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The Death of a Sea

BY CAROL CREWDSON,
JOE ZIEMANN,
AND LEE BLANEY

“The Aral Sea must die like a soldier in battle.”

POLAD-POLAD ZA

Introduction

The Aral Sea, located in the Central Asian portion of the former USSR, was once the fourth largest inland body of water in the world. Today the sea is bordered by Kazakhstan and Uzbekistan and has sources in six separate republics within the USSR. The sea originally had a surface area of 65,000 square kilometers, the combined size of the Netherlands and Belgium.

Beginning in the 1940s, development policies implemented by the central government of the USSR caused the systematic decline of Aral Sea levels. Flow to the Aral Sea was reduced fifty times through extensive damming for cotton irrigation. In the name of industrial progress, warning signs of ecological decline went unheeded. Within a generation, the sea shrunk by seventy percent and continues to shrink; it has become one of the largest environmental catastrophes in the world. In this paper we seek to explore the political causes, ecological effects, and remediation efforts in progress today.



Political and Theoretical Causes of Environmental Neglect

ROOT PROBLEMS

The Soviet Union had one of the worst environmental records of any industrialized country in the 20th century and the lingering, long lasting effects have left a devastating legacy. The Soviet Union once comprised one-sixth of the world's landmass. Before the

Soviet dissolution in the mid-1980s, three percent of Soviet land was considered to be in “catastrophic condition and irreparable” (Peterson, 1993). Another sixteen percent of former Soviet land is considered environmentally damaged (Peterson, 1993). The Soviet government, therefore, managed to significantly pollute almost three percent of the world. The massive levels of environmental destruction caused by the Soviet Union are a direct result of the communist political structure.

Basic Marxian philosophy is the root of the cause. Karl Marx was a product of the Industrial Revolution and failed to comprehend the dependence of humans on the natural environment. “He perceived air, water, soil, and other natural resources as sufficient to support any population under advanced forms of production if the organization of society ensured a rational valuation of these goods” (Ziegler, 1987). Marx championed technology to harness and master nature, while considering social stratification and population pressures as the causes of poverty.

THEORETICAL CAUSES

The Soviet political and economic perspective on the environment initiated the demise of the Aral Sea. Central planners fond of massive projects were supported by a no-objection submission policy. “We were in a process of preparation for war, therefore we could do everything to win and then correct mistakes later on” (Kamalov 2003). The Water Affairs Ministry was part of the GULAG (the infamous concentration camp ministry) until the late 1950s. Accordingly, the ministers saw themselves as conquerors of the environment, and adopted a warlike policy in order to “win”; however, some of their mistakes have not been so easily corrected.

The sense of urgency and purpose instilled in the central planners led to the conscious decision to sacrifice the Aral Sea for cotton production. Cotton was money and so dams and canals were built in order to divert water from the Aral Sea towards agricultural fields; the haste involved in these projects resulted in the design of a highly inefficient water distribution system. Massive unlined canals flowed through the desert sand, flood irrigation was utilized, and polluted drainage water was emptied downstream of the dams on the rivers.

COTTON INDUSTRY— UNDERSTANDING COTTON AS A NATIONAL IDENTITY

Central Asia, with its hot climate and limited precipitation, has a long history of agriculture dependent on irrigation. The Soviets discovered an extensive network of canals in the oases of the Fergana valley when they arrived. Ancient traditions were based upon thrifty water use and crop rotations to maintain the richness of the soil. Ancient peoples grew wheat, barley, millet and alfalfa as well as a variety of fruits and nuts. Under Soviet rule, cotton was introduced to Central Asia, creating an urgent need for irrigation waters. In 1917, the Soviet scientist Voeykov suggested to fully use the Amudarya and Syrdarya rivers for irrigation because the sea was a “useless evaporator” (Kamalov 2003).

Under Communist rule in the middle of the twentieth century, the Aral Sea basin

development initiative was realized. The State Planning Committee allowed particular industries to be located closest to the best area of natural resource provision. In the 1940s and 1950s, the central government decided to pursue a policy of cotton independence. The Planning Committee saw that the arid environment around the Aral Sea was perfect for cotton production due to the long, warm growing season. Cotton was considered ideal for the region, as unemployment rates were high, making worker availability plentiful.

