.С. Кускова, Ю.А. Веденина, Д.А. Дирина, Е.А. Ушаковой и др.

Целью данного исследования является оценка потенциала развития сакрального туризма в Казахстане.

Объект исследования, представленный в виде административных областей, выбран на основании административного деления Казахстана. Все 14 административных областей находятся в системе регионального управления и имеют самостоятельные органы управления. Каждая



административная область представляет собой часть туристского пространства страны. Во всех областях имеются собственные программы по управлению туризмом и выделяются средства для развития для туризма, в том числе и сакрального.

Предметом исследования являются возможности организации сакрального туризма в административных областях Казахстана.

### Материалы и методы исследования

Исследование потенциала сакрального туризма осуществлялось в соответствии с итоговой методической классификацией сакральных объектов Казахстана, которая включает разделение их по двум общепризнанным категориям: общенациональные сакральные места и региональные объекты; и пяти блокам: особо почитаемые памятники природного наследия (культурный ландшафт); археологические и архитектурные памятники; крупные средневековые городские центры и столицы Казахского ханства; религиозные и культовые объекты – места поклонения; сакральные места, связанные с историческими личностями; сакральные места, связанные с историческими и политическими событиями.

Оценку потенциала сакрального туризма предлагается провести методом баланса, на эффективность использования которого указывают многие ученые (Гудковских, 2017). Этот метод позволит детально проанализировать ресурсную базу потенциала сакрального туризма, выявить имеющиеся возможности, провести сравнительный анализ туристских возможностей территорий и определить приоритетные направления развития сакрального туризма. Метод баланса включает оценку блоков, значения которых коррелируются поправочными весовыми коэффициентами.

Порядок применения метода баланса при оценке потенциала сакрального туризма: выбор объекта оценки; отбор ключевых критериев; определение весовых поправочных коэффициентов; нормирование результатов; ранжирование оценочных шкал; оценка блочная и интегральная; разделение территории по степени потенциала сакрального туризма; построение карты туристского потенциала (Ушакова, 2014).

Сторонники метода баланса допускают применение оценки потенциала путем экспертного интервьюирования при ситуациях, связанных с факторами, не дающими возможность провести масштабную оценку потенциала, тогда как экс-

пертный опрос является более оптимальным вариантом в этом плане, так как позволяет формировать набор параметров для оценки гибче.

Главное достоинство методики состоит в том, что она предполагает использование расширенного перечня критериев и показателей количественной и качественной оценки потенциала туристских ресурсов сакрального значения, в том числе критериев экологичности территории и сформированности институциональной среды.

Формула расчета потенциала сакрального туризма с использованием экспертного опроса представлена следующим образом:

$$ПСТ = (|СР| + |ПКР| + |ИСТ|), \quad (2)$$

где ПСТ – потенциал сакрального туризма; СР – возможности использования сакральных ресурсов в туристских целях; ПКР – возможности использования природно-климатических ресурсов в целях развития сакрального туризма; ИСТ – возможности использования инфраструктуры в целях развития сакрального туризма.

Каждый из блоков рассчитывается по формуле Гудковских М.В. (Гудковских, 2017):

$$B_i = \sum k_i * a_j, \quad (1)$$

где  $B_i$  – блоки оценки потенциала сакрального туризма;

$a_j$  – компоненты блока;

$i$  – число компонентов блока оценки;

$k_i$  – коэффициент значимости определенного компонента в структуре оценки блока.

Компонент оценки рассчитывается по формуле:

$$a_j = (f_1 + f_2 + f_3 + \dots + f_n), \quad (2)$$

$f_n$  – значение критериев в компонентах блока;

$n$  – число критериев в компоненте оценки.

### Результаты и обсуждение

Во избежание дублирования и искажения полученных результатов была разработана система критериев и показателей оценки потенциала сакрального туризма

В качестве экспертов были привлечены специалисты туристских компаний, специалисты департамента туризма и научные исследователи



в сфере сакрального туризма. Привлечение широкого круга специалистов в сфере сакрального туризма и междисциплинарность исследования позволили обеспечить объективность полученных результатов и их полноту.

Опросный лист включил наиболее значимые критерии оценки и шкалу важности каждого параметра по 10-балльной шкале. Экспертная анкета включила 3 блока вопросов с 24 факторами оценки, каждый из которых был оценен экспертами. Обработка информации осуществлялась при использовании программы SPSS Statistics.

Результаты оценки позволили провести ранжирование критериев по степени значимости, а также расчет коэффициентов их весомости. По итогам расчета, коэффициент конкордации, определяющий степень согласованности мнений экспертов, составил 0,72. Полученный результат засвидетельствовал о том, что он является не случайной величиной и отражает в целом общность суждения экспертов с высокой степенью достаточной согласованности.

Привлечение экспертов дало возможность определить коэффициенты весомости критериев оценки. Средний весовой коэффициент блока «Возможности использования сакральных ресурсов в туристских целях» составил 0,65. Блок «Возможности использования природно-климатических ресурсов в целях развития сакрального туризма – 0,19. И более низкие весовые коэффициенты получил блок «Возможности использования инфраструктуры в целях развития сакрального туризма» – 0,16.

Более высокие значения по результатам опроса получили такие критерии оценки сакральных объектов, как мемориальная значимость; достаточное количество туристских маршрутов сакрального значения; современное использование в сети экскурсионных маршрутов; связь с практикой посещаемости; уникальность объекта, историографическая значимость и др. Более низкие баллы получили такие критерии, как: контрастность (пейзажность); комфортность экологических условий; достаточное количество работников и др.

Блок «Возможности использования сакральных ресурсов в туристских целях» включил следующие показатели оценки: мемориальная значимость; уникальность, ценность; историографическая значимость; сохранность, пригодность к показу; транспортная доступность; информационная обеспеченность и узнаваемость; достаточное количество туристских маршрутов сакрального значения; современное использо-

вание в сети экскурсионных маршрутов; связь с практикой посещаемости; туристская нагрузка и освоенность территории; емкость, аттрактивность; безопасность (состояние объектов); технологичность освоения; радиус влияния сакральных объектов. Блок «Возможности использования природно-климатических ресурсов в целях развития сакрального туризма»: комфортность климатических условий; комфортность географических условий; комфортность экологических условий; контрастность (пейзажность); рекреационные возможности территории. Блок «Возможности использования инфраструктуры в целях развития сакрального туризма»: инфраструктурная обеспеченность; достаточное количество средств размещения; достаточное количество работников; сформированность институциональной среды.

