Aral Sea: Environmental Tragedy in Central Asia

The Aral Sea, a terminal lake fed by two major rivers, the Syrdarya and Amudarya forms a natural border between Kazakhstan and Uzbekistan. In 1960 it was the fourth largest lake in the world; today it is on the verge of deteriorating into a small and dirty waterhole. The destruction of the Aral Sea is an example of how quickly environmental and humanitarian tragedy can threaten a whole region. The destruction of the Aral Sea is a textbook example of unsustainable development.

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The Aral Sea and the whole Aral Sea Basin has achieved worldwide notoriety as one of the major human-induced environmental degradation of the 20th century. The International Geographical Union singled out the Aral basin in the early 1990s as one of the earth's critical zones [Kasperson 1995]. It is also often referred to as a 'Quiet Chernobyl', a silent catastrophe that has evolved slowly, almost imperceptibly, over the past few decades [Glantz and Zonn 1991]. The shrinking of the Aral Sea has in recent years captured the attention and interest of governments, environment and development organisations, the lay public, and the media around the globe [Ellis 1990]. From the mid-1980s, when the former Soviet (FSU) opened its doors under the policy of glasnost (openness), the Aral Sea situation took on the aura of an environmental calamity to many foreign observers [Glantz 1998]. Since then scientists have spoken out more strongly for saving the Aral Sea. Unfortunately by that time the Aral Sea had shrunk to a third of its former size. Although it was newly exposed to the international media, and discussed with a new openness in the Soviet Union, it was a known crisis situation that was on the agenda of the policy-makers in FSU for over 30 years.[1]

Aral Sea before 1960

The Aral Sea is situated approximately 600 km east of the Caspian Sea. There used to be more than 1,100 islands separated by lagoons and narrow straits, which gave the sea its name: in Kazakh, 'Aral' means 'island'. At present the Kok Aral, the largest among the islands (now peninsula) scattered over the Aral Sea separates the north-eastern part which is called the Small Aral from the south-western part, the Big Aral. This forms the natural borderline between Kazakhstan and Uzbekistan that share the sea. The two parts are connected by the Berg strait. The Aral Sea till 1960 was the fourth largest lake in the world, covering 66,000 square km, with a total volume estimated at more than 1,000 cubic km [Kabori and Glantz 1998]. Although it is called a sea, in reality it is a terminal lake fed by two major rivers, the Syrdarya in the north and Amudarya in the south. The Amudarya, the largest river in the area, starts from the Kunlun mountains in the Hindu Kush range runs north-west through the Pamir Heights, and then flows through Kyrgyzstan, Tajikistan, Uzbekistan (forming border with Afganistan), Turkmenistan, once again through Uzbekistan before entering the Aral Sea. The Syrdarya commencing from the northern base of the Tien Shan mountains in Kyrgyzstan, flows through Tajikistan, Uzbekistan, Kazakhstan and then into the Aral Sea [Islamov 1998]. Therefore, though the Aral Sea itself lies between Uzbekistan and Kazakhstan, all five states of central Asia share the Aral Sea basin, an area of 6,90,000 square km.[2] The stream flows of these two perennial river systems, sustained a stable Aral Sea level. Over the centuries, about half of the flow of the two rivers reached the Aral Sea.

A vast delta sustained a prolific fishery.[3] In the sea, a variety of species of fish were found and caught, including species that only existed in the Aral Sea, and among those the famous Aral sturgeon. Its waters supplied local fisheries with annual catches of more than 40,000 tonnes, while the deltas of its major tributaries hosted dozens of smaller lakes and biologically rich marshes and wetlands. Tight forests of reed and rush, sometimes stretching several kilometres into the sea encircled the shores bordering the sea. Around the sea and in the river delta, big populations of Saika (an antelope), wild boar, wolf, fox, muskrat, turkey, goose and duck were found.

