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FORECASTING AND THE FORECAST OF CHANGES OF ARID GEOSYSTEMS IN THE CONDITIONS OF PROCEEDING ECOLOGICAL DESTABILIZATION IN ARAL SEA REGION

Abstract. The main natural and anthropogenous factors of forecasting are revealed; the basic tendencies to change of natural complexes are established; for the first time, it is scientifically proved that Aral Sea and Aral Sea region are genetically uniform and paragenetically dynamical macrogeosystems; considering properties and features of a structural and dynamic condition of superaqual, subaqual and eluvial geosystems of Aral Sea region and Aral Sea, the forecast of their transformation till 2020 year is developed; are developed practical action for cardinal improvement of an environment in delta of Amu Darya and the dried bottom of Aral Sea.

Keywords: geosystem, landscapes, the geographical forecast, desertification.

Introduction. In an environment of intense desertification of deltaic Plains of Aral Sea coastal zone has a prediction for their further development as the fall of mirrors the Aral Sea. Sustainable progressive change in the natural environment of the Aral Sea region with the decline mirrors the Aral Sea requires a prediction of transformation of Geo-systems region until a certain time [1]. The application of special importance is the foresight of Geo-systems drying sea change phases. Besides those natural phenomena and processes, this will happen on the drying of the sea, will have a direct impact on the deltaic Plains around Aral area. Therefore, in considering drying sea and around Aral area as par genetic geo system, when forecasting should be aware of synchronicity in space and in time many of the expected natural processes [2].

The scientific value of the forecast changes in the natural environment of the Aral Sea region, of course, as we all know, because, not having a deep science based materials on the future status of the region cannot be sustainably Geo-systems control negative phenomena and qualitatively transform nature in a suitable direction. This same fact is dictated by next side of the environmental destabilization region, where the situation of natural environment is deteriorating from year to year, productivity, soil and other natural resources is decreasing at a rapid pace, medical and hygienic living conditions remain poor patients. The accelerated development of desertification in the region and the above mentioned negative natural and anthropogenic processes on a large scale requires development of scientific predictions in different versions [3].

Practical significance of forecast changes regions Geo-systems region is to develop appropriate systems for timely prevention of negative natural and anthropogenic phenomena and processes.

Intensive review of Geo-systems in around Aral area, anthropogenic desertification and desiccation of the sea due to a catastrophic decline mirrors the Aral Sea, accelerate the dynamics of physical-geographical processes and phenomena, and intensify at last development of natural complexes. Here the dynamics of Geo-systems and natural processes occur with greater intensity and rapidity than in other regions of Central Asia. In this regard, the Aral Sea and around Aral Sea region is the only region where development of Geo-systems is with great activity [4].

The active change of Geo-systems here lies the high dynamics of the natural processes (salt accumulation, desalinization, deflation, accumulation of substances, the rise and decline of groundwater levels, etc.) and the transformation of the groundwater regime, land cover change, formation of Aeolian landforms. It was found that the higher the degree of activation of natural processes, the more intense the drying sea in the morphological differentiation of the parts of the landscape.

Structural-dynamic status of the Amu Darya River Plains Delta Geo-systems because of their uneven watering is in various stages of change. On those sites (arrays), where flooding of ecosystems almost not observed, transformation of natural systems is well known: they are in the formation of eluvial properties specific to the area of desert landscapes. In the between river-end valleys, where regular flooding is varying degrees, remain at large hydro-morph and on the periphery of half hydro-morph conditions. This is due to the development of the sub aqueous and the super aqueous primarily Geo-systems here.

In the Inland valleys of Western and central parts of the Amu Darya Delta when the watering should expect gradual change of Geo-systems as the water table drops below 5–7 pm. There will be almost all kinds of transformation of Geo-systems, from the Lake to the eluvial, inclusive, for a certain period of time [3].

Between boilers hills in the Amu Darya Delta because of the dominance of top-down currents moisture geo system sought by eluvial properties, hence the predominance of natural desalinization in the soil affects the acceleration of development (evolution) over a large area mainly Automorphic soils (desert-sandy, takyr, residually saline), which contribute to the dissemination of xerophyte, galophyte, and psammophyt groups. Naturally, in the context of Automorphic Aeolian processes become dominant. From here, you can make the important conclusion that further intensification of eluvial dynamic processes with predominance of muddy-clay soils should be expected formation of takyr, sandy and Sandy-loamy Aeolian Geo-systems.

