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БОРБОРДУК АЗИЯДАГЫ СУУ-ЭКОЛОГИЯЛЫК ТОБОКЕЛДЕРИ

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ВОДНО-ЭКОЛОГИЧЕСКИЕ РИСКИ В ЦЕНТРАЛЬНОЙ АЗИИ

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WATER-ECOLOGICAL RISKS IN CENTRAL ASIA

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Макалада Борбордук Азиядагы (БА) өлкөлөрдө өсүп жаткан суунун жетишсиздигинин себептерин менен жаратылыш жана антропогендик жагдайлардын таасири - мөңгүлөр азайтуу байланыштуу, туруксуз сугат жана иш калдыктары боюнча талдоосу жүргүзүлгөн. Борбордук Азиядагы дарыялардын жээгинде жайгашкан өтө кооптуу калдыктарды сактоочу мүнөздөмөсү берилген. Азыркы өлчөө ыкмалары спектрометр DR 5000; радиометр SRP-68-01; масс-спектрометр GC-MS, HP 5890 II колдонулган. Белгиленген натыйжалары суунун булганышы изилдөө, топурак, өсүмдүктөр, радиоактивдүү элементтер менен тамак-аш азыктары, тыюу салынган пестициддер, оор металлдар - уран, мышьяк, кадмий. Бул терс айлана-чөйрөнү булганышы ар кандай түрлөрдү заттар менен экологияга жана жергиликтүү аймактык жашоочуларынын ден соолуктарына тийгизген таасири көрсөтүлгөн. Эки ийгиликтүү пилоттук долбоорлордун жыйынтыгы баяндалган: сарамжалдуу жөнүндө аймактардагы суу ресурстарын колдонуусу жана экстремалдуу өзгөчө аймактадарда ичүүчү сууну ооруканалар жана мектептерге тазалоо үчүн.

***Негизги сөздөрз**: суу ресурстар, соолуу, булгануу, пестицид, уран, жумшартуу боюнча чаралар.*

В статье проанализированы причины нарастающего водного дефицита природных и антропогенных факторов влияния - из-за сокращения ледников, нерациональной ирригации и отходов промышленной деятельности в странах Центральной Азии (ЦА). Приведены характерстики наиболее опасных хвостохранилищ, расположенных на берегах рек ЦА. Применены современные методы измерений на спектрофотометре DR 5000; радиометре SRP-68-01; масс-спектрометре GC-MS, HP 5890 II. Изложены результаты исследований загрязнения вод, почв, растений, пищевых продуктов радиоактивными элементами, запрещенными пестицидами, тяжелыми металлами – ураном, мышьяком, кадмием. Показано негативное влияние этих видов загрязнения на экологию местности и здоровье жителей регионов. Описаны резльтаты двух успешных пилотных проектов: по рациональному водопользованию в регионах и по очистке питьевой воды в больницах и школах экстремальных районов Юга Кыргызстана.

***Ключевые слова:** водные ресурсы, истощение, загрязнение,пестицид, уран, меры по смягчению.*

The article analyzes the causes of increasing water scarcity of natural and anthropogenic factors of influence - due to the reduction of glaciers, irrational irrigation and industrial waste in the countries of Central Asia (CA). The characteristics of the most dangerous tailing dumps located on the banks of the CA rivers are given. Modern methods of measurements on the spectrophotometer DR 5000; radiometer SRP-68-01; mass spectrometer GC-MS, HP 5890 II were applied. The results of studies of contamination of water, soil, plants, food radioactive elements, banned pesticides, heavy metals – uranium, arsenic, cadmium. The negative impact of these types of pollution on the ecology of the area and the health of the inhabitants of the regions is shown. Two successful pilot projects are described: on rational water use in regions and on purification of drinking water in hospitals and schools of extreme regions of the South of Kyrgyzstan.

***Key words:** water, depletion, pesticides, uranium, pollution, mitigation, projects.*

Introduction

There are six aspects of the crisis: 1) depletion of Alpine water resources for irrigation, 2) degradation of the irrigation and drainage system, 3) water lost (evaporation due Global Warming); 4) not adequate water sharing among states (due contest of energy and irrigation needs); 5) steadfast water infiltration of hazardous substances; 6) geo- seismic dangerous factors; 7) expected accidents – flow down of hazardous tailing and warehouses (due rise of landslides); 8) rising groundwater s (example - the collapse of the dam near Nukus in 2005 two days after the triumphant opening).