The Aral Sea was like a big oasis in the desert. For many centuries the steppe and semi-desert areas around the Aral Sea have been home for various ethnic groups. Prior to the arrival of imperial Russia, the population living in the region of the Aral Sea was predominantly nomadic. This way of life was to an extent essential given the conditions of the desert environment. The climate is strongly continental and the landscape is a typical semi-desert. Annual precipitation is about 200 mm. Agriculture is impossible with this amount of rainfall. Only in the area close to the two rivers agriculture was possible, so people living away from the river banks lived solely by raising animals. The first task of the imperial Russian government was to settle the population into agricultural communities. It was found that the land was good for agriculture if water was made available. At the end of the 19th century, cotton was cultivated on a relatively large scale when new irrigation technologies were introduced. Canals were dug to facilitate irrigation and sizeable portion of central Asia's agricultural production was completely dependent on irrigation.

In the years after the Bolshevik Revolution interest in irrigating the central Asian territories grew. The irrigated area was extensively developed beginning in the 1920s as the Soviets of the times (Bolsheviks) were eager to increase cotton production. In 1918 Lenin issued a proclamation about more cotton from 'Turkestan'. Besides this they also wanted to get control of the rural population. In the late 1930s, under Stalin's command the Soviet water ministry began a massive project of water diversion for the purpose of irrigating the steppes in Uzbekistan, Kazakhstan, and Turkmenistan to prepare them for cotton farming. The first major irrigation project came into operation in 1939 with the construction of the canal surrounding the Ferghana Valley in Uzbekistan. Towards the end of the 1940s, large amounts of water from the Syrdarya River were diverted to Kizil-Orda in Kazakhstan and to the area near Tashkent in Uzbekistan for agricultural purposes [Altan 1995]. Agricultural production

along the Syrdarya was prepared and initiated, with tragic consequences to the Kazakh nomadic culture. The Stalin collectivisation programme struck the Kazakhs harshly, and it is estimated that more than one million Kazakhs died or fled the area and moved to the countries south of Kazakhstan. The Kazakhs, who remained, did not have the required knowledge and tradition in agriculture, which is why experts had to be brought from outside.[4] As the peasants of central Asia did not take well to collectivisation and industrialisation of agriculture, cotton production in Uzbekistan and wheat/rice in Kazakhstan did not increase until around the early 1940s – after a million or so farmers and peasants were killed [Hav 1998].

Following Stalin's death in 1953, his successors Nikita Khrushchev and, later, Leonid Brezhnev continued the same Soviet policy in central Asia, converting even more arable lands to the production of cotton. Several large-scale canals were completed between the late 1950s and 1970 to serve these expansions of the cotton monoculture: the five-hundred-mile Qara-Qum Canal from the Amudarya to Ashkhabad, the Mirzachol Sahra irrigation network, the Chu Canal in Kyrgyzstan, and the Bahr-i Tajik Reservoir serving Tajikistan [Blake 2002]. Beginning in the late 1950s Moscow instituted a regime of cotton monoculture, whereby the entire way of life became focused on the production of cotton, with few benefits incurred by the population and the indigenous cultural ways were destroyed. Nikita Khrushchev (1953-1964) was personally fascinated by an agriculture that required no humus, and which could be conducted directly on sandy soil, using only vast supplies of water. Kazakhstan and Uzbekistan both covered vast areas of sandy soil, and through both republics ran these two rivers with immense amounts of water. A programme was launched to make the USSR self-sufficient in wheat and cotton. Cotton needs a warm climate, which is why the cotton production was placed in Uzbekistan, irrigated by the waters of the Amudarya. Production of wheat, barley, millet and rice was mainly placed along the Syrdarya and its irrigation system in Kazakstan.