As the cotton industry grew, its importance permeated many aspects of daily life and culture. “White Gold” gained political domination, and was carefully carved into a national identity. Central Asia was transformed into the Soviet Union’s main producer of cotton.

THE PROBLEM WORSENS

A massive system of incentives developed, setting increasingly higher targets for cotton production. Soviet planners halted traditional crop rotations in order to attain these targets. Cotton became a monoculture crop dependent on the heavy use of pesticides and fertilizers to maintain sustained harvest (Weinthal). As cotton quotas increased, more land was brought into cultivation, and the amount of irrigated land increased, until irrigation became the dominant use of water in Central Asia. Today, the Central Asian republics (with the exception of Kazakhstan) depend almost entirely on irrigation for agriculture. By the 1980s, the Aral basin was producing ninety-five percent of the nation’s cotton, while diverting ninety-five percent of the annual flow to the Aral Sea.

The newly irrigated lands became less suitable for growing cotton as exploitative fertilizer use exhausted soils and decreased flow to the sea salinized groundwaters. Even though the amount of water available for irrigation increased, the yields and quality of cotton declined.

SEALING THE FATE OF THE ARAL SEA

The Water Ministry made the deliberate decision to sacrifice the Aral Sea for the sake of cotton production. Polad-Polad Zade, the First Deputy of the ministry, said, “the Aral Sea will die a glorious death” (National Geographic 1990). “Experts believed this a worthwhile tradeoff: a cubic meter of river water used for irrigation, they calculated, would be more economically beneficial than the same volume diverted to the Aral Sea” (Pryde, 1991). “Crops on this land could yield a profit of 750 million rubles, while disappearance of the sea would merely result in loss of sixty million rubles in fish and ten million rubles in muskrat skins” (Goldman, 1972).

However, Soviet economists failed to include the losses incurred by accumulating environmental damage in their calculations. Environmental degradation is considered a negative externality because the degradation arises indirectly from the industrial process. In an advancing market economy, industries can be held responsible for damages caused by externalities to private property and public health through lawsuits.

In a Communist society, the community as a whole absorbs damage, since everyone “owns” the environment; therefore, there is less incentive to mitigate damage because pollution is more profitable. Profits of industry are theoretically shared by all, while environmental pollution affects only a select few.

INEFFICIENT WATER USE

The Soviets developed an extensive and inefficient system of dams and canals. Due to the absence of proper lining, the lengthy Karakum Canal lost almost fifty percent of its water volume. However, this loss is not extraordinary as approximately forty-six percent of the diverted water in the Aral basin irrigation distribution system is lost en route.

In 1970, a resolution was passed that made water use free to almost every source. Since free water provided no incentive for consumers to conserve water, rights were exploited. Similarly, with no economic losses being imposed on the end users or distributors, no move was initiated to increase the system’s efficiency.

STRUCTURAL BARRIERS TO RECOGNIZING THE PROBLEM

The structure of Soviet environmental authority proved a contributor to the Aral Sea problem as communication between agencies often proved difficult. Shortly after development began in the 1960s, negative environmental effects were observed, prompting some scientists to predict disaster. The bureaucracy was too fragmented to make coherent policy and enforcement decisions and Soviet environmental committees did not have the powers needed to stop industrial projects which they saw as environmentally dangerous. The disaster was not averted.

The group in charge of environmental enforcement, the State Committee for Hydrometeorology and Environmental Control (GIDROMET) is a union body, which does not have override power in policy creation and final decisions. Union government bodies function at the level of the separate republics of the USSR, which are similar to state governments in the U.S. However, in the Communist system, union governments do not have the same level of autonomy as states do, essentially “taking orders” from the central government. Additionally, GIDROMET does not have full control over all environmental areas. Instead the system is fractured into specific ministries (fishing, agriculture, etc.), which struggle to act unilaterally and create policies at the national level for GIDROMET to enforce at the union level. “Thus, the union republics function more as administrative agencies than as true federal units holding substantive legislative power” (Ziegler, 1987). The main enforcement agency (GIDROMET) was not closely tied to the policy-making bodies in the central government. In the U.S., the state level Department of Environmental Protection is centralized and has the power to make overriding decisions to halt environmental damages. The Soviet structure lacks a system of checks and balances that give voice and power to varying interests. The Politburo and Central Committee were supremely interested in the advancement of Soviet power, and in the end had the final say in any environmental