Water depletion, review. The area of irrigated land in Central Asia (CA) from 2.5 million hectares in 1922 increased by 1990 to 8.5 million hectares, and the population of the region. In the Alpine regions, intensive melting of snowfields and glaciers is observed, resulting in the loss of the Pamir- Tien Shan one and a half thousand glaciers and 20% of the volume of glacial water. The Ak-Shyirak glacier system in the Inner Tien Shan from 1943 to 1988 lost 3.98 km^3 of snow-ice mass, and steadfast size reduction 8, 3 meters per year, the number of landslide-prone risk points is increasing [1;2].

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High dry last year in CA lead to lower harvest, so surprise praising of rice in the Fergana region. It is the first ring about future problem in case steadfast warming and water depletion. No good trust among CA states, judging by the unsuccessful water summits latest ten years, and stop Kyrgyzstan involvement in MFSA, that's all show - problem not really solving.

It has been discussed several scenarios for 20-30 years by computer programs. There are four options: Good (effective water distribution and demographic policy) when the volume of irrigation water is about 9,500 cubic meters per hectare and the population growth is no more than 1% per year; Satisfactory - 1000 cubic meters and 1.3%, respectively; The bad ones are 1200 and 1.5%; Catastrophic - 1300 and 2%. We are expected state-state tension by needs of irrigating lands in Fergana valley.

Water pollution of CA, review. These are: 1) in the Eastern Tien Shan on the banks of the Mailuu-Suu River (tailings with a capacity volume 2 000 000m^3, weighing more than 4 000 000 ton), several tailings were demolished in 1958, 1992 and 2002, but in the event of demolition large tailings will pollute up to 300 km^2 of the territory of neighboring

Uzbekistan, and on the fan, the exposition will be 10-12 thousand curies; at present, even before the repository demolition, local cattle meat has already been stuffed with uranium [3]; 2) in the Central Tien Shan storage Tuyuk-Suu which threatens to break in river Min-Kush; 3) Degmay radionuclides repository in Tajikistan Sogd oblast (weighing 36 tons, exposure doses up to 20.00 μS), migrating to Khoji-Bakirgan Say and further to Syr-Hole, irrigating area of Uzbekistan. The content of radionuclides in Mailu-Suu river was 2.67 - 15.0 μg /litre, strontium 137–3710 μg /litre, by our study in 2013.

Uranium content, our study. There is very high content of plant dry residue average 2.20 x10^{-6} g/g, most high content in Tacniatherumcrinitum and Atgilopstriuncialis (samples from Min-Kush and Mailuu-Suu areas, 2010-2014). The fodder is a source for animal body building (cows and camels), so a source of pollution for meat and milk. Lambs meat contains 1.2 mg/g uranium in Min-Kush (samples in 2012). We have compiled a general table of the most dangerous tailings off the shores of the rivers of Central Asia. Breakthroughs of these rivers will result in the worst consequences for the population.

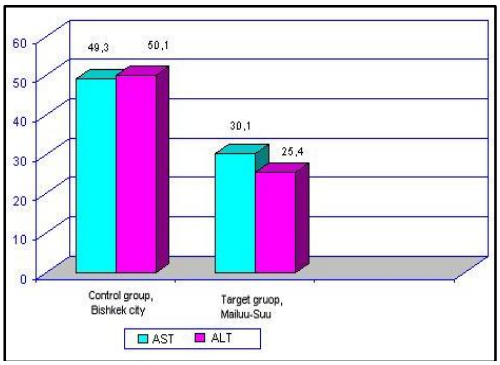
The following data - our study in Mailuu-Suu area.High concentration of radioactive and heavy metals in sill of the river in tabl 1. Meat of domestic animals is the single source of protein for local population. Cow milk and meat contain 2.27 and 0.107 mg/kg of wet weight. Uranium content in lambs skin, horn, hoof in Mailuu-Suu average level 0.183 mg/kg. Human teeth contain uranium: 0,481 x 10^{-6} g/g in children milk-teeth; and 0,687x10^{-6} g/g in elderly people.

Tabl.1.

Pollution ofMailuu-Suu river sill (2010-2012 years)

Content in sand-pebbles of Mailuu-Suu tailings 3,5,17, cover lie (ppm)	
U	1000-1500
As	43-52
Cd	0.7-1.1

Moreover mention pollution lead to disorder of thyroid glands, liver function, immunity dysfunctions, especially concerning teenager. The disorder example is in picture 1.



Picture 1. Liver function test of teenagers in Mailuu-Suu (our data 2014)

Our analytic methods. Devices: spectrophotometer DR 5000; radiometer SRP-68-01 with counter BTGI-01; ICP-MS (Perkin Elmer-Sciex ELAN-6000;Chrom-Mass-Spectrometer GC-MS, HP 5890 II Gas Chromatograph.