The Aral Sea drainage basin, soon became a very important basin for Soviet agriculture. For millennia, people have successfully converted desert landscapes into agricultural land through irrigation. Although irrigated agriculture in the Aral Sea basin started with the Tsarist conquests of the 18th and 19th centuries, irrigation during the Soviet regime was different because huge amounts of water was diverted from the region's two major rivers. Upstream irrigation schemes, for the growing of rice and cotton, consumed, like a sponge, more than 90 per cent of the natural flow of water from these rivers. So much so, beginning in the late 1970s, no water from the Syrdarya reached the Aral Sea and the Amudarya supplied only a minimal and ever-decreasing volume [Bedford 1996]. Added to this because of high evaporation, these lands became salinised. In order to flush out those salts from the soil, drainage channels were constructed, but these were quite inadequate. Large diversions, poor irrigation construction and maintenance, and mismanagement of water resources have been identified as major causes for the decreased flow to the Aral Sea which in turn altered the existing ecological balance.

Demise of Aral Sea

It is publicly accepted that this tragic demise of the Aral Sea began in 1960. That was the year planners in Moscow inaugurated the Aral Sea Project, the ambitious economic programme to convert vital wasteland into the cotton belt of the Soviet Union. The planners assigned central Asia the role of supplier of raw materials, notably cotton. This led to a substantial reduction in the sowing of traditional crops such as alfalfa and plants grown for vegetable oil. Orchards and mulberry groves were uprooted to pave the way for more cotton. The desire to expand cotton production onto desert land increased the dependence of central Asia, particularly Uzbekistan on irrigation.

The Aral Sea and its tributaries seemed a limitless source of water. Extensive canals were dug to spread the water of the Amudarya and Syrdarya across the desert floor. Irrigated area doubled in less than a decade to 17 million acres, half of this land produced cotton and other half rice, wheat, corn, fruits, vegetables, and forage for livestock. It goes without saying that irrigation agriculture was not planned for the purpose of destroying nature. Creating an enormous income from irrigated agriculture was a brilliant success. By Moscow's account, the early years of the project were an accomplishment. Production quotas for cotton and other commodities were met or exceeded year in and year out. The Aral Sea basin became the country's leading supplier of fresh produce. Incomes in the five republics of Central Asia that share the basin – Kazakhstan and Uzbekistan along the shores of the Aral Sea, and Kyrgyzstan, Tajikistan, and Turkmenistan to the south in the watersheds of the Amudarya and Syrdarya rivers – climbed steadily. From 1940 to 1980, Soviet cotton output rose from 2.24 to 9.1 million tonnes. Most of this cotton came from Uzbekistan, Turkmenistan, and Tajikistan, which together accounted for nearly 90 per cent of the entire Soviet crop [Critchlow 1991].

The trouble began because the contraction of the Aral Sea and some other consequences brought by irrigation had been treated as trifling matters by the authorities until the 1970s. It is not the project as such but the ill-conceived and badly managed farming methods that have devastated the economy, health and ecology of the Aral Sea basin affecting millions of people. Numerous canals were dug and the building of dams across the river was also done in haste. By 1978, a vast network of irrigation channels stretched into the deserts to quench cotton's thirst across 7.7 million hectares, mainly in Uzbekistan. The main and seondary canals were dug in the sand and no pipes set in place or cementing was resorted to. Draining the fields was not given any importance either. In the season, floodgates were closed, and the water was led directly into the fields, a system that caused a tremendous loss of water. Less than 10 per cent of the water taken in was directly beneficial to the crop. The rest disappeared down the sandy soil or evaporated. It was these large inefficient and ineffective programmes that were adopted to meet the huge demand for water that ultimately resulted in the drying up of the Aral Sea. The resultant drop in the level of the Aral Sea was supposed to be made good by ambitious projects for diverting the waters of rivers in northern Russia. Those projects never got off the ground, and the Sea continued to dry out, year after year. The result was catastrophic and the irrigation that made the desert bloom and incomes rise set in motion a disastrous chain of events first detected in falling water levels and declining fish catches.