Figure 2: Social and Environmental Paradigms (Ziegler 1987)

DOMINANT SOCIAL PARADIGM	ENVIRONMENTAL SOCIAL PARADIGM
1. Maximize economic growth	1. Continue economic growth
2. Preserve centralized planning, rapid completion of plans	2. Improve central planning to eliminate waste, plan for unforeseen effects of economic activity, go-slow approach
3. Retain hierarchical structure of ministries and departments, but reduce departmentalism	3. Create centralized environmental protectional agency to reduce negative impacts of departmentalism
4. Promote science and technology for economic growth	4. Promote science and technology with greater attention to solving environmental problems
5. Strengthen Party control and guidance over economy and society; maintain existing distribution of political power	5. Accept Party guidance, but urge greater Party attention to environmental problems
6. Greater reliance on specialists and experts, with Party having final decision	6. Final decisions on environmental questions to be made by experts and specialists, eliminate political considerations

matter (Figure 2). “Soviet republics often find themselves at a disadvantage in dealing with polluting industries. Many of the largest industries – defence, chemical and petroleum, steel, coal mining, metallurgy – are administered directly from Moscow. These high-level ministries can often evade the authority of a republic’s Communist Party Committee” (Ziegler 1987).

The tight control the Central Committee and Politburo had over political power insured that social paradigms always had victory over environmental paradigms. This chain of command led to the extreme ecological effects of the Aral Sea disaster.

Ecological Consequences

The ecological and associated human health concerns of the Aral Sea in relation to the Soviet decision to dam the Amudarya and Syrdarya rivers are many. The Syrdarya historically supplied approximately thirty percent of the sea’s water; however, by the late 1970s, no water from the Syrdarya reached the sea (Glantz, 1999). Waters from the larger river, the Amudarya, were largely diverted from drainage into the sea towards supplying water into the Karakum Canal; in the late 1980s there were a number of years with no Amudarya water reaching the sea.

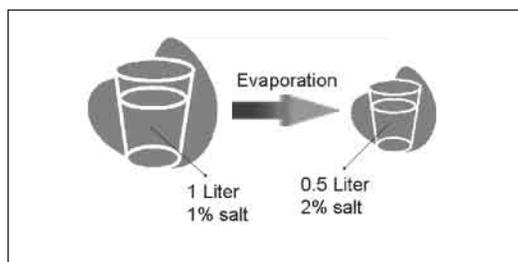
Decreasing water levels had detrimental effects on the lake, the local population, and the surrounding area. This three-fold effect is self evident, as any effect on the lake will directly affect the economy and health of the population centers bordering the water. As the lake dries up, its chemistry is altered; therefore, groundwater recharge from the lake will result in changes to the adjacent land.

THE LAKE

As less water was entering the lakes, the effects of evaporation (remember this area is part of a desert biome) were heavily amplified. From the original damming in the 1940s to the present, the water level decreased approximately 20.9 meters, with the water volume dropping from 1089 km³ to 108 km³ (Nihoul, 2004).

The laws of physics dictate that if a certain volume of water has a corresponding salinity, evaporation of a certain percent of that water will increase salinity (Figure 4). Therefore, the massive water loss described above spurred a rapid salination of the sea,

Figure 4: Conservation of Mass



Increasing salinity has had a detrimental effect on fish populations in the sea due to the inability of the original freshwater fish species to tolerate high salt contents. The effect on fish was first observed in 1971 when salinity reached 1.2 percent. Karpevich observed in a 1975 report that the [1971] growth rates of many fish slowed down, causing increased death rates; numerous morphological aberrations were also documented (Glantz, 1999). When salinity reached 1.4 percent in the mid-1970s, reproductive processes of all existing fish species were disturbed. By the mid-1980s, all commercially profitable fish species were eradicated (Glantz, 1999).

