The crisis of Aral Sea and health of the population in the disaster zone.

R. Kulmatov, I. Soliev
National University of Uzbekistan, Republic of Uzbekistan, 100074
{ rshdkulmatov@yahoo.com, isoliev@gmail.com }

Abstract: The modern problems of Aral Sea crisis and connected with the problems of quality and pollution of surface and underground water resources, food products, lost of biodiversity, influence of climate change on agriculture, and also on health of population in disaster zone are discussed. The following conclusions were obtained as follow:
- The Aral Sea crisis has become not only the in-region problem, but also concerns the interests of world community.
- It is important to decrease the influence of drying up Aral Sea for the health of population of Priaralie.
- Water deficiency and pollution will become a major factor for limiting the development capacity of countries, especially for drinking needs for population of disaster zone and for agriculture production, which plays the key role in their economies.
- The creation of lakes, wetlands and wet areas in the delta and the dried bottom of Aral Sea and the stabilization of biological productivity of ecosystems of the western Aral Sea is needed;
- The establishment and development of GIS-framework for monitoring the environment and social aspects in the area of the Aral Sea and its implementation.
- In a global scale the Aral Sea crisis will be a good an example of the situation, which might happen in many regions of the world under the condition of global climate change.

Keywords: Aral Sea crisis, Biodiversity lost, Drinking water, Climate Change, Health of population.

1. Introduction

During the Soviet period, the expansion of the cotton cultivation required large-scale use of Amudarya and Syrdarya rivers water for irrigation. In Uzbekistan, the area under cotton fields increased from 441 600 ha in 1913 to, 1.4 million in 1960 and 2.1 million in 1987. As a result, irrational water using less volumes of rivers water reach to the Aral Sea and which started to dry quickly. Since 1961, the period of active human influence on the hydrological regime of the Aral Sea. The Shrinking of Aral Sea, at the time the fourth largest inland sea in the world, had far-reaching consequences for the health of population, biodiversity and climate and others of the surrounding regions. This factor is rendering mutual interaction to poverty; deteriorating public health and environmental degradation exacerbate the existing crisis situation. The deterioration of the ecological situation in the region makes the former highly populated areas, such as the Republic of Karakalpakstan (Uzbekistan) and the Kyzylorda region (Kazakhstan), unattractive for living and housing.
2. Results and discussion

2.1. The modern conditions of Aral Sea.

For last 35-40 years the level of Aral Sea has gone down on 30m, the volume of waters has decreased from 1064 to less than 80 km3; the salinity of water has reached in the western part 120-130 g/l, and in east hollow up to 290 g/l. Then, the Aral Sea, practically, has turned to a lifeless reservoir (Fig.1). The area of the drained bottom of Aral Sea is near 5 million hectare (Fig.2). Desert winds move the sand and salt over long distances, delaying millions of tons of (often polluted) salts on the fields throughout the basin, which threatens, by some accounts, even the glaciers in the mountain ranges that are far from the sea. Every year the sand is lost from the dry bottom of the Aral Sea by winds and cyclonic storms which away 75 million tons of sand, as well as another 65 million tons of fine dust and salt, resulting in lower productivity of pasture and crop yields [1].

![Fig.1. Decreasing volume of Aral Sea water by yr.](image)

On the irrigated lands in the downstream part of Amudarya and Syrdarya rivers annually falls about 100 million tons of salt and sand, which caused tremendous damage to the environment, the economic and social life of the region is enormous moral trauma population of the Aral Sea region. With the fall of the level and the lack of stock from the open sea, with a reduction in recharge from above, the level suitable for drinking water needs from groundwater is reduced by 10-15 meters and then becomes unavailable for use by the public[1,2].
Fig. 2. Dried up Aral Sea area.