Ниже на основе отобранных критериев авторами разработана оценочная шкала в баллах, которая дает возможность определить степень благоприятности ресурсов для развития сакрального туризма. Исследование представлено в виде пояснения к методике расчетов потенциала сакрального туризма фрагментарно по категории «Особо почитаемые памятники природного наследия».

Параметр «Мемориальная значимость особо почитаемых объектов природного наследия» рассчитывался в зависимости от мемориального статуса сакрального объекта.

Ранжирование параметра «Мемориальная значимость особо почитаемых объектов природного наследия» шло в следующей последовательности: 5 баллов – объект имеет международное признание (включен в список Всемирного наследия ЮНЕСКО или кандидат на зачисление); 4 балла – объект имеет общенациональное значение; 3 балла – объект имеет региональное значение; 2 балла – объект имеет местное признание; 1 балл – объект без признания.

Параметр «Уникальность, ценность особо почитаемых объектов природного наследия» рассчитывался в зависимости от важности по значению в контексте уникальности и ценности сакрального объекта. Ранжирование параметра «Уникальность, ценность особо почитаемых объектов природного наследия»: 5 баллов – объект представляет собой исключительный природный феномен, «место памяти» в пространстве с уникальными природными явлениями, ландшафтными объектами в Казахстане, связанными с природными местами, традиционным мировоззрением казахов, важнейшими ценно-

стями сознания в истории этносов (природные памятники, особенные символические природные процессы в конкретной местности, редкие примеры природно-геологических явлений); 4 балла – объект является почитаемым природным местом паломничества и поклонения, показывает высокую духовность и ее истоки в этническом сознании, носитель информации о прошлом и современности. Природный объект представлен как маркер основных значимых событий, фактов, этапов в истории природы региона и отражает важнейшие события, традиции, достижения, творения природы в сакральном, религиозном, историко-культурном, искусствоведческом, литературном, образовательном контекстах, показывающий отличительные этапы в мировой и отечественной природно-культурной среде; 3 балла – объект содержит важный природный ареал обитания для сохранения биологического разнообразия. Объект показывает отличительные примеры и образцы экологических, биологических, биофизических, зоологических процессов в эволюции разных экосистем на территории современного Казахстана; 2 балла – объект представляет собой образец интересного научного факта в естественной истории планеты, экологических и биологических процессов в Казахстане; 1 балл – объект является природным местом традиционных народных празднований, шествий, соревнований.

Ранжирование параметра «Транспортная доступность особо почитаемых памятников природного наследия»: 5 баллов – объект доступен для всех видов транспорта, регулярно проводятся экскурсии и паломничества, имеются информационные указатели с названием объекта (QR коды), имеется техническая возможность посещения лицам с ограниченными возможностями; 4 балла – на объекте возможно проведение тематических экскурсий и паломничества, доступен для отдельных видов транспорта, имеются информационные указатели с названием объекта (QR коды); 3 балла – есть возможность добраться до сакрального объекта на отдельных видах транспорта, имеются информационные указатели с названием объекта; 2 балла – есть

возможность добраться до сакрального объекта на средствах автомобильного транспорта повышенной проходимости; 1 балл – нет возможности добраться легковым автомобильным транспортом

Параметр информационной обеспеченности и узнаваемости рассчитывался с позиции возможности нахождения информации в сети Интернет, в зависимости от величины и известности у пользователей на сайтах. Кроме того, принимался во внимание тот факт, насколько объект может представлять туристский интерес. Ранжирование параметра «Информационная обеспеченность и узнаваемость особо почитаемых памятников природного наследия»: 5 баллов – наличие информации для туристов на известных мировых сайтах, путеводителях (в том числе и на английском языке). Объекты представляют достаточный туристский интерес; 4 балла – наличие информации на казахстанских сайтах для туристов. Объекты включены в программу обязательного показа для туристов; 3 балла – наличие информации на региональных сайтах для туристов. Объекты включены в программу показа для туристов; 2 балла – имеется информация в сети интернет в поисковых системах. Представлен в виде экскурсионного объекта; 1 балл – имеется информация в сети интернет об объекте с характеристикой.

Согласно предлагаемому в исследовании подходу, интегральный показатель вычисляется путем суммирования величин потенциала трех блоков, формирующих структуру сакрального туризма: «Возможности использования сакральных ресурсов в туристских целях», «Возможности использования природно-климатических ресурсов в целях развития сакрального туризма» и блок «Возможности использования инфраструктуры в целях развития сакрального туризма» (таблица 1).

Далее была осуществлена проверка правильности выполненных расчетов и корректировка результатов оценки, интерпретация полученных результатов. Расчет и обработка данных в основном проводились на основе применения программ SPSS Statistica и Excel.

**Таблица 1** – Итоги расчета интегральной оценки потенциала сакрального туризма Казахстана в разрезе административных областей на основе экспертной оценки

№	Область	Оценка потенциала сакрального туризма по блокам			Итоговая оценка
		1 – СР	2 – ПКР	3 – ТИ	
1	Акмолинская область	2094,95	193,42	125,6	2413,97
2	Костанайская	1335,75	124,83	70,88	1531,46
3	Павлодарская	1643,85	168,15	83,2	1895,2
4	Северо-Казахстанская	557,05	57,38	34,72	649,15
5	Восточно-Казахстанская	1868,1	196,08	103,68	2167,86
6	Карагандинская	3058,25	300,01	166,24	3524,5
7	Атырауская	1008,15	96,9	60,64	1165,69
8	Западно-Казахстанская	1718,6	161,69	96,96	1977,25
9	Актюбинская	1840,8	163,21	109,6	2113,61
10	Мангыстауская	1856,4	173,85	102,24	2132,49
11	Алматинская	2998,45	299,82	173,76	3472,03
12	Жамбылская	1609,4	171,95	95,68	1877,03
13	Туркестанская	4201,6	413,63	251,04	4866,27
14	Кызылординская	1647,75	127,11	90,56	1865,42

Примечание: составлено автором

Для того, чтобы интерпретировать результаты, разработан коридор оценок в разрезе каждого из блоков, а также рассчитан шаг оценивания (таблица 2).