THE PEOPLE

The disintegration of the Aral Sea has greatly affected the surrounding population. These people lived in the region for hundreds, if not thousands of years, and adapted to the prescribed environment. They grew dependent on the sea for survival. Upon the collapse of the fishing industry, the region was catapulted into economic desperation and failing health, a ruthless combination. This amalgamation created a

domino effect whereby the deterioration of life conditions directly resulted in poor waste treatment practices (Glantz, 1999). With more wastes being released into the diminishing lake waters, disease rates swelled. Studies from 1988-1989 have shown that nearly two-thirds of the population suffer from various pathologies and that that rate is on the rise (Glantz, 1999).

The rates with which disease rose are quite astounding. Water borne pathogens such as enterobiasis (pinworms) and hymenolepidosis had morbidity rates which rose 370 percent and twenty-nine percent respectively in certain regions. Hepatitis B rates have increased by approximately 800 percent. Inflated disease incidence and morbidity rates have been observed for many diseases (Glantz, Nihoul, and Bos). Clearly, the decreasing water quality and absence of proper nutritional supplements caused the rapid degradation of human health.

The sea was originally dammed in order to grow cash crops (cotton) enhanced by chemical pesticides and fertilizers. Runoff from farmland introduced these chemicals into the watershed and eventually to the lake itself. Upon entering the highly concentrated salt lakes, these chemicals were precipitated out of solution and deposited on the lakebed. Therefore, as the dry lakebed was being exposed, a mechanism for the transport and dispersal of salt, pesticide, and other waste (toxic chemicals, synthetic surfactants, phenols, oil products, etc.) particles was evolved.

Open to the elements, these particles found their way into toxic dust and salt storms that have bombarded the surrounding communities. Throughout the 1980s, these dust storms have increased in size and occurrence, with salt removal from the dried sea-bed estimated at forty to 150 million tons per hectare (Glantz, 1999). A seventy-five percent decrease in surface area translates to about five million hectares, making the spread of sickness and disease inevitable.

The health hazards can be characterized by the subsequent diseases, which often occur. Diseases such as the measles and polio have seen increased incidence rates of seventy-nine percent and 450 percent respectively. While the transport of airborne pathogens is severe, the effects of dust and salt on respiratory systems are critical. Between 1981 and 1987, deaths associated with acute infection of a respiratory organ increased almost three fold. During the same time period, cancers of the liver, esophagus, and digestive system intensified (Glantz, 1999).

THE LAND

The natural ecology of the Aral Sea has been devastated; the health of humans has been significantly threatened and endangered. Furthermore, the surrounding land has been changed to such a degree so as to disable its use for future generations. This ruin has taken place through four main processes: desertification of the immediate area, climate change associated with the retreat of the sea, the salting of the ground and mineralization of groundwater.

Groundwater levels have dropped roughly twenty meters with the sea level, leaving little water in the upper reaches of soil. This progression has led to increased erosion of

the natural soils. Dispersal of eroded soils and the exposed sediment in the dry seabed has resulted in the desertification of the Aral Sea region. This process makes the way and conditions of life very difficult to sustain.

A large lake such as the Aral Sea greatly affects the climate of the surrounding land. During the summer months, the waters allow for cooler temperatures; the lake gives off heat and exudes warmer temperatures during winter months. As the lake has withdrawn, temperatures have fled towards the extremes. Winters are now much colder, and summers much hotter. These relatively extreme temperatures have assisted in the desertification process and affect farming and harvesting practices.

The assertion of the conservation of mass was made earlier to demonstrate that as water levels drop, salinity increases. Because the sea was the chief source of groundwater recharge, the groundwater has become highly mineralized. Mineralization of groundwater diminishes drinking water supplies and causes the salting of land as waters levels fall. Salting land is an old Roman technique of making sure that a defeated city would never return. The salt destroys any ability for crops or vegetation to grow. Waters diverted from the Amudarya River were diverted into the Karakum Canal; this canal runs for over 1300 km, with approximately 1150 km of unlined bed (Bos, 1996). The unlined bed allows for the deposition of salts into agriculture soils, which ruins crops and renders soil fruitless. Salt flats have also formed upon old wetlands areas due to the decreasing water levels. Through the mineralization of groundwater and irresponsible and inefficient use of unlined canals, the people of the Aral Sea basin are salting their own land.