Unfortunately, therefore, just 20 years the fourth largest inland sea on earth turned into a dry, contaminated, toxic salt plain. The ecological crisis in the Aral Sea area now covers the once very fertile autonomous republic of Karakalpakstan in Uzbekistan, Tashauz Velayat in Northern Turkmenistan and Kzyl Orda Oblast in western Kazakhstan. This entire region fell prey to one of the worst environmental disasters. Before 1960, 55 billion cubic metres of water flowed into the Aral Sea,

maintaining it at a healthy level. During the 1980s, the average flow into the sea was only 7 billion cubic metres. Recently, only 1 to 5 billion cubic metres have reached the sea annually. Seventy-five per cent of the lake's volume has been lost since 1960, and there are strong fears that it may dry up completely by 2015. In the past, the Aral Sea fluctuated in response to world-wide climate, typically rising when glaciers melted and falling when glaciers formed. Under natural conditions the Aral Sea would be rising now – the nearby Caspian Sea has risen two metres since 1977 due to increased rainfall and decreased evaporation.

Environmental Degradation

It has been publicly acknowledged that the environmental degradation in the Aral Sea basin is the outcome of the Soviet tribute to King Cotton. The luxury use of the water resources of the rivers has led to a severe loss of the equilibrium between the natural water sources in ecosystems and the water use in agricultural irrigation. Water diversions from the two main regional rivers robbed the sea and deltas of annual freshwater replenishment. The river water is saline below 0.7 per mille, while the water in the Aral Sea was brackish with salinity at approximately 9 per mille. The salt in the Aral Sea was caused partly by the vast evaporation, and partly by the fact that the ground water in and around the Aral Sea is salted.[5] The salinity was controlled because of the vast supply of fresh water from the two rivers Syrdarya and Amudarya. The summer heat caused (and stills causes) a vast evaporation and the evaporation was the reason for the good climate around Aral before the drying out of the sea. As the water was diverted from the rivers, which feed the Aral Sea, salinisation became widespread.

Environmental problems created by the drying up of the Aral Sea besides salinisation of the soil, include increased salinity of sea water, wind erosion, salt-laden dust storms, destroyed fish spawning grounds, the collapse of the fishing industry, waterlogging, disruption of navigation, the division of the sea into separate parts, the loss of wildlife in the littoral areas, the large reduction of streamflow from the two main tributaries, the need for extra-basin water resources to stabilise the sea level, a change in the regional climate, the disappearance of pasturelands, and so forth. All these grave environmental problems are affecting the region's economy; a situation compounded by high population growth rates. By the beginning of the 20th century, 8 millions of people lived there. Since then the population of the region has increased to 50 million people and the irrigated land has grown to 7.7 million hectares. Discussed below are some of the major issues.

(a) D*esertification*: As described above, the huge irrigation projects in central Asia during Soviet times are blamed for the catastrophic desiccation of the Aral Sea. As the Aral Sea level dropped from 53 metres above sea level to 36 metres, its surface area shrunk by half and its volume by three-quarters. Salt concentration doubled. As a result, in addition to the drop in water levels, the large amount of irrigated lands in time began to reduce productivity because of salinisation. This phenomenon is called the Aral Sea desertification. Most parts of the dry sea floor are covered with deposits of billions of tonnes of toxic salts, brought there over the decades with the water seeping from the fields into the rivers. The area of the dry sea floor, locally known as the Aralkum desert, is now about 40,300 square kilometres. During the Soviet regime, large areas in this region were used as military and space centers and so the problem is aggravated as the salt is polluted with chemicals. The wind blowing from the sea, catch the salt polluted with chemicals from the exposed seabed and carry it to crop fields at an estimated rate of 75 million tonnes a year moving in belts as broad as 40 km, damaging soil thousands of km away [Sinnot 1992]. Such salts can destroy the cotton crops at the very beginning of their vegetation period. To move the salt away from the soil it is necessary to continually water the land for a long period of time. This requires even more fresh water to be supplied which means more diversions of the river waters and so this formed some sort of vicious circle. And thus desert and sandy areas are being extended by the impact of wind, and therefore further desertification is taking place. The Uzbek Academy of Sciences says that new desert to the south and east of the Aral Sea has already expanded to 5 million hectares. This is often ironically referred to as a 'white desert' because the toxic salt pans encrust its surface after merging with the Karakum (black desert) and Kyzylkum (red desert), that surround the Aral Sea. The vast wasteland of glaring white sand that blows into agricultural fields contaminates the earth and forces farmers to compensate for declining output by putting more pesticides and fertilisers into the soil – poisoning it even more.

