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THE ARAL SEA DEGRADATION AND BIOLOGY DESCRIPTION OF ACTIONS ON THEIR ELIMINATION

Abstract: This article represents the updated version of the texted version on the state of environment of the Republic of Uzbekistan and on the department «Ecology and ground science» Karakalpak state university of name Berdak, prepared in 2012 . Its purpose is providing of the broad sections of the public and decision-makers with easy for understanding, modern and reliable environmental information.

***Key words:** Ecology, Environmental Protection, Pollution, water resources, the population, Aral Sea, desert "Aralkum", The regional flora.*

The basic attention in the report is given to the description of the some priority national environmental problems, identified at the development of the National Environmental Action Plan for Sustainable Development of the Republic of Uzbekistan: Deficit of water resources; Degradation of pasture and arable lands; air pollution of urban territories; Environmental pollution in oil fields area; Environmental pollution with industrial and municipal solid waste; Shortage of forests and especially protected territories; Pollution of the water bodies with wastewater. Most of the sands and soils in the Pre-Aral area are light and easily transported by wind.

On the basis of geographical and archeological research it was established that the Aral Sea has had periodical changes of its water area, i.e. expansions are followed by with drawals. This was brought about by climate change and changes in the state of the environment in the region. With the development of land use, anthropogenic factors affected the natural periods of sea fluctuations changing flows of the Syrdarya and Amudarya. This is especially explicit in the present. The beginning of irrigated agriculture in the region dates back to the 6th-7th centuries B.C. and coincides with flourishing the most ancient civilization where irrigation was a major decisive factor of historical and socio-economic development.

Today the Aral and surrounding territories are world-known for ecological disasters attributed mainly to anthropogenous factors. The growth in water consumption connected to cultivation of new irrigated territories, where mainly cotton and rice are grown, together with the increase in the population working in agriculture, the flow of water to the sea from the two major river systems -the Amudarya and Syrdarya - completely stopped.

In spite of intensive glacier melting which should have led to increase of territory of the Aral Sea, during last 25 years disastrous reduction of the largest inland water body takes place.

The Aral Sea is the largest inland body of salty reservoirs in the world. Situated in the centre of the Central Asian deserts at an altitude of 53 metres above the sea level, the Aral Sea functions as a gigantic evaporator. About 60 km^2 of water evaporates per year.

The sea contributed to hydrothermal regime improvement, influenced water regimes of arid plants, pastures productivity, and provided normal functioning of artesian wells etc. Ecological balance in the basin was formed in the first half of the 20th century and was stable up to the beginning of the 1960's, with a volume of 1,064 kmi, and a water territory of 66.4 thousand kmI. Because of irrevocable removal of river water on irrigated territories, ecological balance began to decline. Only half of the previous river runoff reached the Aral Sea.

But even this quantity of water was not sufficient to support sea level at 53 m. However as a result of a tendency of economy development in agrarian areas, leading to growth of irrigated territories and volumes of irrevocable water consumption during years of water shortages, water flow into deltas of the Amudarya and Syrdarya rivers was reduced sharply. In 1982 and 1983 this made up only 2.28 and 3.25 km^3, respectively. Since 1961 the sea level has declined with increasing speed from 20 to 80-90 cm per year.

During the last 50 years, from 1960 to 2010, the sea received less than 2,000 km^3 of river water, which led to the lowering of the sea level by 22 m, accompanied by a reduction of the volume of the water area by 87%.

As a result of the complete stop of the Amudarya and Syrdarya runoff and expansion of irrigated territories without any control of the Aral Sea and environmental needs, a serious complex of ecological, social and economic problems was formed in the Pre-Aral area. These problems by origin and level of consequences have an international character. The sea has lost its fishery and transport importance. It was divided into two parts, the Bolshoi and the Maly (Northern) Aral, and moved 140-190 km away from the original shore. From exposed salty bed (35 thousand kmI) up to 100 million tons of salty dust flew out annually. Suspended solids in the form of aerosols with agricultural pesticides, fertilizers and other harmful components of industrial and municipal wastes prevail in the composition of the winds.