The purpose of the research. On the basis of the actualized thus the scientific explanation is also a forecast of Geo-systems degradation part of the Delta of the Amu Darya, with progressive reduction of reservoir and development result of anthropogenic desertification.

To achieve this goal in the work needed to solve the following interrelated objectives:

1. Determine the scientific and applied value of the forecast changes Geo-systems Aral Sea.
2. Explain the scientific basis and set the main factors of prediction.
3. To develop a forecast of the changes of Geo-systems desertification Amu Darya Delta.

Materials and methods. The main principle of predicting changes of Geo-systems is a historical and dynamic, which was based on a study in evolutionary plans. Determined that only a clear idea about the history of the region of Geo-systems gives reason to make decisions on further ways of natural evolution. It was based on the analysis of the evolution of paleo landscapes deltaic plain Aral Sea region found that they have three stages of development since their establishment. Now in the third stage of development are the landscapes of Akcha Darya, Zhana Darya Deltas and the eastern part of the Amu Darya Delta.

In around Aral area natural systems with high dynamic and have different trends are mainly anthropogenic desertification. Therefore, the impact of anthropogenic factor is a total transformation of Geo-systems dominant role, which should be considered first and foremost when predicting changes to certain dates.

V. B. Sochava [5], stressed that the projections are based on the use of all capabilities of modern science, that is, to use in the prediction of the most reliable methods of research. The wider, fuller, an integrated forecast, so it rather true. According to T. V. Zvonkov [6], forecast as past time, present and future-is based on three groups of methods-retrospective, the methods of the past (the identification of historically stable and continuity tendencies of the development of the natural environment), diagnostic methods-the present (causal analysis) and predictive methods of the future (extrapolation of stable predictive signs of past and present). For the regional forecast, it is important to identify sustainable trends in the development of the region as whole and dominant types of landscapes. The first task involves mainly classical paleo-geographic methods, 2nd by landscapes (historical analysis of modern landscape, spatial-temporal, etc.).

According to predictive changes of Geo-systems as a result of desertification deltaic Plains of South Aral we have used methods of extrapolation, analogy, landscape-indication, remote, mapping, and mathematical modeling.

Much of the Delta Amu Darya in many sides is similar to Akcha Darya, Zhana Darya and Delta around Syr Darya Delta that were formed much earlier. On the modern stage of development of Geo-systems, they are on the same level compared to modern Deltas Syr Darya and Amu Darya. In other words, they can be somewhat similar in predicting Geo-systems modern alluvial plains regions in conditions of auto morph trends.

Extrapolation method to transfer the identified trends both in time-from the past and the present to the future and in space from areas where the specified event occurred to areas where was expected.

Landscape-indication method lately finds universal use for predictions of natural systems. S. V. Viktorov [7], distinguishes three types of landscape indicating: forecast indication (prediction), stage-synchronous display (process definition and stages during their development) and retro inductive (detection of any process in the past).

More increasingly gets remote method of forecasting of environment changes. You can use it to examine contemporary dynamics of Geo-systems through various comparisons of cosmic camera photos years' and identify certain trends in their development.

In the prediction of landscapes, in addition, was used by the mapping method based on a comparison of the cartographic materials of different years and identifying certain trends of Geo-systems, contributing to predict them by a certain date. V. B. Sochava [5], the great importance attached correlation maps that display spatial location dependencies, quantified, among various geographical phenomena. Correlation maps-a kind of model for judging how landscape-ecological relationships in space are and how to effect change in a factor on the components that make up the geo-system. V. B. Sochava [5], paid more attention on the application of mapping method in the prediction of Geo-systems deserves close attention, for cartographic materials are the Foundation or base the development of prognostic observations.

The decline in the level of the Aral Sea in 1980-1990 years various scientific organizations of the Russian Federation, the Republic of Kazakhstan and the Republic of Uzbekistan has developed a geographical projection of natural complexes changes of Aral Sea coastal zone in different years, mostly up to 1990 and 2000.

Comparison of actual changes in the structural and dynamic state of Geo-systems currently forecast 1990-2000 material, indicates that, to a large extent (85%) they met [8].

The guiding principle of the study was based on the paradigm of physical geography, for which its objects appear to be developing and holistic systems. The format of this vision appealed to the study indicated higher problems with clarifying interpretations of the concepts of geo, Geo-system, landscape and geographical process. Based on the adopted definitions of S. Kolesnik [9], D. L. Armand [10], Ya. Deneka [11], etc. the researchers, who agree with them.