**Таблица 2** – Диапазон интегральной оценки потенциала сакрального туризма по блокам параметров на основе экспертной оценки

№	Уровень потенциала	Шаги оценок по блокам			
		шаг – 607,43 1 – СР	шаг – 59,38 2 – ПКР	шаг – 36,05 3 – ТИ	шаг – 702,85 Итоговая оценка
1	Потенциал отсутствует (ПО)	менее 557,05	менее 57,38	менее 34,72	менее 649,15
2	Потенциал низкий (ПН)	557,06–1164,49	57,39–116,73	34,73–70,78	649,16–1352,01
3	Потенциал ниже среднего (ПНС)	1164,50–1771,93	116,74–176,12	70,79–106,84	1352,02–2054,87
4	Потенциал средний (ПС)	1771,94–2379,37	176,13–235,51	106,85–142,90	2054,88–2757,73
5	Потенциал выше среднего (ПВС)	2379,38–2986,81	235,52–294,90	142,91–178,96	2757,74–3460,59
6	Потенциал высокий (ПВ)	2986,82–3594,25	294,91–354,29	178,97–215,02	3460,60–4163,45
7	Потенциал очень высокий (ПОВ)	более 3594,26	более 354,30	более 215,03	выше 4163,46

Примечание: составлено автором

Далее с учетом диапазонов по каждому из блоков была составлена матрица, отражающая уровень развития потенциала сакрального ту-

ризма в административных областях Казахстана, как в разрезе отдельных блоков, так и в рамках общей оценки (таблица 3).

**Таблица 3** – Матрица интегральной оценки с точки зрения величины блоков потенциала сакрального туризма по блокам

№	Область	Блоки			Итоговая оценка
		1 – СР	2 – ПКР	3 – ТИ	
1	Акмолинская область	ПС	ПС	ПС	ПС
2	Костанайская	ПНС	ПНС	ПНС	ПНС
3	Павлодарская	ПНС	ПНС	ПНС	ПНС
4	Северо-Казахстанская	ПО	ПО	ПО	ПО
5	Восточно-Казахстанская	ПС	ПС	ПНС	ПС
6	Карагандинская	ПВ	ПВ	ПВС	ПВ
7	Атырауская	ПН	ПН	ПН	ПН
8	Западно-Казахстанская	ПНС	ПНС	ПНС	ПНС
9	Актюбинская	ПС	ПНС	ПС	ПС
10	Мангистауская	ПС	ПНС	ПНС	ПС
11	Алматинская	ПВ	ПВ	ПВС	ПВ
12	Жамбылская	ПНС	ПНС	ПНС	ПНС
13	Туркестанская	ПОВ	ПОВ	ПОВ	ПОВ
14	Кызылординская	ПНС	ПНС	ПНС	ПНС

Примечание: составлено автором

Расчет потенциала по вышеприведенным показателям на основе экспертного опроса с при-

менением метода баланса показал неравномерность распределения потенциала по территории страны (рисунок 1).



**Рисунок 1** – Итоги расчета интегральной оценки потенциала развития сакрального туризма Казахстана по административным областям на основе экспертной оценки

Получен объективный результат – Туркестанская область по всем оцениваемым параметрам показала высокие баллы, так как имеет самую высокую концентрацию сакральных ресурсов по Казахстану. Здесь сакральный туризм имеет приоритет среди других видов туризма. Выделяется объект исследования не столько значительным количеством сакральных объектов (в области расположено 103 сакральных объекта (14,1%)) и плотностью их расположения, сколько их уникальностью. Всемирно известные сакральные объекты, такие как мавзолей Ходжа Ахмеда Яссауи, мавзолей Арыстан баб и др. Инфраструктурная обеспеченность улучшается из года в год, в соответствии с запланированными мероприятиями в рамках государственной программы «Рухани жаңғыру», в ходе реализации Концепции развития туристской отрасли до 2023 г., а также программы развития территорий регионов. Более 10% из количества сакральных объектов представляют объекты природного наследия, что подтверждает природное и экологическое благополучие территории исследования. Область, обладающая богатейшими сакральными ресурсами, является потенциальным лидером генерации деятельности сакрального туризма. Будущее инвестирование в сакральный туризм будет здесь достаточно приоритетным.

Далее практически на одинаковой строке расположились Карагандинская и Алматинская области. Уступая только по показателям туристской инфраструктуры, Карагандинская область выделяется своими сакральными объектами и благоприятными природно-климатическими условиями. Эксперты дали высокую оценку области по следующим показателям: емкость, аттрактивность, безопасность. Позиция Алматинской области немного уступает по возможностям использования сакральных ресурсов и природно-климатических ресурсов в туристских целях. Имеются все предпосылки для возможности использования инфраструктуры в целях развития сакрального туризма. Комфортные климатические, географические и экологические условия, пейзажность и аттрактивность сакральных объектов, а также наличие памятников природного наследия и сакральных мест, связанных с историческими и политическими событиями, дают возможность позиционировать области в числе передовых.

Акмолинская, Восточно-Казахстанская, Актюбинская, Мангыстауская области занимают третью строку. В Акмолинской области выигрышными моментами являются инфраструктур-

турная обеспеченность, сохранность (пригодность к показу), комфортность географических условий, транспортная доступность сакральных объектов.

Достаточно минимален радиус влияния сакральных объектов, что отражается на доступности объектов потребителям сакрального туризма. В Восточно-Казахстанской и Актюбинской областях низкая инфраструктурная, информационная и транспортная обеспеченность, отсутствие возможности использования сакральных объектов в сети экскурсионных маршрутов и меньший радиус влияния сакральных объектов не дают возможности предположить о хороших перспективах развития сакрального туризма в этих областях. Мангыстауская область, расположенная на западе страны, имеет все возможности привлечь туристов (Бекет-ата, Шакпак-ата, Султан-эпе и др., куда ежедневно приезжают на паломничество многие верующие и также туристы), но в силу низких показателей обеспеченности природно-климатическими ресурсами и скудном разнообразии природных ландшафтов область имеет средний потенциал развития сакрального туризма.