Soil exhaustion and salinisation were exacerbated by the massive use of fertilisers and pesticides [Kekacewicz 2000]. The discharge of salt besides decreasing the agriculturally useable area is destroying pastures and creating a consequent shortage of forage for domestic animals. The pasture productivity has decreased by a half, and meadow vegetation destruction has decreased meadow productivity 10 times.

(b) *Destruction of fish populations in the Aral Sea:* Before 1960 fishing was a thriving business. A once-thriving fishing industry had become adversely affected by increasing amounts of pollutants entering the Aral Sea by way of the rivers, in addition to the fact that in the last 30 years, more than 60 per cent of the lake has disappeared. Consequently, concentrations of salts and minerals began to rise in the shrinking body of water. The salinity of Aral Sea water increased to such an extent that several areas had the same salinity as the open ocean. This change in chemistry led to staggering alterations in the lake's ecology, causing precipitous drops in the Aral Sea's fish population. The mineral content of the water has increased fourfold to 40 g/litre, preventing the survival of most of the sea's fish and wild life. Fish have all but disappeared from what remains of the lake, leaving thousands of people without a livelihood. As the Aral began to shrink rapidly fishing boats and their communities were left high and dry, sometimes tens of kilometres from the old shoreline.[6] All commercial fishing ended in 1982, current fish hauls are negligible, and entire fishing communities are now unemployed. The loss of fish productivity sparked a collapse of the industry and employment in this sector. In 1960, 43,430 metric tonnes of fish were caught in the Sea, dropping to 17,400 tonnes in 1970, to zero tonnes in 1980, and remaining there until now [Letolle and Mainguet 1993].

Two important ports, Aralsk and Moynaq flourished as fishing centres. The port of Aralsk, situated in the northern part of the Small Aral in Kazakhstan was a well functioning town with a shipbuilding yard, fishing industry and ferry service. In the shipyard, ships of 50-500 tonnes were built for cargo and fishery on the Aral Sea. The Aralsk railway station, situated on the track from Moscow to Tashkent and Almaty, was the most important railway connection in central Asia. Cargo from the railway used to be trans-shipped to cargo boats and shipped off southwards to the port of Moynaq in Karakalpakstan, Uzbekistan.[7] In 1975, fishing stopped in

the Small Aral, and Aralsk was a port without a port. The ferry service stopped, the ground water salinity increased, hunting went down, and the climate started undergoing changes, among other reasons because the big forests of reed and rush disappeared, when the water drew back. In order to maintain the employment in fishing industry, frozen fish was introduced from other parts of the USSR, such as the Baltic Sea, the White Sea, and the Pacific Ocean. This supply stopped with the disintegration of the FSU.

Moynaq situated on the southern shores of the Aral, besides being a center for fishing industry, was once a very popular spa town. It is impossible to imagine a time when this town was a thriving vacation resort. Soviet tourists once flocked to Moynaq to swim in the Aral Sea's waters, famed for healing skin diseases, and to sunbathe on pristine beaches. Children from far away cities came here for summer camps to breathe the sea air and eat fresh fish. Today Moynaq overlooks a glistening salty plain, now a graveyard of rusting hulks of stranded fishing vessels. The sea is miles away from the promenade and impossible to see with the naked eye.