In these definitions clearly focuses on levels of Geo-systems, their proportions among themselves and with other components of nature. On the basis of physical Land area occupies a planetary level and is composed of the wide-zonal and high altitude lap geoms. The last are subdivided into regional geo-systems, chorological and topological regional levels. In turn such geo systems are grouped into under system and mezzo system, or are differentiated by subsystem (sub levels). The term "landscape", as D. L. took Armand [10], "is a synonym for the natural territorial or water area complex". The landscape has, as such, exterior and internal structure made up of direct and inverse relationships and interactions between biotic soil, biological, and anthropogenic subsystems (components, elements, agents); energy balance; specific position in space; development under the various impacts and self-regulation, which leads to a stable state.

Landscape or Geo-system (the same level of organization) is treated as identical concepts. So change the landscape areas perceived as total (integrated) geographical process planetary level, and landscape auto forming are private physical-geographical processes and factors. The importance of the processes and drivers took the landscape forming activities of the societies of Homo sapiens.

Landscape with its natural benefits and anti blogs, is a framework of all being, and along with that is the human societies. This function of the landscape determines its ecological significance and raises its qualitative aspects in the value category.

With such perceptions of physical and geographical processes or from the vision of their models are addressed as the Aral Sea crisis. The Aral Sea with his pouring until recently, large rivers, the Amu Darya

and Syr Darya rivers-unique water features plain Turan lowland, which is a regional Geo-system; desert geo Eurasia.

A few more detailed taxonomic scheme of area studies is shown in table 1. This diagram explains the senior levels of the organization, and the subsequent Geo-systems-provides explanations for allocation of the junior according to their chain of command. From the methodological point of view, this scheme presents the characteristic landscapes from older to younger levels of their organization.

The obtained results. Forecast changes Geo-systems Delta of the Amu Darya and the Aral Sea dried implemented by us on the basis of physiographic development. Districts are identified on the basis of a detailed physical-geographical analysis of the southern Aral Sea region from the point of view of their differentiation into separate geo-systems which differ from each other in all aspects of landscape structural features. In turn, each terrain is differentiated to complex natural boundary, and the last on the tracts, which cover naturally limited territory with certain natural mode of development. The structural and dynamic state of the Geo-systems differs in general are resilience against the impacts of anthropogenic factor, with the same development of desertification processes, the same condition hydro biological-regime, the dominance of certain types of hydro geological regime and in accordance with the predominance of a particular type of soil-process (eluvial, super aqueous and subaqueous), etc. [8].

Table 1 – Taxonomic scheme of landscapes studying area

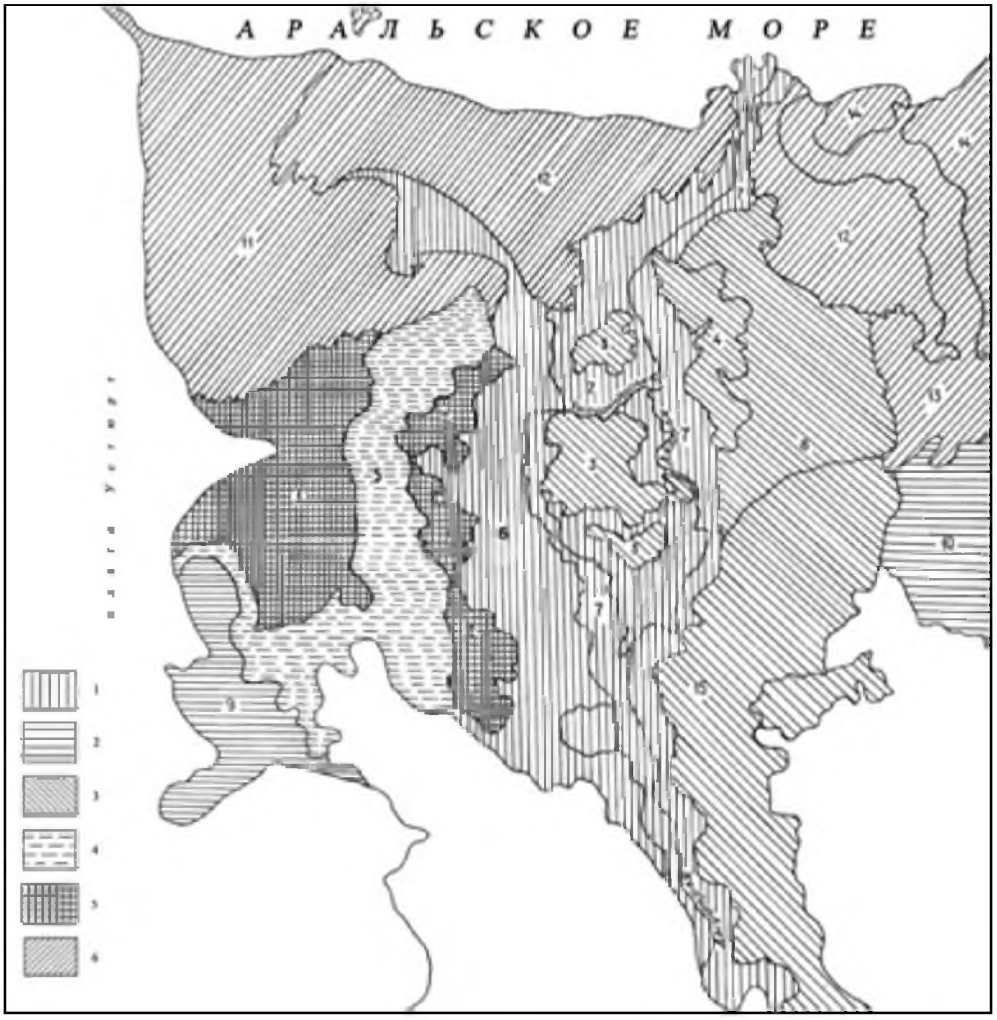
Dominant factor of landscape formation	Level of organization of landscape	Thematic examples of geosystems
Climate	Geom	Deserted
Geotexture	Supergroup	Turan lowland
Morphostructure	Group	Offshore, postakval, deltaic, buttes, sand-plain
Positioning by tructure-forming component (geosystem)	Subgroup	Right-bank and left-bank of (big) river
Hypsometrical position	Variety	Low-lying, vile, plateau, foot, dividing water, ridge, cellular
Habit (exposure and etc.)	Variation	Under the toponymy of the locality

