

## THE SYR DARYA RIVER – NEW ECOLOGICAL DISASTER IN CENTRAL ASIA

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**Abstract.** Syr Darya one of the most important rivers in Central Asia, Central Asia's longest river, and second-largest by volume. By the time it nears the end of a twisting course that takes it through four Central Asian states, the Syr Darya has accumulated such high levels of agricultural runoff such as pesticides and fertilizers, industrial waste, and any number of other contaminants that some are warning that crops irrigated by the river in southern Kyzyl-Orda province should be burned.

**Key words:** Kazakhstan, Syr Darya, Central Asia, ecological disaster.

### INTRODUCTION

The Syr Darya river is very important part of Aral Sea Basin, and also it is important because the Central Asian Republics depend on it for drinking water, irrigation, and hydroelectric power. In the upstream countries of the Basin, Kyrgyzstan and Tajikistan, the river is used for hydroelectric power, especially during winter months, while downstream, in Turkmenistan, Kazakhstan, and Uzbekistan; it is used for agricultural purposes in the summertime. The post-independence upstream shift in water use away from irrigation has created disputes between the upstream and downstream countries over how the region's transboundary waters should be managed.

Agriculture is the largest water consumer in the region and a major employer of the region's workforce, producing a large percentage of each country's gross domestic product (GDP). Water diversions for irrigation have resulted in severe problems associated with lack of water in the downstream areas of the Syr Darya Basin near the Aral Sea. Improving water quality and increasing water quantity to meet basic human needs in these environmentally damaged and economically depressed areas is an urgent need.

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However, providing this water through reduced agricultural water use may impose great economic damage on the basin countries.

Given the great dependence of the Central Asian economies on irrigated agriculture, the issue of water allocation, involving both quantity of water and timing of allocations, has emerged as a major factor in the Republics' development.

As one of the most important rivers in the region, the Syr Darya is an environmental threat not only to people but also for the whole ecological niche of the basin. Years of thoughtless use of water for economic purposes have become a huge problem [Pannier 2009]. Now the main goal of all the neighboring countries should be the idea of saving the longest river in Central Asia.

## CATCHMENT

The Syr Darya is formed by the confluence of the Naryn and Qoradaryo rivers in the eastern Fergana Valley and generally flows northwest until it empties into the Aral Sea.

After leaving the Fergana Valley the river flows northwest, receiving the Ohangaron, Chirchik, Keles, and Arys rivers on the right. In its middle and lower reaches it follows a meandering course through the eastern outskirts of the Kyzylkum Desert, frequently changing its bed, forming channels that often lose themselves in the sands, and overflowing its low banks at flood. It is fed in its upper mountainous basin mainly by snow and to a lesser extent by glaciers, and high water lasts from March or April to September. The Syr Darya carries a considerable amount of silt, much of which it deposits in the vicinity of Qazaly, Kazakhstan. The river freezes in its lower reaches from December to March.

There are a number of hydroelectric power stations on the Syr Darya and its tributaries, of which the largest are the Farhod (in Uzbekistan), Qayroqqum (Tajikistan), and Shardara (Kazakhstan) stations on the main stream and, in Uzbekistan, the Chorwoq station on the Chirchik River and the Uchqurghon station on the Naryn River. There are also dams in Kazakhstan at Kyzyl-Orda and Qazaly. The Toktogul hydroelectric power station, which was constructed on the Naryn River in the 1970s and expanded in the '80s, regulates the river's flow. As much as 5 000 000 acres (2 000 000 hectares) of land are irrigated by the Syr Darya and its tributaries, with cotton the chief crop in the Fergana Valley and the Syr Darya's middle course and rice in the river's lower reaches.

Along its course, the Syr Darya irrigates the most productive cotton-growing region in the whole of Central Asia, together with the towns of Kokand, Khujand, Kyzyl-Orda and Turkestan.

Various local governments throughout history have built and maintained an extensive system of canals. These canals are of central importance in this arid region. Many fell into disuse in the 17<sup>th</sup> and early 18<sup>th</sup> century, but the Khanate of Kokand rebuilt many in the 19<sup>th</sup> century, primarily along the Upper and Middle Syr Darya (Fig. 1).