Оценку ниже среднего потенциала получили области: Костанайская, Павлодарская, Западно-Казахстанская, Жамбылская и Кызылординская. В Костанайской области отсутствуют сакральные объекты, связанные с историческими и политическими событиями, в Кызылординской и Жамбылской областях отсутствуют особо почитаемые сакральные объекты природного наследия, Западно-Казахстанская – помимо незначительного количества сакральных объектов, характеризуется неблагоприятными природными условиями. Другие показатели, такие как: слабая инфраструктура, транспортная доступность, информационная обеспеченность, связь с практикой посещаемости, достаточное количество туристских маршрутов сакрального значения, отсутствие интереса к объектам, малый радиус влияния сакральных объектов, недостаточно благоприятные условия технического освоения территории, низкое качество сервиса и т.п., подтверждают низкий потенциал развития сакрального туризма в этих административных областях.

В Атырауской и Северо-Казахстанской областях потенциал достаточно низкий в силу отсутствия в первую очередь ресурсов и возможностей для развития на этих территориях сакрального туризма, о чем свидетельствуют показатели и результаты исследования.

Далее на основе проведенных исследований был оценен потенциал развития сакрального ту-

ризма в разрезе регионов Казахстана (рисунок 2).

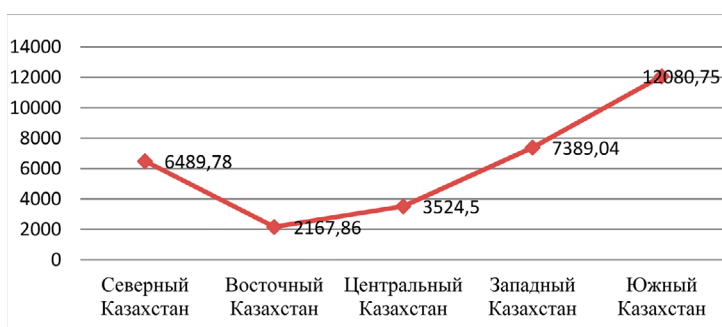


Рисунок 2 – Результаты оценки потенциала сакрального туризма по регионам Казахстана

Наибольшие баллы практически по всем показателям оценки потенциала получил Южный Казахстан, включающий Алматинскую, Туркестанскую, Жамбылскую и Кызылординскую области. Всего в регионе сконцентрировано более 271 сакрального объекта общенационального и регионального значения (37%). Регион характеризуется расположением вдоль Великого Шелкового Пути, богат природными условиями и ресурсами.

Примерно равноправную позицию заняли регионы – Западный Казахстан 179 (24,4%) и Северный Казахстан 151 (20,6%). Характеризуясь наличием примерно одинакового количества входящих в них сакральных объектов, в силу природных особенностей мест расположения и недостаточной инфраструктурной обеспеченности, данные регионы характеризуются средним потенциалом развития сакрального туризма.

К регионам с более низким потенциалом развития сакрального туризма отнесены Восточный Казахстан 48 (6,56%) и Центральный Казахстан 82 (11,22%). В силу того, что данные регионы включают в свой состав по одной административной области, показатели оценки по сравнению с другими регионами, включающими в состав по четыре области, оказались относительно незначительными.

### Заключение и выводы

Комплексный анализ потенциала сакрального туризма показал, что наибольшей возможностью принять и обеспечить потенциальных туристов с имеющими ресурсами (природно-климатическими, сакральными и инфраструктурной обеспеченностью) обладают области,

расположенные на юге и в центральной части страны. Перспективы развития сакрального туризма в Туркестанской, Карагандинской и Алматинской областях, согласно проведенным расчетам интегрального потенциала, очевидны. Нельзя опровергнуть тот факт, что наибольшие баллы эти области получили не только по количеству сакральных объектов, расположенных на их территориях, но и по высокой плотности расположения и инфраструктурной обеспеченности. Хотя присутствуют те же проблемы, как и в других административных областях, получивших меньшую оценку: слабо развитая сеть экскурсионных маршрутов, отсутствие информации на известных мировых сайтах, недостаточная вовлеченность в туристскую деятельность определенных объектов, минимум легендирования, малая аттрактивность, низкое качество сервиса и пр. Поэтому в административных областях с наиболее улучшенными показателями интегрального туристского потенциала рекомендуется дальнейшее развитие инфраструктуры.

Исследование подтверждает, что потенциал развития сакрального туризма административных областей и регионов Казахстана не имеет возможности приносить выгоды территории, если он не использует потенциальные возможности использования сакральных, природно-климатических ресурсов и инфраструктуры в целях развития сакрального туризма.

Таким образом, на основе экспертного опроса с применением перечня критериев оценки и весовых поправок стало возможным провести более объективную оценку потенциала сакрального туризма в разрезе административных областей и регионов Казахстана, результаты которой можно использовать для решения организаци-

онно-управленческих задач в целях сбалансированного развития сакрального туризма на региональном и локальном уровнях.

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## GREEN TECHNOLOGIES IN THE FIELD OF TOURISM

Currently, the consumer attitude towards of natural resources are increasingly dominating. Therefore, the introduction of new approaches in various spheres of human activity, including tourism, contributing to an increase in the efficiency of their use, without harming the environment, is necessary for modern society. In this regard, the most relevant is the greening of tourism activities. Ecologization of tourist activity is considered as a complex phenomenon of modern social development, in the process of which there is an interaction of various material and ideological objects and phenomena of natural, social and economic content. Ecologization, as an important part of the “green” economy, is aimed at maintaining the welfare of society through the rational use of natural resources, as well as the return of final products to the production cycle. The article discusses the ways of greening technologies in the field of tourism, the positive and negative impact of tourism on the environment, as well as the consequences of its negative impact, and reveals the principles of greening tourism. At the same time, the theme of the international exhibition held in 2017 in Kazakhstan EXPO “Future energy” – alternative energy sources was analyzed, ideas for implementing the principles of the “green economy” were demonstrated, and technologies presented at the exhibition that promote tourism were highlighted. A sociological survey of the population was conducted on the issues of greening technologies in the field of tourism, and ways of greening the tourist infrastructure were proposed.