In identifying districts (figure) along with other components of the great emphasis placed on the lithologic-geomorphological structure that specifies the type of the Soil-Geo-systems process, soil drainage, the development of physical-geographical processes and phenomena, irrigation, groundwater flow direction, etc.

In the southern Aral Sea region to identify Geo-systems we identified districts, sub aqueous, super aqueous and eluvial locations. This principle makes it possible to more accurately identify the definition of mezzo geo-systems, subject to certain types of desertification, as well as the dynamics and stability of natural systems to external forces.

Each district consists of mostly the same classes of desertification, which dominated territorially. According to the characteristics of square the nature of same classes was defined by the dominant degree distribution, sometimes with equal correlations or along with the dominance of some classes, there are other minor degree but on the occupied territory.

Zoning of desertification on current state can be the basis for not only differentiated activities to combat terrorism, but also to predict changes of Geo-systems as a result of the intensity of their processes. In this regard, the information contained in the zoning, contributes to the integration of type classes, causes of desertification, as well as other materials important in substantiating the forecast changes Geo-systems in the future [8]. A thorough study of the dynamics of desertification in the area revealed the tendency of their development (table 2).



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Physiographic microregionalization of the delta of the Amu Darya under the modern condition of desertification (made up by V. A. Rafikov [8])

Notation conventions to figure:

N	Groups	Subgroups	Variety	Numerals have been marked as neighborhoods
1	Aquatorial	Right-bank	Basins	1. Sudochinsky 2. Karadjarsky 3. Mejdurechinsky 4. Maypostskiy 5. West 6. Muynaksko-Kinkairskiy 7. Akdarinsky 8. Kunyadarinskiy 9. Prichinkoviy 10. East 11. Southwest (Adjibayskiy) 12. Central (Rybacko-Ordobaysky) 13. East (Djiltirbasky) 14. Arkpetkinsky 15. Erkidarynsky
		Left-bank	Watercourse	
2	Post-merged			
3	Deltaic	Right-bank	low-lying	
		Left-bank	Vile	
4	Tabular		Dividing water	
5	Buttes			
6	Sand-plain			

Table 2 – Tendency of development of processes of desertification in Aral Sea

N	Tendency
1	Aeoline partition
2	Technoerosion
3	Erosion damage
4	Technogeneous damage of soil
5	Salt-accumulation and dessalage: intensive Salt-accumulation progressive salinization stabilization of salinization
6	Degradation of vegetation
7	Anthropogenic succession
8	Degradation of soil
9	Exogenic evolution or transformation of geosystems
10	Halomorphic, halo- and xerophytic geosystems
11	Submerged development
12	Supermerged development
13	Eluvial development

Sudochin geographical district. Current status of development of the mezzo geo-systems is characterized by a general degradation of the Lake sub aqueous complex: increasing salinity and deteriorating water quality, depletion of hydro zoo-cenosis and vegetation is the accumulation of dissolved mineral fertilizers and pesticides. Expected results development of natural complex up to 2020, can be estimated as follows: when an influx of CDW (collector-drainage water) and water (the predominance of first) the degree of mineralization of the water mass of the Lake will grow up to high limit (40-60 g/l), which will lead to the complete disappearance of living organisms, the coast will turn into a sinister salt marsh without vegetation, water area decreases by 15–25% (from 2010) [8].

