

Modern problems of Pollution, Protection and Management of Main Rivers of Aral Sea basin

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Aral Sea basin is situated in the middle of Central Asia. It occupies 2,2mln. km². Area with population about 40mln. includes watershed of two main rivers in Central Asia: Amydarya and Syrdarya.

From 7 million hectares of the irrigated grounds of the Central Asian region, about 60%, i.e. 4,2 million hectares is shared by Uzbekistan.

Irrigated lands have a special value in Uzbekistan. Occupying only 15 % of farmland, they give more than 95% of all agricultural production. However, the sizes of irrigated lands in the country are limited by shortage of water resources, which are already exhausted and polluted presently.

We investigated the contents and temporary-time distribution of more than 20 polluting substances in the river waters of the Aral Sea basin within 2003-2005 years. In result of study there were determined the dissolved oxygen, COD, BOD, macro kations and anions, pesticides and other pollutants.

One of the main rivers of Central Asia - Amu Darya is used, mainly, in lower ranges. Water capacity of Amu Darya is 78 km³ per one year

The water of Amydarya river have mineralization 1227, 3mg/L (1,2 Maximum Permissible Concentration (MPC) on the average. In the hydro post of the Termez city (middle stream of river) it has 642,3mg/L (0.6 MPC), and in the willage Kzyljar near Aral Sea (downstream of river) it increases to 1527,7 (1.5 MPC). The River of Amu Darya and its tributaries are characterized by low COD and BOD values typical for rivers of arid zones.

Therefore, the average BOD value gradually decreases from upstream to downstream. In the range of Termez city the value of COD on the average has made 5, 5- 27, 6 mgO/dm⁻³, making on the average on the river 17,2 mgO/dm⁻³. The level of pollution of the river by petroleum is high, on the average 0, 07 mg/dm³ (1, 4 MAC).

The contents of ammonium, nitrates and nitride nitrogen is low, their average sizes on water flow has made 0. 02 mg/dm⁻³(0, 1MAC), 1. 59mg/dm⁻³(0, 2MAC), 0, 009mg/dm⁻³(0, 45MAC).

The contents of alpha-HCH - 0,004 mkg/dm⁻³ (0,4 MAC), gamma HCH - up to 0,002 mkg/dm⁻³ (0,2 MAC), DDT and its metabolites are not found out.

On size of an index of the polluted substances (IPS) the quality of water of Amu Darya has worsened in ranges of Tuyamuyun and village of Kzyljar also has passed from class II to class III of the moderately polluted waters. The level of pollution of the river in points of middle stream Termez city (class II) and downstream Nukus city (class III) has not changed.

The basin of Syr Darya is located in area of accommodation of large industrial objects, which waste waters render influence on quality of water resources of the basin, to which concern: ON "Electrokhimprom", Alti-Aryk oil refining factory, lime factories, urban clearing structures. The 6 regions of Uzbekistan are situated in territory of the Syr Darya river basin: Andizhan, Namangan, Fergana, Tashkent, Dzhizak and Syrdarya. Waste waters are dumped to Syr Darya and its inflows.

About 2 millions of hectares of lands are irrigated in the Syr Darya river basin. The channels with total volume of water fence of 23,12 km³ per one year are constructed for irrigation. Water use from the river has increased from 70 % in 1960 up to 95 % in 2005. At the same time, volume of the collector-drainage water, generated in the basin, has made 13,5 km³ per one year.

The water mineralization of the river has increased to 1216, 7 mg/L (1.2 MPC) on average. The oxygen mode in 2003-2005 was satisfactory, concentration of the dissolved oxygen at a level 11, 35 mgO/dm⁻³ that corresponds to a level of the last year. On current of the river the contents of organic substances (on COD) varied within the limits of 10,1-16,8 mgO/dm⁻³.

Water is most polluted by organic substances in ranges below Bekabad city and Nadejdinsky settlement, where the maximal value of COD have made 27, 1 mgO/dm⁻³ and 35, 3 mgO/dm⁻³ accordingly.

The pollution of water by ammonium, nitrogen nitrate and nitride has increased 1,5-1,6 times, on the contrary, has made - 1,97 mg/dm⁻³ (0,2 MAC), 0,046 mg/dm⁻³ (2,3 MAC), 0,05 mg/dm⁻³ (0,1 MAC) accordingly.