**Key words:** tourism, greening, technologies, EXPO-2017, energy-saving technologies.

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### Туризм саласында технологияларды экологияландыру

Қазіргі уақытта табиғи ресурстарға деген тұтынушылық қатынас басым болып келеді. Сондықтан оларды қоршаған ортаға зиян тигізбестен пайдалану тиімділігінің артуына ықпал ететін туризмнің, соның ішінде адам қызметінің әр түрлі салаларына жаңа тәсілдерді енгізу қазіргі қоғам үшін қажет. Осыған байланысты туристік қызметті экологияландыру ең өзекті мәселе болып табылады. Туристік қызметті экологияландыру қазіргі әлеуметтік дамудың күрделі құбылысы ретінде қарастырылады, оны жүзеге асыру барысында табиғи, әлеуметтік және экономикалық мазмұндағы әртүрлі материалдық және идеологиялық нысандар мен құбылыстардың өзара әрекеті жүреді. Экологияландыру, «жасыл» экономиканың маңызды бөлігі ретінде, табиғи ресурстарды ұтымды пайдалану арқылы қоғамның әл-ауқатын сақтауға, сондай-ақ түпкілікті өнімді өндірістік циклға қайтаруға бағытталған.

Мақалада туризмдегі технологияларды экологияландыру жолдары, туризмнің қоршаған ортаға тигізетін жағымды және жағымсыз әсерлері, сондай-ақ оның кері әсерінің салдары қарастырылып, туризмнің экологияландыру қағидалары көрсетілген. Сонымен қатар, 2017 жылы Қазақстанда өткен халықаралық көрменің тақырыбы «ЭКСПО. Болашақ энергиясы» – баламалы энергия көздері талқыланып, «жасыл экономика» қағидаттарын іске асырудың идеялары қарастырылды, туризмді ілгерілетуге ықпал ететін технологиялар көрсетілді. Туризм саласындағы технологияларды экологияландыру мәселелері бойынша халыққа әлеуметтік сауалнама жүргізілді, туристік инфрақұрылымды экологияландыру жолдары ұсынылды.

**Түйін сөздер:** туризм, жасылдандыру, технологиялар, ЭКСПО-2017, энергия үнемдейтін технологиялар.

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### Экологизация технологий в сфере туризма

В настоящее время всё более доминирует потребительское отношение к природным ресурсам. Поэтому внедрение новых подходов в различных сферах человеческой деятельности, в том числе и туристской, способствующих повысить эффективность их использования, не нанося ущерба окружающей среде, является необходимым современным обществу. В связи с этим наиболее актуальным является экологизация туристской деятельности. Экологизация туристской деятельности рассматривается как сложное явление современного общественного развития, в процессе реализации которого происходит взаимодействие разнообразных материально-вещественных и идеологических объектов и явлений естественного, социального и экономического содержания. Экологизация, являясь важной частью «зеленой» экономики, направлена на поддержание благосостояния общества за счет рационального использования природных ресурсов, а также возвращения конечных продуктов в производственный цикл. В статье рассматриваются пути экологизации технологий в сфере туризма, положительное и отрицательное воздействие туризма на окружающую среду, а также последствия его негативного воздействия, раскрываются принципы экологизации туризма. Вместе с тем проанализирована тема международной выставки, проведенной в 2017 году в Казахстане, – «ЭКСПО. Энергия будущего» – альтернативные источники энергии, продемонстрированы идеи воплощения в жизнь принципов «зеленой экономики», освещены, представленные на выставке, технологии, способствующие продвижению туризма. Проведен социологический опрос населения касательно вопросов экологизации технологий в сфере туризма, предложены пути экологизации туристской инфраструктуры.

**Ключевые слова:** туризм, экологизация, технологии, EXPO-2017, энергосберегающие технологии.

### Introduction

The tourism industry, which began in the 1950s, is one of the most dynamically developing sectors of the world economy and has already had its impact on nature. Therefore, the increase in tourist flows and their density in all regions of the world causes serious concern to political figures, representatives of the scientific community and most ordinary people. According to UNWTO formal General-Secretary Taleb Rifai information, 5% of global CO<sub>2</sub> emissions come from tourism, which divided 40% from air transport, 20% from accommodation, and the remaining 40% from transportation, such as ground transport, railways and cruise and health services. Concerned about the future of the tourism industry, tourism organization should concentrate they attention to develop the industry through a green economy (Pecheritsa, 2013).

Tourism is an industry that is closely related to the environment and despite its emphasis on the purity and quality of nature, aims to make extensive use of many natural resources for its development. Therefore, tourism not only has a positive impact on the country's economy, but also has a negative impact on the environment. The negative impact of tourism today occurs in many developing countries, especially in countries that do not have sufficient

technical and financial capacity to replenish the resources consumed by tourists and eliminate the household waste they produce. For example, in Nepal, despite the lack of fuel, active forms of tourism are very popular among tourists, and every tourist who goes for a walk in the country burns about 6 kg of wood per day. In Egypt, only one hotel uses the light, which is consumed by 3,600 ordinary families a year (Pecheritsa, 2013).

In addition to the indisputable advantages of tourism for the region, such as the protection of special protected natural areas, there are several negative effects of its development. The most important negative effects of tourism for the environment and socio-cultural environment are as follows (Property 24; Khrabovchenko, 2013):

Ignoring the recreational capacity of recreation areas, overuse of natural ecosystems due to the simultaneous increase the number of people for that place;

Increase of unauthorized loads on the natural landscape in accordance with the Environmental Code of the Republic of Kazakhstan;

Increased noise caused by an increase in the total number of vehicles;

Increasing anthropogenic pressure, which leads to the loss of historical and architectural heritage, changes in the sectors of the local economy that depend on tourism and affect the emergence of the region.