Karadjar geographical district. Here there is a general degradation of the Lake and super -aqueous in Geo-systems sporadic flow of river water in different volumes, decreasing the area of reeds and their productivity. It should be noted that the degree of surface water salinity increases gradually from South to North, in the village of Karadjar flow salinity ranges from 1.6 to 2.5 g/l, and in the years of low water rates are doubled [8].

Between river geographical district. It is established that the normal volume of water flows from the rivers each year (approximately 0.1–0.2 км^3) in the northern part of the expected normal functioning Lake complex with rich bio-cenosis, sporadic flows of water-Lake-mire complex with high mineralization, poor bio-cenosis, contaminated water environment; in the middle lane when there is Lake maximum aqueous area of the complex will be flooding and inundation (super aqueous complex), and in the case of the minimum water-soil salinization, the change of vegetation in the direction of the Xero-and galophytization; in the southern half would be the development of eluvial (Aeolian, less erosion, suffo-cenosis and other processes and phenomena) [8].

Maypost geographical district. The structure of Maypost district is quite complicated, here are the basin dried Lakes and marshes and flat watersheds in between. Therefore, in the case of the nugatory ecosystems, the natural environment was a mosaic of structural and dynamic state of Geo-systems, i.e. hollow Lakes even longer will retain the subaqueous conditions while the former bottom marshes will form super- aqueous complexes. After a period of time subaqueous systems will go into super-aqueous and the last is at eluvial. Accordingly, changes in soil and vegetation cover due to the intense flow of ground moisture on evaporate transpiration and slight outflow towards the drying of the sea.

West geographical district. In the context of maintaining the existing number of river water flow and increase the salinity of the degradation of tugay will impact also on average, and subsequently in the upper reaches of the river. Increase the felling of trees to the local population because of the lack of construction materials. Up to 2020, the riparian ecosystems of Great Djonsiz (great dead) will be subject to desertification average, places a strong category.

Muynak-Kinkairj geographical district. By the end of the projected time wind relief would represent a significant portion of the neighborhood. This confirms a sharp dominance to 2020, eluvial Geo-systems within the neighborhood. It is possible that the like takyr soils, residual common salt marshes closer to 2020, the black saksaul plantations shoots can appear in conjunction with the annual saline yulgunnik. In our point of view, this phenomenon should start from the end of 2015's, and at the beginning of 2020 in the predominant part of the territory of all active and semi-active salt marshes are Automorphic.

Akdarya geographical district. By the end of the projected time status of the Amu Darya tugay compared to 2010 is, deteriorate drastically reduced tree areas, especially near populated areas (up to 50–70 km radius). Dominant in much of tugay are yulgunnik, i.e. Shrub tugay will replace charcoal will expand the areas of development, chingil and several other shrubs that the pastoral relation is not material. The Elimination of trees in tugay woods will expedite the disposition of the substrate to deflation and in some places the water erosion, collapse of the slopes of the river-end. It's all up to 2020, sufficiently will result in changes to Geo-systems, we can say that for the micro-Strip tugay will tend to moderate-and severe desertification.

Kunadarya geographical district. By the end of the predicted time of some part of the deltas will still be covered by Sandy cloak. This is a steady wind blowing from the North and North-East, South and Southwest. When strong winds grit (15–20 m/s) can be extended to more southern parts of the basin, which will lead to be sanded of saline soils.

Prichinkov geographical district. By the beginning of 2020, the environmental the effects achieved quite large proportions. Grazing eco-systems degradation, large areas of land would become totally bared and will be mostly rough and boilers topography. Expansion of decertified sandy soils and Sands will result in gradual distribution of psammophytos.

East geographical district. By the end of the predicted time of natural complexes of the sub aqueous part of the Delta still more will be transformed as a result of unsustainable use of grazing, crop, land resources. Greatly expand the moving sands, residual salt marshes, plump deflation takyr and sandy soil and desert sand will cover the new arrays.