2.2. Water quality.
In waters of a residual Aral reservoir increased contents of organic substances (The dissolved organic substances, benzene, xylene and phenol) and heavy metals (nickel, lead, mercury, and zinc) have been established. In separate sites of the Aral Sea the high contents of vanadium, copper, cadmium, chromium and presence methanol are produced. The level of pollution of soil by mineral oil, benzene, xylene and toluene, and also chlorine-organic pesticides are much lower than allowable concentrations. Major of pollutants in the environment of disaster zone are pesticides, heavy metals and the rests of mineral fertilizers. Radioactive pollution of the natural environment is not established [1,3].

In spite of the measures and international assistance, has not yet been able to improve the water quality, mitigate the environmental and sustainable livelihood of population in the disaster area in Uzbekistan and Kazakhstan. The water factor and its pollution are playing the determining role in increase of diseases of people, increase in the general and children's death rate. Water seasonally from 30 % up to 100 % does not meet sanitary requirements (Fig.3.). Total pollution of surface water in disaster zone has led to the considerably polluted underground water, including water wells [1,4].
2.3. Biodiversity lost.

Zone of the natural landscape of the Aral Sea region, with its unique tugai flora and fauna of the famous rich, degraded beyond recognition, lost its vitality and attractiveness of natural value (Fig. 4.).

On the territory of the Republic of Karakalpakstan (Uzbekistan) 498 species of vertebrates, including mammals 68, birds: 307, nesting: 141, wintering: 20, span: 146, reptiles: 33, amphibians: 2, fish: 49 are registered. The biodiversity of invertebrates is estimated tentatively more than 3500 species [1,5]. Nowadays, nearby the Aral Sea region has lost more than half of the gene pool of fauna and flora. As worsening the ecological conditions in the regions nearby the Sea, the following has been lost from the fauna – Koulan, Argali, Striped...
Hyena, Cheetah. Very complicated situation has occurred in the population of Saigak and Antelope. Nowadays its population has critically endangered. Consequently the Aral crisis has led to changes in the biodiversity of the Ustyurt plateau. In recent years, the region recorded only 35 species of mammals which are listed in the Red Book 4 types: gazelle, manul, Indian medoed, and caracal. Zone of the natural landscape of the Aral Sea region, with its unique tugai flora and fauna of the famous rich, degraded beyond recognition, lost its vitality and attractiveness of natural value. It is important that, ensuring the gene pool conservation of flora and fauna, the formation and development of protected natural areas.

2.4. Fishing lost.

In the past, the Aral Sea was the one of the richest fishing zones in the world. However, in recent years the average annual catch of valuable fish species was 25-27 thousand tones, harvested up to 2 million paces ondatro skins, production of canned fish averaged 18-20 million standard cans. By 1979, stopped shipping, and since 1984, sea fishing completely lost meaning [Fig.5]. Nearby the Aral Sea, there was 38 species of fishes in the basins and nowadays we have only 27 species [5].

Fig. 5. Lost of fish resources.

2.5. Chemical pollution.

Almost thirty-year water use for irrigation of cotton monoculture and the use of pesticides, especially organochlorines, have led not only to environmental and economic volatility, but also created serious critical threat to public health [6]. The pilot study conducted by Doctors without Borders in the Republic of Karakalpakstan, showed the presence of organochlorine, homogeneous specific dioxins, furans and polychlorinated biphenyls in breast milk samples and in a number of different food products (lamb and chicken fat, eggs, cotton and oil), are exceeding the recommended WHO standards [7]. So far in the field crop discovered metabolites of DDT and HCH in concentrations that also exceed health standards (monitored by the of environmental pollution and the
However, the complexities of monitoring environmental pollution by these compounds are expensive. In addition, the ongoing work to develop methods for determining it in all media: air, water, food is not done yet. A few other chemicals entering the food supply chain as a result of environmental pollution can be extremely serious risk to human health. Importantly and the risk associated with lack of nutrients such as iodine, vitamin A, folic acid, iron. Uzbekistan is practiced enrichment of food by these trace elements (salt iodization, fortification of flour) in order to ensure a sufficient supply of the organism. To responsible for the quality of food are all interested in parties of producers and consumers. Share samples of foods that do not meet hygienic standards for the period 2000 -2007 which is varied in ranges from 6.80% -6.2% for microbiological indicators and 5.7% -5.9% of the sanitary-chemical indicators[1].