**Table 1** – The positive and negative impact of tourism on the environment (compiled by the authors)

Positive effect	Negative effect
<ul style="list-style-type: none"> <li>– direct financial investments in environmental protection, which come in the form of payment for visits to eco-tourism facilities;</li> <li>– support and development of specially protected natural areas;</li> <li>– reduction of impact on ecosystems (in accordance with environmental standards);</li> <li>– rational use of land;</li> <li>– protection of rare species of ecosystems.</li> </ul>	<ul style="list-style-type: none"> <li>– intensive use of water resources to ensure the direct consumption of hotels, parks, as well as tourists;</li> <li>– degradation and depletion of natural resources as a result of intensive construction of tourism-related facilities: land plots, roads, airports, etc.;</li> <li>– the increase in atmospheric pollution is due to the growth of international tourist flows by various modes of transport;</li> </ul>

Tourism is a major carrier of social and environmental changes. The main argument for social changes is the development of international tourism. Because international tourism is considered as a catalyst for the transition of any country from the traditional way of life to modern western forms of society, all its characteristic features. As tourism introduces new trends in the social sphere, it contradicts the traditional norms that exist in society and conflicts with long-standing cultural traditions.

Due to this, tourism is associated with human rights violations, and as a result of its development, there is an increase in crime, prostitution, alcohol and drug use. In addition, according to the International Labour Organization probably from 3 to 19 million children and adolescents work in the tourism sector (Yakovenko, 2015; Yakunin, 2015; Ayuso, 2006).

As for environmental changes, we can note the following changes caused by the negative impact of tourism on the environment:

**Table 2** – Changes caused by the negative impact of tourism on the environment (compiled by the authors)

Type of change	Consequences of changes	The type of tourism that leads to change
Changes in geological resources (mountain landscape, minerals and extractable resources)	This is mainly due to changes in the composition of rocks, destruction of stalactites, stalagmites in caves, environmental pollution and the extraction and use of precious stones from fossils for souvenirs.	Speleotourism and mountain climbing.
Changes in the soil.	As a result of the construction of tourist infrastructure (buildings, structures, car parking lots, roads, pedestrian paths), the destruction of the upper fertile soil layer or, as a result, the degradation of vegetation.	All types of tourism.
Changes in water resources (underground water, open reservoirs with fresh water and seawater)	The location of hotels, tourist territories on the banks of lakes and rivers leads to a gradual waterlogging of the territory due to their carelessness and lack of clean water.	Beach tourism, accommodation, catering facilities located along the beach.
Changes in vegetation (forests and their cover)	Trampling of the forest cover by humans leads to degradation, picking plants leads to an increase in the number of weeds that replace it.	Active types of tourism (adventure, sports and etc.)

Currently, the rapid growth of tourism, as we can see above, leads to particularly significant environmental changes. In order to solve environmental problems, the tourism sector should be implemented through environmental protection. The ecologization of tourism includes the following areas: active preservation of Natural Heritage; transition of tourism industry enterprises to the use of resource-saving technologies; improving the

ecological culture of participants in tourist activities. In order to transfer tourism industry enterprises to the use of resource-saving technologies, we need to consider ways to obtain alternative energy sources.

### Scientific research methodology

Taking into account the negative impact of tourism on the environment, it is proposed to develop

the industry through environmental protection. The ecologization of tourism is a long-term and step-by-step system and is part of the ecologization of the economy. The initial step of the system will be to fully understand the term and implement it in the industry, as well as the country's environmental policy.

Ecologization of tourism – the transition to the use of environmentally friendly and safe innovative technologies and products in the tourism industry, taking into account the cultural, historical features and traditions of the country. At the same time, the ecologization of tourism should be carried out in the areas of resource-saving technologies in the tourism business, modern technologies for processing and processing waste in the tourism business and the ecologization of transport support in tourism. The main requirements for the ecologization of tourism as an integral part of the ecologization of the economy include the following (Nezdoyminov, 2014; Andrei, 2015):

- the ecologization of tourism should make a significant contribution to the process of protecting, preserving and increasing the natural resources of a particular region;

- in tourist enterprises, environmentally friendly products should be used when serving consumers;

- ecologization of tourism it is necessary to create conditions for the active dissemination of ideas of sustainable economic development, including improving the situation in developing countries, where tourism is the main branch of the national economic system;

- environmental protection should be an integral part of the modern tourism industry;

- the greening of tourism should contribute to the preservation of the ethno-cultural potential of the territory, traditions and beliefs of the local population.

The transition to an environmentally friendly model of production and consumption of tourist products requires, in particular, appropriate conditions and incentives, as well as support from World organizations such as the United Nations, UNWTO and the state organizations. “One of them is that Kazakhstan won the Expo Future Energy Exhibition and, thanks to this exhibition, held the world conference “Tourism and future energy - CO2 emissions reduction”, which is the main step in support of the greening of Tourism. The future of tourism is inextricably linked with the possibility of introducing alternative energy technologies in the industry and forming sustainable development strategies. Therefore, it is a great responsibility to hold the exhibition of future energy in our country, which

is important for the development of tourism. At the same time, our country is not indifferent to the problems of the modern world, because of its participation in the holding of this exhibition. Thanks to the exhibition EXPO 2017 future energy, our homeland has entered the era of new discoveries and innovative solutions in science and technology. This will lead to a radical change in the nature of economic growth and our way of life.

According to the results of the expo Future Energy Exhibition, 115 countries and 22 international organizations took part in the exhibition and demonstrated their technological achievements in the production of future energy to the entire population. The exhibition contributed to the development of transport infrastructure, the construction of about 10 new hotels and about 20 hostels in Nur-Sultan city. In addition, thanks to the support of our country for sustainable development, we were able to demonstrate the achievements of other countries in sustainable development.

At the same time, the ecologization of tourism is carried out through projects that have emerged thanks to the adopted policy and integration of countries. The Green Arena project, developed between Northern Europe and the north-western territory of Russia, is based on three priority areas:

Tools and strategies for the transition to a “green economy”. This includes the development of strategies for sustainable and green development and territorial branding of the city or district, master plans, the introduction of “green investments” in infrastructure (energy, transport, water supply, etc.), resource-saving technologies in housing construction, creating conditions for modern, environmentally friendly and livable.