Southwest (Adzibaj), Central (Rybat-Ordobay), East (Dziltyrbas) geographical districts. In the southern Aral Sea region to identify Geo-systems we identified districts, subaqueous, superaqueous and eluvial locations. This principle makes it possible to more accurately identify certain mezzo geo-systems, subject to certain types of desertification, as well as the dynamics and stability of natural systems to external forces. So identified Southwest (Adzibaj). Central (*Rybat-Ordobay*), East (Dzyltyrbas) districts, like subaqueous Geo-system, are, on the one hand, the almost regular flooding areas and serve as the accumulation of hydro geo-chemical substances flow surrounding Plains of the Delta, on the other hand, because of the constant moisture in the weak vulnerable to desertification.

Erkin darya geographical district. By the end of the predicted time of arid Mountain geo system will be primarily wind, form little hills and little barchans relief, typical of sandy deserts to rise sharply sanded the grey-brown soil and residual salts. Found that the complexity of the structural and dynamic state of Geo-systems and their watering and other features determine the trends of desertification processes. In one same path geo system marks the development of not just one, but several of the desertification process [12].

Conclusion. The following regularities in the development of desertification in Amu Darya River Delta at the beginning of desertification (1961-1973), when there was a progressive decrease in runoff of the Amu Darya and shall owing of the ducts, lakes and a partial drying of waterlogged areas and therefore reducing flooding of the Delta, was drying and drainage of soils and ecosystems in General of Geo-systems.

From 1974 year almost stops the natural draught of the Po River Delta and live stock concentrates only on Akdarya. This led to the final drying lakes and swamps, to stop the flow at the prevailing part of the ducts [1].

From 1983 to 2010 there were a combination of relative tide and water shortage in the Amu Darya basin, affecting the development of desertification: in watery position due to water logging of large parts of the ecosystem of the Delta is close lying of the ground water level to the surface and water area of the Lake complexes in several times, while habitats become dominant, and herbs-', greatly improving the

conditions of growth of trees and bushes, tugays generally favorable environmental conditions for normal growth and development of zoo-cenosis [8].

The combination of low water and tide, to varying degrees, affected, intensification and development trends of desertification in the region: If the tide is its braking, economy-acceleration, but all of this is happening against the background of the degradation of the natural environment of the region due to non-payment of the amount of moisture. Therefore, despite the occasional improvement of ecosystems individual arrays of the former living part of the Delta, desertification is still happening at an accelerated rate [8].

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ПРОГНОЗИРОВАНИЕ ИЗМЕНЕНИЙ АРИДНЫХ ГЕОСИСТЕМ В УСЛОВИЯХ ПРОДОЛЖАЮЩЕЙСЯ ЭКОЛОГИЧЕСКОЙ ДЕСТАБИЛИЗАЦИИ В ПРИАРАЛЬЕ

Аннотация. Выявлены главные природные и антропогенные факторы прогнозирования. Установлены основные тенденции изменения природных комплексов. Впервые научно обосновано, что Аральское море и Приаралье генетически единые и парагенетически динамичные макрогеосистемы. С учетом свойств и особенностей структурно-динамического состояния супераквальных, субаквальных и элювиальных геосистем Приаралья разработан прогноз их трансформации до 2020 года.

Ключевые слова: геосистема, ландшафт, географический прогноз, опустынивание.

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АРАЛ МАҢЫ АЙМАҒЫНДА ЭКОЛОҒИЯЛЫҚ ТҰРАҚСЫЗДЫҚ ЖАҒДАЙЫНДА ҚҰРҒАҚШЫЛЫҚ ГЕОЖҮЙЕЛЕРДІҢ ӨЗГЕРУІН БОЛЖАУ ЖӘНЕ БОЛЖАМДАУ

Аннотация. Болжаудың негізгі табиги және антропогендік факторлары анықталды. Табиги кешендердегі өзгерістердің негізгі үрдістері белгіленді. Арал теңізі мен Арал теңізі алгаш рет генетикалық түрде біртұтас және парагенетикалық динамикалық макрогеожүйелер ретінде гылыми негізделген. Арал маңы аймағының аса тәуліктік, субакуальдық және элювийлік геосистемаларының құрылымдық-динамикалық күйінің қасиеттері мен ерекшеліктерін ескере отырып, оларды 2020 жылга дейін трансформациялау болжамы жасалды.

Түйін сөздер: геосистема, ландшафт, географиялық болжам, шөлейттену.