Due to the reduction in the sea dimensions, and the increase in evaporation and drainage-collecting water, water salinity considerably increased from 9.94 g/litre in 1965, to about 22 g/litre in 2010. Sharp continental climate is a feature of the Pre-Aral area climate.

During the last 10-15 years the drying off of the Aral Sea, brought about noticeable changes in climate conditions. In the past the Aral was considered a regulator mitigating cold winds from Siberia and reducing the summer heat. It contributes to aerosol transference into upper layers and fast spread in the atmosphere

Climate changes have led to a dryer and shorter summer in the region, and longer and colder winters. The vegetative season has been reduced to 170 days. The pasture productivity has decreased by a half, and meadow vegetation destruction has decreased meadow productivity 10 times. On the shores of the Aral Sea precipitation was reduced several times. Average precipitation magnitude is 150-200 mm with considerable seasonal ununiformity.

High evaporation (up to 1700 mm per year) is marked while air moisture is reduced by 10%. Air temperature during winters has fallen, and summer temperatures have increased by 4-6 degrees C, including observations of 54 degrees C.

Frequent occurrence of long dust storms and ground winds is characteristic feature of the Pre-Aral area climate. Strong winds often blow in the region. They are the most intensive on the western coast - with perhaps more than 50 days of storms per year. Maximum wind velocity reaches 23-28 m/s.

These climatic conditions defined that agriculture without irrigation is impossible. The result is intensive accumulation of salt in the soil leading to water use for watering plants and washing off lands.

Most of the sands and soils in the Pre-Aral area are light and easily transported by wind.

The drying off of the Aral Sea resulted in two different kinds of desertification. The newly dried sea bed, and the artificial water logging of irrigated lands. As a result, a new desert "Aralkum" appeared in the centre of the great deserts. It is solid salt-marsh consisting of finely-dispersed sea depositions and remnants of mineral deposits, washed away from irrigated fields. A new qualitative phase of desertification affecting the Pre-Aral ecosystem degradation, regional and global climate, mountainous flow-forming systems and water-salty regime of agricultural zone takes place.

The sea bed, formerly referred to as a so-called "fresh water maker" of vast water collecting basin at the expense of rich sea hydrobiocenose activity, is an artificial anthropogenous volcano, throwing tremendous masses of salt and finely-dispersed dust into the atmosphere. Pollution is increased because the Aral Sea is located along a powerful air stream running from west to east. of the Earth. That is why traces of pesticides from the Aral region were found in the blood of penguins in the Antarctic, and typical Aral dust has been found on Greenland's glaciers,

Central Asia.

If the cover of moraine depositions increases, they no longer will be moisture condensators and sharp reduction of the river flow will start.

The Aral disaster has deteriorated the sphere of inhabitation of the region sharply, due to polluting of the atmosphere, the drinking water and the soil.

An evaluation of the field with drawl from the dry parts of the Aral Sea bed shows that this magnitude varies from several hundred thousand tons to 20-30 million tons per year. In the composition of dust cloud suspended solids in the form of aerosols with agricultural pesticides, fertilizers and other harmful components of industrial and municipal sewage prevail. Salt content makes up 0.5-1.5%. Sand-and-salt aerosol effects on oasis soils and pastures are predominantly negative. Replacing multilayer herbage by single-layer, reduces the quantity of useful feeding plants, and often plants that have no feeding value are cultivated.

Two million hectares of fertile lands disappeared as a result of overwatering and as a result of fast rise of ground water they got polluted for the second time.

Today these lands are either water logged or salinized. Former arid soils of the Pre-Aral area with automorphic feed and moisture regime became meadow-swamp soils with hydromorphic regime. To support this regime artificially it is necessary to raise standards by 2-3 times, in order not to activate the secondary salinization process. A vicious circle of agriculture was formed in this region, where heavy swamped lands are left. The land-improvement condition of irrigated soils in Central Asia is worsened by collective-drainage water saturated with pesticides and discharged as return runoff into numerous local landscape depressions. Before 1960 the river deltas were home to over 70 kinds of mammals and 319 types of birds. At present only 32 kinds of mammals and 160 types of birds remain. As a result, artificial reservoirs-accumulators appear. These reservoirs are a real disaster for surrounding lands. Some of them cause secondary pollution when of the the atmosphere in the surrounding regions.