It is not as though this situation was a bolt from the blue. From the 1970s this subject was widely discussed in government circles. At a 1977 Soviet conference on the environmental impact of a drop in the level of the Aral Sea, a paper prepared by two Uzbek republic scientists reported a sharp reduction in fish landings [Gorodetskaya and Kes 1978]. Others also at that time suggested that a demise of the commercial fishery would likely occur because of the desiccation of the sea's fish spawning grounds [Barovsky 1980]. The same forum also suggested that the depletion of the Aral Sea fisheries would be one of the first consequences of declining sea levels. There was a report in a journal by A U Reteyum wherein he pointed out, "in 1965, the Council of Ministers of the USSR passed a special resolution, 'On Measures to Preserve the Fishery -Importance of the Aral Sea.' " This is an example to support the belief, that signs of deterioration in the Aral basin were visible as early as the mid-1960s [Reteyum 1991]. By the late 1970s, it was quite clear that the Aral Sea fisheries were in an irreversible decline and probably if proper precautions were taken in time the present situation could have been avoided.

(c) *Climatic Changes:* During the last 5-10 years the drying off of the Aral Sea, brought about noticeable changes in climate conditions. The sea's warming effect in winter and its cooling effect in summer decreased dramatically. The Aral Sea is a desert lake situated in a strong continental climate, with a variation of temperature from 40 degrees centigrade plus in the summer time to 30 degrees below zero in the winter. In the past the Aral Sea was considered a regulator mitigating cold winds that soared out of Siberia in winter while keeping summertime temperatures from growing too hot. High evaporation (up to 1700 mm per year) is marked. The evaporation too was the reason for the good climate around Aral before the drying out of the sea, and in spite of a high level of evaporation the water balance was maintained because of the vast supply of water from the two rivers. Climate changes have led to a dryer and shorter summer in the region, and longer and colder winters. Air temperature during winters has fallen, and summer temperatures have increased by 2-3 degrees C, including observations of 49 degrees C. This change to a more continental climate, with shorter, hotter summers and longer, colder winters deliver little precipitation for the next harvest. On the shores of the Aral Sea precipitation was reduced several times. Average precipitation magnitude is 150-200 mm with considerable seasonal non-uniformity. The growing season has also declined to 170 days, missing the 200 frost-free days needed to harvest cotton. As explained earlier frequent occurrence of long dust storms and ground winds is characteristic feature of 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 20-25 m/s.

(d) *Health Conditions*: The region's health crisis is believed to be directly linked to the disappearance of the Aral Sea. Making matters even worse, people also have little access to drinking water. Chemical runoff from the farm fields has polluted the Aral Sea even more, making it unsafe for consumption by both humans and livestock. Cotton is a demanding master. Not only is it thirstier than most other commercial crops, it requires heavy applications of pesticides to keep boll weevils and other pests at bay. In the Soviet mind, the theory often seems to be "if a little is good, a lot is better", – a lot of water, a lot of pesticides. In addition, the cotton crop is routinely sprayed with a defoliant each fall to get rid of the leaves to make harvesting easier. Since the basin is a closed system that has no drainage to the outside, the insecticides and herbicides sprayed on the fields percolate downward, accumulating in the underground water supply at dangerous levels. As most tap water comes from wells, the people drink a cocktail of diluted chemicals, some of which are known carcinogens. High levels of pesticide contamination are alleged to affect the human body's ability to absorb iron, causing anemia. The drinking water contains upward of six grams of salt per liter, a level four times higher than the World Health Organisation standard. This has been related to the prevalence of kidney disease. Dust storms rage for up to 60 days a year, spreading toxic residue and salt left behind by the sea. These particles are thought to be a possible cause of respiratory diseases and cancers. (When the sea eventually dries up, an estimated 15 billion tonnes of salt will be released into the atmosphere.) According to Timothy Cummings, an American Red Cross delegate working in the Aral Sea region the combination of toxins from the air and drinking water has added to the poor health of residents – already susceptible to disease because of malnutrition.[8]