2.6. Impact of Climate Change to agriculture.

The analysis of meteorological changes on all meteorological stations located within 300-400 km around the Aral Sea for the long period is showing a zone change of daily amplitude of temperatures. The result should that summer anthropogenesis increase of temperatures and winter downturn with in limits 1, 0-1, 5°C.

The major consumer of water resources of Aral Sea basin is Uzbekistan which consumes up to (50%) of water for the agriculture production. Climate warming will bring to the increase in the main item of the expenditure of the evaporation losses, and therefore, cause the increase of water demand for vegetative, moisture-loading and scrubbing watering. Under the condition of water deficiency in the future, there is a need to assess the additional consumption of irrigation water and the irrigation regime for the new climatic circumstances [8].

The increased risks in the agriculture sector are caused by the following climatic factors: Increase in deficiency of available water resources and deterioration of its quality; increase in recurrence of dangerous meteorological events (heavy precipitation in spring hail), remained probability of crop damage by frost, intensification of air aridity phenomena and extremely high temperatures.

At the present time, there is a main important practical problem - the development of mechanisms and measures of effective allocation of water resources to achieve a consensus among consumers in irrigated agriculture, drinking water supply, industrial production, energy consumption of the Aral Sea basin, the needs of ecology and recreation, which needs good water quality in surface and underground sources and conservation of all components of an enabling environment for future generations if current population growth will continue [1,9].

2.6. Climate Change and Population Health.

Changes of the climate in Uzbekistan, namely - increases in hot days and, connected to its increase in dusty winds; increase in warm days during the winter period, causing infringements of adaptation of the organism, are reflected also in growth of diseases of bodies of breath, especially among children [1,10,11].
Direct Consequences of Climate Change will be the – increase of “heat-related” illnesses, human death and traumas during dangerous climatic events (floods, mud flows and avalanches in case of Uzbekistan). Indirect Consequences of Climate Change to human health reveals with delay. The impact occurs through increased frequency of infection and transmission diseases, as well as through lack in pure water and nourishment. Health problems due to adverse environmental condition are summarized follows:

- Lack of epidemiological evidence and time series studies of adverse health impact due to environmental disaster and climate change.
- In Karakalpakstan (disaster zone), since 1980s there has been 3.00% increase in chronic bronchitis and in kidney and liver diseases, especially cancer, while arthritic diseases have increased 6.00% (Fig.6.)
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Anemia takes a big part in the structure of diseases in the Republic of Karakalpakstan which is 50.4% of all other diseases (Fig.6). The closer the region to Aral Sea, the higher the level of diseases and death rate are seen (Fig.7-8.).

![Fig.6. Anemia in children (per 100,000 individuals)](image-url)
Fig. 7. Bronchial asthma morbidity rate

Fig. 8. Bronchial asthma morbidity rate
The main reasons of health problems with population in the Aral Sea area are:

- Insufficient supply of the water in the disaster zone Aral Sea area (Khorezm region and Karakalpakstan Republic (Uzbekistan)) with ecologically pure potable water.
- Pollution of atmospheric air with salt and dust winds from the seabed of the dried part of the Aral Sea.
- Pollution of atmospheric air with emissions of harmful substances from stationary and mobile sources.
- Environmental contamination with stable organic pollutants.

The following problems are also important:

- The creation of lakes, wetlands and wet areas in the delta and the dried bottom of Aral Sea and the stabilization of biological productivity of ecosystems of the western Aral Sea;
- The establishment and development of GIS-framework for monitoring the environment and social aspects in the area of the Aral Sea and its implementation;

3. Conclusions

- The Aral Sea crisis has become not only the in-region problem, but also concerns the interests of world community.
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Acknowledgment

The present research was carried out under the Professorial Research Fellowship of Central European University, Hungary (2008). We thank Ministry of Health Uzbekistan for supporting this research and presenting the necessary data about the health of population and climate change in disaster zone.

References