The most spread pollutants in the Aral Sea are: oil hydrocarbons, phenols, synthetic surface-active substances (SSAS), chlororganic pesticides (COP), heavy metals and minerals. The abundant use of pesticides with high physiological reaction (B-58, metaphos, corotan, butiphos, hexachloran, lindan, DDT etc.) poses a tremendous threat to living organisms. Reservoirs carrying water with undecided compounds of heavy metals and chlororganic pesticides, led to the destruction of fishery, the appearance of cancerogenic diseases, and changes in citogenetic indices.

The maximum pollution level by oil hydrocarbons in 1970 was 54 MPC (maximum permissible concentration) in the Maly Aral (MPC=0.05 mg/dmi), and 80 MPC in the Bolshoi Aral. Since 1978 the tendency to oil hydrocarbons pollution stabilization at the level of MPC is marked. Phenols made up 28 MPC (MPC=0.001 mg/dmi)in the Maly Aral, and 63 MPC in the Bolshoi Aral. At present there is no information about phenol pollution because observations have been stopped. Concentrations of SSAS and heavy metals do not exceed MPC.

Salinization increased from 10 g/l to 40-50 g/l because of lack of fresh water inflow.

In the past the uniqueness of the Aral Sea contributed to richness and diversity of the biota which could be compared with Africa. The Pre-Aral area possessed half of the biological species of the former USSR, many of these, however, have disappeared or are threatened. There were 500 kinds of birds, 200 species of mammals and 100 species of fishes, thousands of insects and invertebrates.

In low streams of the Syrdarya River, more than 100 thousand hectares of alluvial soils became salt-marsh, and more than 500 thousand hectares of swamp and medow-swamp soil became dry. This resulted in the transformation and destruction 5-7 kinds of herbs needed for fodder for sheep, horses, camels and goats. Diseases and death of cattle began, musk-rats cultivation stopped, and sheep live-stock decreased sharpl The regional flora is impressive and includes 1,200 flowers, 560 types of tugai forests of which 29 are endemic to Central Asia. The flora of the Aral-Sea coast includes423 kinds

comparison with the coast. Among them are 30 species which are valuable fodder plants, 31 kinds of weeds, and more than 60 kinds of local flora are potential phytomeliorants for dried coasts. The change in water balance caused mineralization of the water in the Aral Sea basin, which led to the loss of unique biocenosis and a number of endemic species of animals. Inflow reduction into the Aral caused irreversible changes of hydrological and hydrochemical sea regimes and hydro systems. Salt balance changes increased the sea salinity 3 times, transforming it into a desert. The formerly flourishing sea ecosystem supported 24 species of fishes that are disappearing. These include carp, perch, sturgeon, salmon, sheat-fish and spike. There were 20 kinds of fish in it, but fishery was based mainly on bream, sazan, aral roach (vobla). Barbel and white-eye fish were caught in the Aral Sea. The first signs of the negative impacts of salinization on ichtyofauna of the Aral Sea, appeared in the mid 1960's when salinity reached 12-14%. On shallow water the salinity of water increased faster than in the open parts of the sea, negatively affecting spawning places. By 1971 the average salinity exceeded 15% and resulted in the destruction of fish spawn. Since 1971 the average salinity has reached 12% in the open part of sea, and the first signs of negative impact on fish have appeared. Some kinds of fish have slowed their growth, and the number of fish has been sharply reduced. By the mid 1970's average salinity of the sea exceeded 14%, and the natural reproduction of the Aral fish was completely destructed. In the late 1970s Sea has lost its fishery completely. Of the ichtiofauna of the Aral Sea. several species of fish did not reproduce at all. By 1980 salinity exceeded 18%. The Aral only aboriginal species - pricles and acclimatizers - bullheads and sprats are left. In the estuaries of the Syrdarya and Amudarya grown up fishes were caught occasionally. The researchers of the tendency to increase. In the epicenter of out

glossa and plaice-kalkan. The most promising were the experiments with plaice-glossa having ecological plasticity, spawned at the places with 17% to 60% of salinity, at present its catch makes up 30% of the total number.