Green routes and tourist and recreational potential of the Nordic countries and Russia. “Greenways” is the positioning of cultural and cognitive tourism as an integral part of local sustainable development through a network of green routes of European cultural and natural heritage.

Innovative networks and clusters of “green technologies”. Development of “green technologies” that ensure economic growth, development of cooperation at all levels in all sectors of the country, including industry, science and the public sector, innovation in small business and the promotion of resource conservation and environmental protection, cluster development (Kovalev, 2011; Sharygin, Luchnikov, 2012).

In our opinion, the welfare and prosperity of the country should be at the highest level in order to develop sustainable tourism, create conditions

for the greening of Tourism. It is determined by the British Analytical Center Legatum Institute, which has been operating since 2006. The Center created the world Prosperity Index (Legatum Prosperity Index) between countries. This index is a summary of the countries 1) economy; 2) entrepreneurship; 3) management; 4) education; 5) health care; 6) security; 7) personal freedom; 8) social capital 9) is determined by such indices as the natural environment and places states in certain places. For example, in 2017, Kazakhstan ranked 72nd out of 149 countries, and in 2018, it ranked 73rd. In those years, the country of Russia took 101st and 96th places. And the last place is occupied by 149 Afghanistan. According to the overall results of the world Prosperity Index, the situation of countries is improving, but this trend is not happening in all countries. Therefore, environmental support for the tourism sector is not at the same level in all countries (Ratings legatum prosperity index, 2018).

Scientific works of domestic and foreign authors on the study of Tourism ecologization were consid-

ered, as well as the following research methods were used: the method of analysis of theoretical data, comparative legal and logical methods.

The research is based on the use of scientific methods: generalization from particular to general and from general to particular, analysis, forecasting, environmental assessment (analogy).

In the course of writing the article, various sources of literature were used: scientific literature, analytical materials, etc.

## Results and discussions

The goal of using “green technologies” and the goal of Greening – to find the most cost-effective solutions that reduce the impact of production growth, ensuring the use of the environment and efficient use of resources (*about Project, 2013*).

To do this, first of all, it is necessary to determine the directions and ways of their implementation, which are suitable for use in accommodation, food, transport basic services and additional services that make up the tourist infrastructure.

**Table 3** – Ways to ecologize tourist infrastructure services. (The tourism sector of the German economy feels comfortable, 2013; Environmental certification in tourism as a tool for quality assurance and effective marketing, 2013; Microsoft and the world tourism organization will encourage innovation in the tourism sector, 2012)

Tourist infrastructure services	Ways of greening	Forms of implementation
Accommodation	Use of resource-saving technologies	– automatic lighting control; – automatic heat supply regulation; – operation of a solar power plant (photovoltaic panels); – solar panels installed on the roof to heat water; – wind generators for generating electricity.
	Use of modern waste treatment technologies	– Sorting waste according to the international standard into 4 special categories: paper waste, glass products, plastic products and metal; – transfer of garbage by plasma gasification to garbage cleaning and recycling plants.
	Use of modern processing technologies	– window glass made of recycled materials; – use of non-toxic paints in interior decoration; – furniture made of recycled materials.
Catering	Use of eco-goods and food	– purchase of organic food and consumer goods; – boycott and refusal to consume goods on the part of producers who violate the norms of environmental legislation.
	Use of modern processing technologies	– use natural packaging materials that can be recycled or safely recycled later.
Transport services	Greening of transport	– equipment for reducing CO2 emissions in air, surface, and water transport; – driving with diesel fuel and electric motors; – hybrid cars, electric vehicles; – organize access to nearby places by bicycle and horse-drawn carts.
	Greening of road networks	– installation of environmental structures on transport road junctions; – provision of equipment for alternative modes of transport from environmentally friendly products.

In order to use the above-mentioned technologies in tourist services, any recreation area that provides for sustainable development should strive to solve 4 problems:

Reducing greenhouse gas emissions, especially carbon dioxide.

The Fairmont Waterfront Hotel, located in Vancouver, Canada, uses a heat reuse system to reduce carbon and heat emissions: the system captures condensate from the hot water reservoir and returns it to the water entering the pipes and heats it in this way. This technology saves 305 thousand kilowatt-hours of electricity per year, which is equivalent to the annual energy consumption of seven private homes.

#### **Conservation of biodiversity.**

If environmental measures were not taken in time, international tourism has already had a negative impact on the flora and fauna. For example, an unregulated flow of travelers to desert areas is observed on the Caribbean islands and swamps of New Zealand and continues to disrupt the feeding system and nesting sites of chicks there.

#### **Waste recycling.**

As one of the main pollutants of nature, the tourism industry should have its own impact on waste production, as waste reduces the quality of water and soil and reduces the attractiveness of recreational areas. In recent decades, waste from a large influx of tourists to Venice has led to pollution of the city's canals and floods. Therefore, tourist centers should pay special attention to proper waste management.

#### **Protection of water systems.**

Providing high-quality water is very important for the long-term environmental sustainability of any resort. Water scarcity is observed in many regions of the world. Two main factors - population growth and the consequences of climate change - are causing concern due to the lack of this important vital resource.

All the above elements of environmental protection are interrelated. Poor waste management can lead to the release of harmful gases and contamination of water supply, and both of these factors can pose a threat to biodiversity (Tourism investing in energy and resource efficiency, 2015; Ruban, 2016; Modern tourists choose ecological vacations, 2013).

The introduction of energy-saving technologies will be the second step for any industry, if the above-mentioned issues will be solved first of all.

And the Expo of the Future Energy Exhibition in Nur-Sultan will serve as a guide to the optimal

solution for the use of "green technologies". Because during this exhibition, each country had the opportunity to use the technology they need, and there was an exchange of experiences between countries.