The USSR Environmental Report, a government publication, pointed out that the total pesticide load in Turkmenistan was 20 to 25 times the national average. "In high pesticide use areas the total infant morbidity (disease rate) through age six is 4.6 times higher than in low pesticide regions" [Jones 1999]. According to the Soviet Academy of Sciences, child mortality rates in the central Asian region increased between 1970 and 1985. In the Bozataus region of Karakalpakstan, an area simultaneously plagued with a lack of sewage treatment facilities, inadequate maternal and child health care, and rising levels of pesticides and herbicides in drinking water, 110 of every 1,000 infants die before their first birthday. This compares with 109 in Africa, 95 in India, and 37 in China. For example, in Karakalpakstan, the esophageal cancer rate is seven times higher than in the rest of the country. One Soviet researcher, E Paronina, studied health conditions in Karakalpakstan and reported her dismal findings. Summing up, she says, "All of this (health crisis) is the inordinate price paid with the health of the population for self-sufficiency in cotton" [Jones 1991]. Not surprisingly, the local medical literature is filled with stories of birth deformities, increased liver and kidney disease, chronic gastritis, rising infant mortality, and soaring cancer rates.

People have also had to adapt to a drastic change in climate. As already observed over the last four decades, summers have

become hotter and shorter, and winters cooler. "A climate change doesn't necessarily affect the spread of disease, but it makes life a lot more difficult," said Darin Portnoy, a Western TB specialist working for a World Bank Project in Moynaq. "People are staying inside for longer periods of time. They're in enclosed conditions where they spread disease to others."[9]

Just as it seemed to appear as if matters could not get more depressing there was another nerve-racking revelation. It was brought to light that barrels of the anthrax bacteria had been buried on Vozrozhdeniye Island, situated in the Aral Sea, when Uzbekistan was part of the USSR. During Mikhail Gorbachev's rule, Washington's intelligence team revealed that the Soviet Union, contrary to its treaty pledges, was producing chemical weapons. In 1988, the US demanded the inspection of Soviet chemical facilities. It is believed, scientists in the Siberian city of Sverdlovsk were ordered to transfer hundreds of tonnes of anthrax into giant stainless-steel canisters and pour bleach into them to kill the bacteria. The deadly cargo was then transported to the Aral Sea island which had been the Soviet Union's open-air testing site for biological weapons. However, the bleach failed to destroy the anthrax bacteria completely. Tests on soil samples show that some of the spores are still alive. The fear is that the buried anthrax bacteria could be transported to Uzbek and Kazakh territory by lizards and birds. Anthrax, characterised by lesions in the lungs and external ulcers, is transmitted from animals to humans though contact. Both Uzbekistan and Kazakhstan have asked the US for help in assessing the site's danger, since Russia has not delivered on Boris Yeltsin's 1992 pledge to close and decontaminate the site [Jones 1999].

Regional Water Strategy

As early as the 1982, the government sought to develop a water resources master plan for the Syrdarya and Amudarya river basins and placed strict limits on water withdrawal. Soon after, two organisations were created to operate and maintain the main hydraulic infrastructures and to monitor water use. There were many proposals to transfer of water to the Aral from the Caspian Sea.[10] One long-standing scheme was to divert the waters of such Siberian rivers as the Ob, Irtysh, and Yenisey and to channel them southward to the Aral Sea region and to the desert. This plan has been canceled after years of controversy about its cost and environmental consequences, but some local scientists are still hanging on to the idea. Another suggestion was to break up the glaciers of the Pamir and Tien Shan mountains with nuclear explosions. These ideas are not realistic, especially at a time of economic crisis. However, such ideas still survive.