The Pre-Aral area is characterized by a complex spatial structure of ecosystems. The physical and geographical conditions of the region, the consequences of its economic utilization during many centuries, and the active influence of modern anthropogenous processes influence these. Pre-Aral ecosystems are developing in extreme conditions of desert. The factors limiting biota development were established by nature itself. The Pre-Aral area has suffered from anthropogenous processes for a long time, both regionally and locally. Anthropogenous impacts have caused transformations of natural ecosystems which finally led to dramatic changes and degradation.

The ecosystems of delta valleys have been transformed greatly by agricultural land use for many centuries. Irrigated or cultivated fields, rice fields and non-cultivated agricultural lands which are characterized by different stages of soil and vegetation cover rehabilitation, are singled out. The following anthropogenic factors that brought about changes in the ecosystems should be considered according to their significance: pastures, land-use, agriculture, transport, city, rural, military objects, hydrotechnical (artificial reservoirs, dams, canals, sewage accumulators), and cattle-breeding. The process of degradation in the Aral region caused progressive crises in the social and economic spheres. The primary victims of the crises were the most vulnerable layers of population, namely children, women, ill-paid inhabitants of cities and rural areas. The region has the highest child mortality rate in the former USSR (10-12 children per 100 newly born), high level of maternity death: about 110 women per 1000 births. Diseases such as TB, infections and parasites, typhus, hepatite, paratyphoid always accompany poverty. The disease rate has a tendency to increase.

In the epicenter of ecological disaster, anemia, dysfunction of thyroid the gland, kidney and liver diseases are wide spread. Blood, oncological diseases, asthma and heart diseases are progressing. Medical research proves that the incidence and growth of these diseases are directly dependent on ecological disaster.

In agriculture there is a steady tendency to transition to ecological management of production. One of the main principles of the above mentioned tendency is maintenance of positive humus balance in soil at the expense of introduction of alternation of crops and application of organic fertilisers.

The largest ecosystems, limiting on size and scale, is biosfere. Biosfere name the active shell of the land, including all alive organisms of the Land and residing in interaction with lifeless ambience (chemical and physical) of our planet, with which they form the united integer. Biosfera our planets exists 3 mlrd. years, she grows and becomes complicated contrary to trend cool entropiya to deaths; she carries the reasonable life and civilization. Biosfera existed long before appearance of the person and can dispense with it. Opposite, existence of the person without biosfere impossible.

All rest ecosystems are found inwardly biosfere and are hersubsystem. Large regional ecosystems, characterizing some main type to vegetation, is identified the biom. For instance, biom to deserts or humid tropical wood. Much smaller system is a population, including group by person of one type, t. e. united origin, occupying determined area. The more complex system, than population, is a community, which includes all populations, occupying given territory. Thereby, population, community, biom, biosfere are situated in hierarchical order from small systems to large.

The important effect to hierarchical organization consists in that that on measure of the association component in more large functional units on new step of the hierarchical stairway appear the new characteristic, being absent on previous step. These characteristic it is impossible predict coming from characteristic component, forming new level. This principle has got the name emerjentsing. The Essence his: characteristic integer impossible to reduce hisparts to amount characteristic. For instance, hydrogen and oxygen, residing on level, when joining form the molecule of water, possessing already absolutely new characteristic. The other example. Some algaes and intestine-form the system coral reef. Enormous productivity and variety coral reef - an emerjenting characteristic typical only of rifing community, but at all not for hiscomponent, living in water with low contents biogen element.

Activity organism in ecosystem adapts geochiming ambience to its biological need. That fact that chemical composition of atmosphere and powerfully bufer physical ambience of the Land sharply differ from conditions on any other planet of the Solar system, has allowed to formulate the hypothesis Henry. According to this hypothesis exactly alive organisms created and support on the Land favourable for life of the condition.

Sooner whole, green plants and some microorganisms have played the main role in shaping of terrestrial atmosphere with herhigh contents of the oxygen and low contents of the carbon dioxide. The hypothesis Geo emphasizes importance of the study and conservations these adjusting mechanism, which allow atmosphere to adapt to contamination, conditioned activity of the person.

Beside green plants N_2O acidifies with forming the gaseous oxygen O_2, herewith SO_2 is restored before organic material (in brought equation organic material - a glucose). Beside fotosyntes bacteria are synthesized organic material, but is not formed oxygen. The breathing - a process, inverse photosynthesis, under which organic material acidify by means of atmospheric oxygen.