Massive expansion of irrigation canals in Middle and Lower Syr Darya during the Soviet period to water cotton and rice fields caused ecological damage to the area. The amount of water taken from the river was such that in some periods of the year, no water at all reaches the Aral Sea, similar to the Amu Darya situation in Uzbekistan and Turkmenistan.

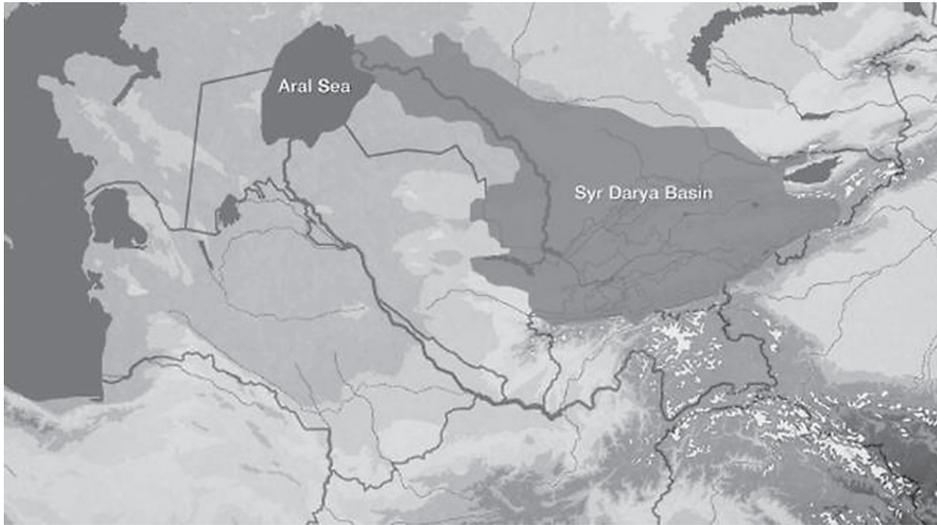


Fig. 1. Syr Darya Basin

## PROBLEMS WITH IRRIGATION

The main pollutant of the water in the basin is its main user, i.e. crop agriculture. Since drainage infrastructure discharges some of its effluent back into the river, the downstream water quality gradually aggravates. Water salinity increases up to  $2 \text{ g} \cdot \text{l}^{-1}$  in the deltas of the Syr Darya [Rust et al. 2001] or up to 2,9. The use of pesticides and insecticides estimated at  $(38\text{--}57) \times 10^3$  ton and  $(570\text{--}1140) \times 10^3$  ton of mineral fertilisers, the chemical pollution of the water is also a serious problem in the region. The number and capacity of the sewage water treatment plants is also not sufficient. The main environmental issue in the Syr Darya Basin remains the collapse of natural ecosystems in the area of the Syr Darya delta. Here, once productive wetlands, turned into a drying bed of Northern Aral Sea since 1960s. As a consequence, the fish population of the lake was drastically reduced, virtually eliminating the commercial fishing industry in the region. Furthermore, the exposure of the dried-up bed of the Aral Sea allowed strong winds to erode the underlying sediments contributing to deterioration of air quality for the nearby residents and soil quality due to salt-laden particles falling on arable land. Salinization and waterlogging due to irrigation represent a serious threat to irrigated land. The area affected has increased during the last decade from roughly 25% to 50% of irrigated land [Raskin et al. 1992, Heaven et al. 2002]. According to Rust et al. [2001] presently, 31% of irrigated area has a water table within 2 meters of the surface and 28% of irrigated area suffers from moderate to high salinity levels, which results in crop yield decline by 20–30%. In the late winter/early spring there is a danger of flooding in the lower course of Syr Darya around Kyzyl-Orda city. The problem rises due to seasonal ice formation in the lower course of the river, which restricts the transporting capacity of the river channel, while in the upper stream too much water is used for hydropower production at e.g. Toktogul reservoir. To

avoid flooding part of the excess water is diverted to Arnasay depression. However, since high degree of stream flow regulation and extremely low longitudinal freedom of Syr Darya (there are 29 major dams in the basin), the danger of flooding is rather a question of proper water management at transboundary level, than a real environmental problem.