The transition to the greening of tourism will reach a certain level, i.e. the initial level, when the following works are carried out:

Any country should participate in exhibitions and events dedicated to the concept of sustainable development and participate in their organization;

Demonstration of the country's advanced technologies at exhibitions, exchange of experience with other countries;

Develop a policy of Environmental Protection of Tourism and contribute to the implementation of this policy, using the knowledge gained at exhibitions;

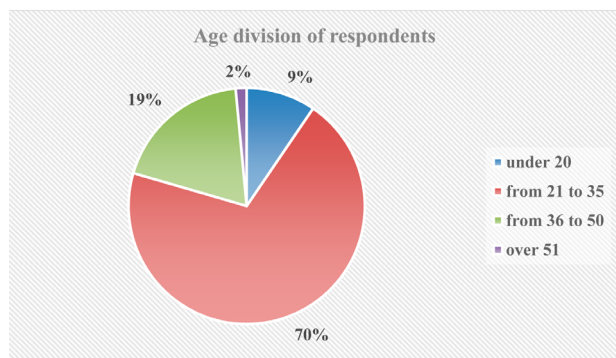
Monitor and assess the environmental situation of your country and determine which parts of the industry are most affected;

Conduct work on familiarizing and popularizing the local population with the current environmental situation, conduct frequent surveys and improve their environmental knowledge.

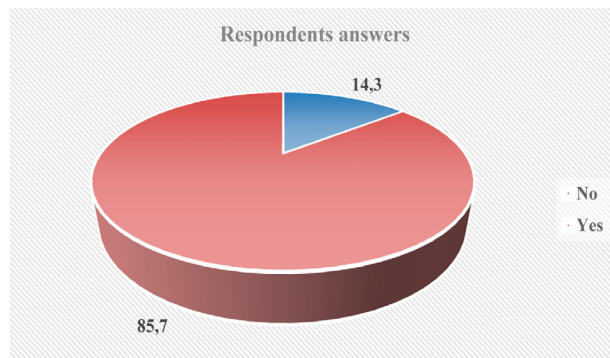
A survey was conducted to familiarize the local population with the current environmental situation and to conduct propaganda work. This survey showed that the local population of the country is able to understand the environmental impact of the tourism industry and the impact of the industry on nature. It was also determined that it is necessary to work with the population (Karpova, 2015; Ruban, 2014; Печерица, 2013).

According to the survey, 1000 respondents answered for 12 questions. Of these, 57.1% were male and 42.9% were women citizens. As for the age of the respondents, the respondents were 9.5% under the age of 20, adults between the ages of 21 and 35 answered 70% , 19% between the ages of 36 and 50, and elderly people over the age of 51 answered 1.4%.

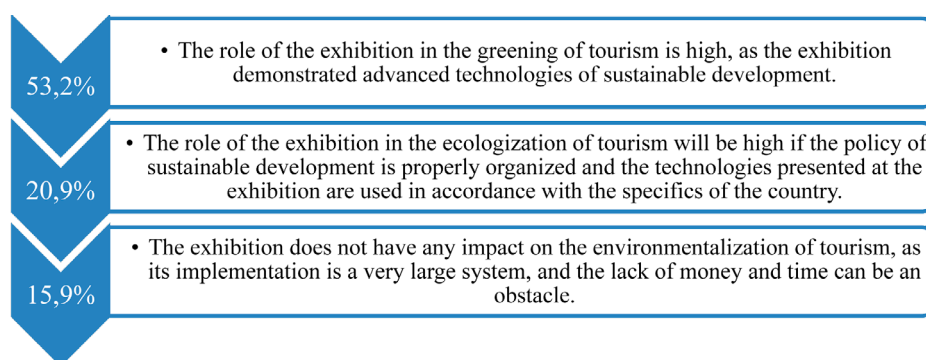
As a result of the above survey, everyone realized that in the first case there are existing environmental problems and they need to be dealt with. At the same time, 95.2% of the local population confirmed that it is their duty to keep the environment clean, and the tourism sector should also provide assistance in Environmental Protection, which should be carried out by investing 33.3% in environmental activities, 33.3% in the restoration of natural monuments, 23.8% in the protection of wild animals and 9.5% in forest planting. And the role of Expo in the greening of tourism in the Future Energy Exhibition was answered as follows:



**Figure 1** – Age indicators of respondents who took part in the survey (compiled by the authors)



**Figure 2** – Opinion of respondents on the need to apply an environmental rating in accommodation (compiled by the authors)



**Figure 3** – The role of Expo-2017 "Future energy" in the greening of Tourism (compiled by the authors)

According to the above-mentioned survey, the local population has proved that today it is necessary to take steps through technologies that have a small impact on the environment, each developing industry, including tourism, should develop through environmental protection, and the expo-Future Energy Exhibition in our country will help to use resource-saving technologies that do not have a negative impact on nature in the field of tourism (Karpova, 2005; World Tourism Organization, 2018; Penner, 2013).

## Conclusion

In conclusion, since the deterioration of the environment has become a problem not only in the country, but also in all countries of the world, the following negative effects on the environment of the tourism industry, which has become a phenomenon of the XXI century, were identified: neglect of the recreational capacity of recreation areas; increased atmospheric pollution caused by an increase in the number of vehicles; increased anthropogenic

pressure, which leads to the loss of historical and architectural heritage.

At the same time, the optimal solution to these problems will be environmental protection. The ecologization of tourism should be carried out through certain stages. One of them will be the vision of advanced technologies through exhibitions, fairs, events and the rational use of technologies depending on the geographical, economic and environmental situation of the country. To do this, it is necessary to start with a simple receipt of energy, if each state has the opportunity. For example, "windmills" can be installed at the Dzungarian gate (near the Kazakh-Chinese border), which is located in the east of Kazakhstan, because there is a strong wind here, which is the beginning of resource saving. This does not mean that the country does not have energy-saving technologies. For example, the following system has been installed in Nur-Sultan: one of the innovations called Smart Flower is a self-regulating system that converts solar rays into electricity. In addition, solar panels will be used to charge bus stops, traffic lights, high-speed car seats,

appliances, street lighting and power lamps in parks and squares.

The immediate introduction of tourism environmental technologies into our daily lives is becoming a big problem, especially for developing countries. Because the introduction and use of these technologies requires knowledge and funds, as well as the presence of environmental knowledge

in the minds of the local population. The solution of this problem should be carried out in developing countries with a certain system (preparation of an ecosystem, ecological education of the population, membership in promotion Associations, participation in exhibitions, exchange of experience) and begin with the introduction of the simplest energy-saving technologies into production.

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