Reducenty, degrading remainder organism, free the biogen elements (C, O_2, N_2, P, S and others), which enter in rotation, necessary ecosystems for existence. Each year produsents on the Land s beside 100 mlrd. t. organic material that forms the global product biosfere.

For this gap of time aproximately such amount alive material, oxidents, changes in SO_2 and H_2O as a result of breathings organism. This process is identified the global disinteration. But this balance existed not always. Approximately 1 mlrd. the years back part formed produsents material was not spent on breathing and did not decompose, since in biosfere was not yet a sufficient number consuments. As a result this organic material was saved and detained in setting. The prevalence of the syntheses organic material on their decomposition has brought about reduction in atmosphere of the Land of the carbon dioxide and accumulation of the oxygen. Beside 300 mln. years back particularly big excess to organic product has brought about formation combustible fossilized, to account which person has later made the industrial revolution. But more then 60 mln. years were back worked out fluctuating stationary correlation between global product and disinteration.

However for the last half a century as a result of economic activity of the person, bound with incineration combustible fossilized mainly, concentration SO_2 in atmosphere increased, but O_2 - decreased that creates the critical situation for stability of atmosphere. Thereby, the most important feature ecosystem is a rotation material, definied global product and disinteration.

The following most important feature ecosystems are their cybernetic behaviour. The cybernetic behaviour ecosystems is defined that that they possess the developed information networks, including flows physical and chemical signal, which link all part ecosystems and control her as united integer. The Difference ecosystems from cybernetic device, created person, is concluded in that that controlling functions ecosystems concentrated inwardly it and diffusing. In cybernetic system, created person, controlling functions are directed and are specialized. instance "standing water", "current water" and etc. Under biotics factor understand the collection of the influences to vital. By comparing cybernetic system with ecosystems possible to find something general.

In that and the other management is founded on feedback. The known that energy to feedback extremely small in contrast with initiated by her energy, which is agitated in system, goes speech about technical device, organism or ecosystem. The Device, realizing feedback above-ground system, are identified the gomeostaz mechanism. Gomeostaz in using to organism means the maintenance hisinternal ambience and stability hismain physiological function. In using to ecosystems gomeostaz means the conservation herconstant aspectual composition and numbers by person. Gomeostatic mechanisms support the stability an ecosystems, warning full plants herbivorous animal or disastrous fluctuations to number predator and their victims and etc.

The brain of the person presents itself device with low energy feature and with enormous ability to management since under comparatively small expenses to energy he capable produsing varied powerful ideas. This has done the person by the mightiest essence on the Land. At least once, this concerns hisabilities to change operation an ecosystems, including biosfere.

The Main features ecosystems - hersize, herstability, processes clearing.

The size ecosystems - a space, in which possible realization of the processes regulation and all forming ecosystems component and element.

Sautocleaning natural ecosystems - an independent return natural ecosystems to condition of the dynamic balance, from which she was obtenium influences natural and antropogen factor.

Avtocleaning - a natural destruction polution in ambience as a result of processes, occurring in ecosystems.

Ekosistems possible to classify on miscellaneous sign. Bioming categorization ecosystems is founded on dominating type to vegetation in large region. In water point living, where vegetation hardly noticeable, in base of the separation ecosystems are found main of the physical line of the ambience. This is from cutting the deterioration of the ecological situation, destruction due to system

natural and antropogening influence. The nature these influence more specific. The Limiting factor level natural and antropogening influence is at most-brot ecological load (PDEN), which in many country is installed whereas, normal operation and stability ecosystems and biosfere possible under not determined limiting loads on them.

The condition biosfere, continuously changing under influence natural factor, usually returns in initial. For instance, change the temperature and pressures, moisture of the air and ground occur within some constant average importances. As a rule, large ecosystems under influence of the natural processes change exceedingly slowly. Existing in the world ecological services (and others) conduct checking for change of these processes.

Any alive organism or community organism necessary not in general temperature, moisture, food and etc, but their determined mode, t. e. borders of the possible fluctuations these factor. The range between ecological minimum and ecological maximum forms the limits to stability, t.c. toleranting given organism - this law toleranting was worded in 1910.