The excess water is diverted to the Arnasay depression since 1960s, but at the regular basis only in the last decade (at average up to 3 km<sup>3</sup> of water is being translocated to Arnasay depression annually in the period from 1990–2000). As a result, over a territory of about 20 000 km<sup>2</sup> there was created an ecosystem of man-made wetlands with unique flora and fauna, which already became a popular place for going game and fishing, as well as small-scale farming. Therefore, perversely enough, it became already an ecological issue to meet the demands of this newly created ecosystem, which means to continue the practice of translocation of the water into the depression, i.e. to deploy Northern Aral Lake of that water.

The water can carry carcinogens into rice fields, pass toxins from nursing mothers to newborns, and is seen as a threat to the health and livelihood of the millions of people who live nearby.

Because of the increased water intake and discharge of waste water back into the river have occurred: increased salinity, sedimentation, began the development of infectious organisms on the banks of the river. Also increased the oil content because of the Fergana refinery.

In 2011, for the studying of the degree of contamination, NATO has allocated a special grant for M. Auezov South Kazakhstan State University in the amount of 600 thousand euro. The study took three years, during which samples were taken from the reservoir on Shardarja in South Kazakhstan province bordering with Uzbekistan. The study revealed high concentrations of heavy metals (mercury, lead, copper, etc.). According to Professor UKGU Uylesbeka Besterekova, Syr Darya water should not be used for agriculture and fisheries management. Even if you start cleaning the water now you need a minimum of 10 years before the water becomes usable again.

A similar statement was made by the kazakh environmentalist Burlibaev Malik in 2009. According to the report, the Syr Darya water cannot be used as drinking water or for irrigation. Rice grown on this water is not suitable for food, as it causes cancer.

Of course, certain measures to prevent the degradation produced. One of them was the creation of the Interstate Commission for Water Coordination of Central Asia in 1992.

## RECAPITULATION

The capacity for shared water management exists in Central Asia, however, at this time it is not as effective as it could be. Government officials often exhibit a desire to handle water management and other regional issues through the development of strictly bilateral arrangements and agreements. There is a need for a consensus among high level advisors to the Central Asian Presidents that regional cooperation can lead to increased benefits, stability and security for the countries. Regional development assistance would demonstrate the mutual economic benefits to be derived from a multi-sectoral approach to regional cooperation in water resources management.

The diversion of water from the Syr Darya for irrigation contributed to the shrinkage of the Aral Sea in the latter part of the 20<sup>th</sup> century. By the 1990s the flow of the Syr Darya along its lower reaches was much reduced during the whole year. The gradual retreat of the Aral Sea shoreline and the drying up of the Syr Darya's deltaic region exposed toxic fertilizer and salt residues to the winds, devastating local plant and animal life and causing serious health problems among the human population.

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As we can see now, another ecological disaster is developing at the moment, prevention of which should be the highest priority objective of all countries included in the region of Central Asia. The sad experience of the Aral Sea should force all countries as soon as possible and more effective to resort to the rescue of one of the most important water sources in many asian countries.

Syr Darya is one of the most important rivers in Central Asia, but now we have to do everything possible to save the river and water quality.

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## RZEKA SYR DARYA – NOWA KATASTROFA EKOLOGICZNA W AZJI

**Streszczenie.** Syr-daria jest jedną z najważniejszych rzek Azji Środkowej – jej rzeką najdłuższą oraz drugą pod względem wielkości przepływu. Gdy Syr-daria dociera do ujścia, przepłynąwszy przez cztery państwa środkowoazjatyckie, niesie tak dużą ilość odpadów rolniczych, takich jak pestycydy czy nawozy, i odpadów przemysłowych oraz ogromną masę innych zanieczyszczeń, że pojawiają się ostrzeżenia, iż plony z pól nawadnianych wodą z tej rzeki w obwodzie kyzylordańskim powinny zostać spalone.

**Słowa kluczowe:** Kazachstan, Syr-daria, Azja Środkowa, katastrofa ekologiczna.

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