With the end of the Soviet period, the five independent Central Asian Republics (CAR) established a joint commission for water coordination to regulate water distribution in the basin and consolidate country positions for the adoption of a regional water strategy. In 1992, the World Bank was asked to coordinate international aid in response to the crisis in the Aral Sea basin. In September 1992, a World Bank team visited the region and prepared a report on its findings. An international conference sponsored by the World Bank, the United Nations Environment Programme (UNEP), and the United Nations Development Programme (UNDP) was held in Washington in April 1993 to discuss the Bank's proposal. Representatives of the five republics, as well as other international organisations and donor agencies attended this. Based on the World Bank's recommendations, a joint Bank-UNEP-UNDP team visited the region in May 1993 and prepared a programme for donor financing in collaboration with the CAR. This programme consisted of 19 projects for the first stage of a three-phase programme to save the Aral Sea [Kirmani and Moigne 1997]. The CAR in turn established three regional organisations – the Interstate Council, the International Fund for Aral Sea, and the Executive Committee – to implement the programme.[11] Greater use of agricultural drainage water and waste water, as well as the introduction of more salt-tolerant crops, is envisaged and, in part, implemented. About 6 cubic km/year of agricultural drainage waters or waste water are directly reused for irrigation, while some 37 cubic km/year return to natural depressions or rivers where they are mixed with fresh water and can be reused for irrigation or other purposes. The best they hope for is some sort of stabilisation of the sea and the survival of the river's two deltas. Saving the deltas could lead to new commercial fishing activity.

Government leaders have said that the amount of land for cotton will be reduced and large amounts of water will be pumped back into the Aral Sea until the year 2005 [Bechm 1995]. Agricultural officials, however, say that it is impossible to demolish the canal system. Too many farmers depend on the income from cotton. The government has also indicated that the welfare of the cotton farmers must come first. Exported cotton is a major source of income. The CAR are unwilling to uproot the cotton monoculture and risk the loss of its economic rewards. And so most scientists believe that the Aral Sea cannot ever be as it was before.

The future of the Aral Sea is therefore quite uncertain. Only thing that is certain is that the Aral Sea is now an environmental catastrophe, as the water level is declining and the ecosystem is being degraded, causing a deteriorating environment and declining living conditions and health of the people living around its shores. It is impossible now to forecast the future for the Aral with any certainty but if no major solutions are found, the sea level will continue to decline. Whatever the future holds this has certainly opened the eyes of governments around the globe. It is a stern warning to the international community and illustrates how fast – in less than 20 years – environmental and humanitarian tragedy can threaten a whole region and its population. The destruction of the Aral Sea is a textbook example of unsustainable development. EPW

Notes

1 Signs of change were appearing everywhere throughout the first 20 years of the Aral Sea problem (1960-1980): Many of the adverse environmental changes were mentioned in Soviet scientific literature at some point in the 1960s and 1970s.

2 A small portion of the Aral Sea Basin's headwaters is located in China and Iran. Afganistan directly shares the Amudarya river, which forming a border between it and Uzbekistan, partially Tajikistan and Turkmenistan

3 'The Aral Sea – Uzbekistan and Kazakhstan', *Featured Lakes of the Month – Living Lakes*, July-August 1998, http://www.livinglakes.org/month/archive/2-aralsea.htm

4 In all, more than 10 million people were moved to central Asia, many of them by force, for political reasons, and most of them to Kazakhstan that till now counts around eight million non-Kazakhs.

5 The salted ground water might be explained by an apparent total dry out of the sea that extended to the interior, hundreds of years ago.

6 'Contaminated Water Devastates Health across the Aral Sea Region', *News and Highlights*, FAO of the United Nations, January 27, 1997 http://www.fao.org/NEWS/1997/970104-e.htm

7 This region was part of the Kazakh area before the USSR and which Kazakhs therefore mainly inhabit.

8 Aral Sea Ecological Disaster Causes Humanitarian Crisis, *In the News*, Written by Stephanie Kriner, Staff Writer, RedCross.org

http://www.redcross.org/news/in/asia/020410aral.html

9 Travel Medicine, *News Share*, 3rd Quarter 1998. Reproduced from *Medecins San Frontieres*, UK issue: no13, spring 1998. http://www.istm.org/news_share/199803/arals.html

10 It has been estimated that at least 73 cubic km of water would have to be discharged to the Aral Sea each year for a period of at least 20 years in order to restore the 1960 level of 53 m above sea level. The governments of the riparian countries consider this an 'unrealistic objective'.

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