Value to concepts limiting factor in that that she enables the studies the most complex ecological situation. If for organism typical broad range толерантности to factor, which is present in ambience in moderate amount, that such factor can not be limiting. Opposite if organism possesses the narrow range toleranting to some volatile factor, that this factor deserves the studies, since can be limiting.

Radioactive Sr-90 extremely dangerous for person and animal. On chemical characteristic he looks like calcium and so, haved a drink in organism, is accumulated in bone and turns out For this purpose, we have developed new polymer compositions based on lignin phosphonium and phosphorylation by the structures of phosphorylated lignophosphonate "PDA-1" were identified by modern physicochemical methods of analysis.

Considering that sands should be treated with aqueous polymer solutions, structure formation will occur in the sand-water-binder system, it is of interest to study the electrical conductivity of sand dispersion in water. A study of the electrical conductivity of sand dispersion in various media revealed the surface dissolution of its grains with the appearance of neoplasms that form a contact zone at the sand-binder interface, and with increasing pH of the medium, the solubility increases. We presented research data on the acid-base properties of the surface of sand, which has been in contact with the atmosphere for a long time at 20 ° C and warmed up to 70 ° C. These two states cover a different degree of surface hydration and characterize its properties in various technological processes.

It was established that contact with the atmosphere at 20 ° C leads to complete hydration of the sand surface and the screening of its active centers by the adsorption layer. In this state, the surface has weakly acidic (pH = 6.3) and weakly basic (pH = 7.1) properties.

Strongly acidic and strongly basic indicators do not ionize upon adsorption on a hydrolyzed surface; therefore, the spectra of indicators with a pH of transition 7.2 contain only acid bands, and with a pH of 6.3, bands of the main form. At 70 ° C, partial dehydration of the sand surface occurs, accompanied by an increase in weakly acidic centers with pH = 3.2-1.7. Strongly acid sites with negative pH values remain shielded residual water molecules. Studies of the surface of the sand revealed a negative effect of the adsorbed quartz surface of the water, which shields strongly acidic and strongly basic centers and prevents their interaction with the binder. A monolithic protective coating should to be in dangerous contact with marrows - circulatory fabrics.perform its functions up to 1.8-2.5 years, subject to the exclusion of techni-

mechanical stresses from it. Its longevity is completely dependent on the weather resistance of the binder. The viscous sand layer, in addition to weather resistance, must also have the ability to pass atmospheric moisture through itself and maintain the moisture of the sand, which is very important especially in arid and extra arid conditions.
If the coating will have a combination of these properties, then phytomelioration will have increased effectiveness. The kinetics of the formation of a polymer-sand structure is associated with the speed of the processes of interaction of sand and polymer, in particular, with adsorption, which determines the adhesive properties.

To clarify the nature of adhesion, it was necessary to study the nature of the formation of the corresponding structures in the contact zone. The most important characteristic of a monolithic polymer sand coating, revealing its operational properties, is the value of the plastic strength PT, at low loading speeds. The curves of changes in the coating strength depending on the hardening temperature (Fig. 1) show that the most acceptable results are achieved at a temperature of 40°C. A further increase in the hardening temperature leads to a strong increase in PT and an increase in the brittleness of the material. Apparently, this is due to a sharp removal of the dispersed medium, which in turn impedes the processes of structure formation in the contact zone.

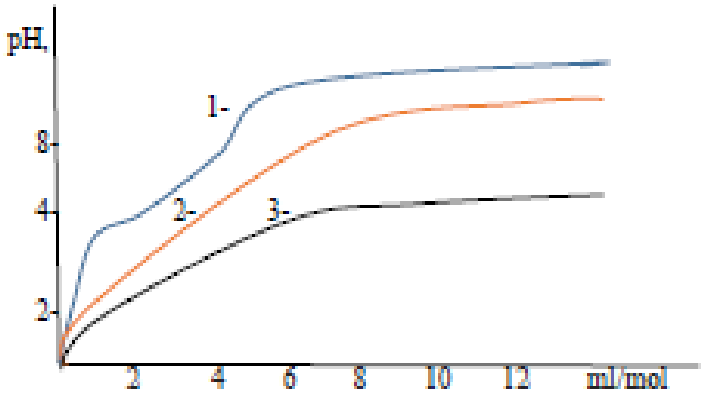

Fig. 1. Dependence of changes in coating strength on hardening temperature. 1-70°C, 2-40°C, 3-20°C.