The contents of phenols on current of the river varied a little and has made on the average 0,001 mg/dm⁻³ (1 MAC) that corresponds to a level of the last year.

Pollution by petroleum insignificantly has increased, but did not exceed MAC - 0,045 mg/dm⁻³ (0,9 MAC). The contents of copper has not changed, and the contents of zinc and chrome in comparison with previous year has increased in 1,4-1,6 times and has made 0,8 mkg/dm⁻³ (0,8 MAC), 5,6 mkg/dm⁻³ (0,6 MAC) and 1,4 mkg/dm⁻³ (1,4 MAC) accordingly.

The presence of HCH isomers was marked at a level of 0,002 mkg/dm⁻³ (0,2 MAC), DDT and its metabolites are not found out.

On chemical structure in all phases of hydrological mode, water concerns to chloride class (seldom sulphate), group of sodium or calcium.

Conclusion:

The main sources pollution of river waters is collector-drainage waters from irrigated agricultural land. Annual volume of it in the Aral Sea basin is about 32-34 km³.

Our long-term research has revealed that the dump in river waters is high-mineralised containing residence of fertilizers, pesticides and herbicides returnable collector-drainage waters from agricultural lands are defines basic reasons of essential deterioration of water quality of the Amydarya and Syrdarya rivers basin in the middle and downstream currents.

The large volumes of polluting substances, including ammonium nitrogen and organic pollutants, are dumped to the rivers from cattle-breeding complexes. The situation is worsened by complete absence of sewer networks and working clearing structures. The unreasoned policy of excessive consumption of Amydarya and Syrdarya waters for needs of irrigation resulted to unprecedented scales of influence on ecology of the region.

The growing pollution and deficiency of waters and worsening quality caused degradation of soil vegetative cover, irreplaceable changes in flora and fauna, decreased the efficiency of irrigated agriculture in the region.

Some recommendation:

Development of monitoring of waters in the basin of the Amu Darya and Syr Darya rivers by using modern means of the account of volume and quality of river waters.

Realization of research and engineering-design works on clearing, regeneration of collector-drainage waters for reuse, demineralization of salty waters.

Hence, there is a need for active participation of the International communities, organizations and experts for the solution of complex use of management and protection of water resources of the region. The participation of developed countries - USA, Germany, Japan etc. also is important in the solution of water problems of the Aral Sea basin.

Literature:

1. Kulmatov R.A., Umbarov I., Turaev N.Y., 2000. Technology of extracting iodine, bromine and rare elements from oil fault underground waters. Collection of 7- informational materials. III International conference "Precious and rare metals-2000", 144-146, Donetsk-Svatagorsk.

2. Kulmatov R A., Fedorov Y.A. and Rubinova F.E.(1998) The Amu Darya: water quality assessment of the former Soviet Union. Collect of articles. E&FN Spon. London and New York. Pp. 413-433
3. Kulmatov R.A.(2003) Problems of Sustainable Development of Land-water Resources of the Republic of Uzbekistan. The 13 Stockholm Water Symposium. Book of abstacts. Stockholm, August 11-14. pp. 278-281
4. Kulmatov R.A., Kulmatova D.R., Umarov M., (2003). Monitoring and management of river water of Amu Darya and Surkhan Darya — The Aral Sea basin. The 6' International River Management Symposium, Book of abstracts. Brisbane, Queensland, Australia, September 2-5. Paper presentation session 3C.3.
5. Kulmatov R.A. (2003). The role of NGO in Monitoring of Quality of Surface Waters. International Scientific-practical Conference "Participation of Society in Overcoming Water Deficiency in Central Asia". Book of abstracts. "University" Publishers. National University of Uzbekistan. Tashkent. 2003.
6. Kulmatov R.A. (2004). Modem problems of natural environment change, water and land resources in Uzbekistan. First international workshop on the human dimensions of climate and environmental change in Central Asia. Grand Valley State University, Grand Rapids, Michigan, USA, May 21-22, 2004.
7. Kulmatov R.A. (2005) Socio-ecological problems of Surkhandarya region J. of Ecological safety and public initiative, #2, p.34-38
8. Kulmatov R. A. Kulmatova D.R.(2006) Involving of the Public in Monitoring and Management of the rivers of the Aral Sea Basin. In: 9th International Riversymposium 4-7 September, Brisbane, 2006. p.54-56