Our study of pesticides 011-2018. Pollution of the Chu River: Chlorocyclohexane 8.5x10 $^{-3}$mg forlitre, Aldrin1.5x10^{-3}, the average summary of DDT-DDE 13.6x10^{-2} mg/litre; but in Vakhsh River in Pamir - ChlorCycloHexane 1.45x10^{-2} mg/ litre, Aldrin 9.0x10^{-3}, DDT-DDE 4.64x10^{-2} mg l. Aldrine is most danger for health by medical assessment. The suspicious [4] that high concentrations of obsolete pesticides in lower reaches of the Syr-Darya (from Uzbekistan to Kyzyl-Orda, Kazakhstan) – is the main cause of a high rice pollution and population diseases high level. We did a wide study of CA main rivers basin pesticides pollution– water, cliff, soil (of pasture, of veggie gardens), and pollution of meat and vegetation. First results are alarming. There are high content ofobsolete pesticides in soil of Nooruz river (Tajikistan): alfa HCCH (HexaChlorCicloHexane) 7.26 mkg for soil kg; beta HCCH – 1.9; gamma – 1.9; delta HCCH – 8.59

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for soil kg; and the other danger substances 4-4-DDT – 2.66; Metoxichlor – 2.84 mkg /kg soil. In case of add several chemicals to water of mentioned rivers – it would problem for health due aggravating effect. Our suspicion supporting by publications of pregnancy and birth disorders in South Kyrgyzstan pesticides area [5;6;7]. There was accidence of dead-poison of sheep in 2013 – picture 2.

Picture 2. Accidence near pesticide warehouse in Jalal-abad area

Pollution by heavy metals in CA, review. In the zone of the former Aydarken mercury and Kadamjay antimony plants, significant dumps remained, containing, among other things, arsenic. We determine high concentration of Hg in rive Galuyan (near Uzbek boarder) and in agro soil – two km on West – 25 mg/kg.In northern Kazakhstan, the Aktobe Chrome Plant pollutes with hexavalent chrome the Ilek River [8], which flows to Russia. Aluminum enterprise in North Tadjikistan polluting river Zaravshan and other waters flowing to the territory of Uzbekistan by Hg, Cd, Sr. Big lakes and rivers of CA have multiple chemical pollution. Several pollutants in Issyk-Kul lake (Institute of Irrigation KR data): in centre of north costs surface-active compounds = 0,03 mg/dm^3; east lake corner (near Balykchi town): zinc = 0,01 mg/dm^3, surface-active compounds = 0,01 mg/dm^3; water near all costs – very high tin concentration. There is high concentration of metals (copper = 0,026 mg/dm^3) in deep water. The other lake of CA - Balkhash polluted by tailing. Ways of pollution: water drainage filtration (hydrodynamic net thickening near the dam), and due lixiviation of heavy metals from ground secession in Taraganlyk bay. There is largest toxic repository (100 mln cubic meters) in Asia continent – cyanide, after Centerra gold mining in Central Tien-Shen. A Petrov-Davydov glacier threatens to destroy the dam and toxic contents can fall into the Ara-Bel and Naryn rivers [9].

Our efforts for pollutants impact mitigation- There are proven water-saving low-cost technologies. These are: contour construction of irrigation canals on the slopes, a monitoring system and a programmable volume of water through the network channels, film coating to reduce evaporation, fregat-rain irrigation [10]. The most promising and modern technology has been developed at the Research Institute of Irrigation. High efficiency has been demonstrated for 10 years by V. Shablovsky original system (Institute of Irrigation KR) in the Fergana Valley irrigation lands.

Drinking water purification. We install 15 filters (Viking – Aqua for) in 8 schools, 4 kinder gardens and in two hospitals of Mailuu-Suu (pic. 3, tabl.2). There is more complex problem of uran and pesticides purification.

Picture 3. Water-filter installation in Mailuu-suu school n 5 kitchen

Tabl.2

Water after filtration in Mailuu-Suu school

№	Pollutant	Beforefiltration (M^1) mg/l	Error mg/l	After filtration (M^2) mg/l	Error mg/l
1	Fe (overall)	0.098	0.003	0.006 *	0.001
2	Mn (overall)	0.198	0.004	0.023	0.005
3	NO_2-N (nitrite)	-	-	0.045	0.002
4	NO_3-N (nitrate)	3.00	0.20	0.20 *	0.05
5	Cl^- chlorides	8.04	0.20	1.10 *	0.06
6	$U^{238+234}$	3.00	0.5	0.2	0.07

Footnote: * statistically significant difference M^1 and M^2.

Conclusion. Natural changes (ground water rise, soil wetting, landslides or avalanches forming, earthquakes are increasing in the Central Asian region, which increase the risk of the wide spread of radioactive and toxic substances. Pesticides and uranium influences aggravating each other in pathology of human body [11]. Such problems require immediate international prevention efforts.

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