The graphical dependence of the change in coating strength on the binder consumption of optimal concentration shows that at a flow rate from 1 l / m2 to 3 l / m^2, the value of Pr is almost constant, from 3 to 5 l / m2 - it increases, and a further increase in binder consumption leads to a noticeable decrease, this worsens the process of absorption of binder into the sand, which leads to its spreading on the surface of the sand. At the same time, sand samples were tested from various regions of the Aral Sea region, treated As a result of studies, it was found that the samples treated with a binder with the content of the drug "PDA-1" - 12%, have the highest stability of the structural and mechanical properties of the system to external loads in the temperature range from 20°C to 80°C. At this minimum value, the elastic-elastic characteristics correspond to the maximum values of true plastic viscosity. The influence of various factors on the water resistance of the coating was studied and the values of these factors were determined. Under structure of the with a binder solution of various concentrations. combination, various and of to Change in the plastic strength of the protective coating formed in the sands by impregnation of the PDA-1 preparation of optimal concentration after testing samples exposed to the IP-1-ZM and Feitron artificial weather apparatus for 20, 40 and 60 cycles. The cycle consisted of 20 hours of ultraviolet irradiation at 30°C, 5 hours of sprinkling and 3 hours of freezing at a tempe-

rature of 15°C.The strength of the protective coating material reaches 5.28 MPa by the end of the first 20 exposure cycles a further increase in the strength of the polymer-sand crust is less intense and reaches its maximum value by 40 test cycles, and then, a decrease in strength is observed. Tests have shown that 20 and 40 exposure cycles, seasoned by the samples, correspond to 1-2.5 years of operation of the polymer-sand crust in natural conditions, which is consistent with the requirements for it.

PS:PDA-1,Paivuaniyazova Dilbar Alaniyazovna.

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Section 3.Environmental and health

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MECHANISMS OF TOXICITY EXPOSURE

Abstract: The article is proves that the order to make the evaluation fully comprehensive, it was decided to compare also material and fire performance as well as attempt a life cycle assessment of a reference product containing halogen characteristics. The tests on the fire behaviour of materials with different flame retardants revealed that halogen free flame retardants produce less smoke and toxic fire emissions to be participants in the news process.

Key words: *toxicit, global problem, equipment manufacturers.*

The environmental behaviour of flame retardants has been studied since the 1990s. Mainly brominated flame retardants were found in many environmental compartments and organisms including humans, and some individual substances were found to have toxicproperties. Therefore, alternatives have been demanded by authorities, NGOs and equipment manufacturers. The EU-funded collaborative research project ENFIRO (EU research project FP7: 226563, concluded in 2012) started out from the assumption that not enough environmental and health data were known of alternatives to the established brominated flame retardants. In order to make the evaluation fully comprehensive, it was decided to compare also material and fire performance as well as attempt a life cycle assessment of a reference product containing halogen free versus brominated flame retardants. About a dozen halogen free flame retardants were studied representing a large variety of applications, from engineering plastics, printed circuit boards, encapsulants to textile and intumescent coatings. A large group of the studied flame retardants were found to have a good environmental and health profile: ammonium polyphosphate (APP), Aluminium diethyl phosphinate (Alpi), aluminium hydroxide(ATH), magnesium hydroxide (MDH), melamine polyphosphate (MPP), dihydrooxaphosphaphenanthrene (DOPO), zinc stannate (ZS) and zinc hydroxstannate (ZHS). Overall, they were found to have a much lower tendency to bioaccumulate in fatty tissue than the studied brominated flame retardants.

The tests on the fire behaviour of materials with different flame retardants revealed that halogen free flame retardants produce less smoke and toxic fire emissions, with the exception of the aryl phosphates RDP and BDP in styrenic polymers. The leachingexperiments showed that the nature of the polymer is a dominating factor and that the leaching behaviour of halogen free retardant that has been used in electronics, wire and cable insulation, textiles, automobiles and