The effects of this tragedy went beyond ecological consequences. The everyday lives of the indigenous people and the future of their children was jeopardized.

Socio-political Effects

The USSR underwent massive political restructuring under Michael Gorbachev in the early 1980s. Gorbachev's famous policies of *glasnost* (openness) and *perestroika* (restructuring) were steps towards less restricting and oppressive government activities. These two policies had major implications in Central Asia.

Under *glasnost*, the Aral Sea problem could be discussed openly for the first time. As the world population became aware of the dramatic rise in health and environmental problems caused by Soviet Policies, political grass roots movements began to form.

Under *perestroika*, the "cotton scandal" was unearthed. To meet the ever-increasing cotton demands from Moscow, an extensive network of bribes and kickbacks developed to falsify production data. This revelation surfaced in the mid 1980s. Nine million tons of cotton reportedly delivered turned out to be a fabrication by thousands of power elites. This disclosure produced major upheaval in the upper ranks of government.

Cotton production continued to decline, and Soviet planners began to encourage environmental protection as a means to improve efficiency. The nationalist grass roots movements considered the cotton culture as a manifestation of Soviet control. These movements felt that workers were victimized by policies from Moscow that forced

them to falsify data to keep up with increasing demands, only to be punished for those actions later.

SHIFTING BORDERS

The dissolution of the Soviet Union caused the Aral Sea to shift from a domestic problem to an international one. The watershed is now shared by five multiethnic and religiously diverse countries, all dependent on surface water sources. The current borders were drawn in the 1920s, without consideration for geographic formations. This decision had major ecological consequences. The Amudarya is shared by Tajikistan, Uzbekistan, Turkmenistan, as well as part of the border of Afghanistan. The Syrdarya extends across Kyrgyzstan, Tajikistan, Uzbekistan, and Kazakhstan. The Aral Sea now lies between Kazakhstan and Uzbekistan.

When the Soviet satellite states first achieved independence, there was widespread negativity regarding the future of the Aral Sea. Geographer David Smith said in 1995, "nowhere in the world is the potential for conflict over the use of natural resources as strong as in Central Asia" (Weinthal, p. 7). These apprehensions came with good reason, as the newly independent nations saw their subsidies cut off, and an upsurge in ethnic conflict, such as the riots in the Fergana Valley just prior to independence. However, major national conflict did not arise and the states embarked on a path of cooperation, even in their transitional government phase.

THE PROBLEM PERSISTS

The ecological changes in the Aral basin have affected the population in varied and complicated ways. The total population of those who rely on the watershed are thirty-four million and growing rapidly, with conflicting interests between the people upstream, midstream, and downstream.

HEALTH EFFECTS

Hardest hit by the health effects mentioned above are the people downstream, in the areas closest to the Aral Sea, such as the semiautonomous region of Uzbekistan, Karakalpakistan. In Uzbekistan between 1980 and 1987 the number of hospitalized people increased from 21.8 to 26.3 percent, including an increase from 20.2 to 24.9 in Karakalpakistan. Since the mid 1970s, mortality rates have increased fifteen times. (Glazovsky, 2002) There has been an increase in digestive diseases such as gallbladder and gallstone disease, chronic gastritis, nephritis, and esophageal cancer. However, it is difficult to separate out the deaths caused by environmental remediation and those caused by inadequate medical attention.

Children and women are hardest hit by some of the health effects (Table 1) as they were extensively used in raising cotton. During the Soviet era, children were taken out of school to work during the cotton harvest. Due to the use of pesticides, the environmental risks are higher for those who worked in the fields. Children and teens also make up a disproportionate amount of the population. In 1989, the seminar "Problems

Table 1
Infant Mortality (the number of children
who died at age 1 or less per 1,000)

Country	1970	1986
Uzbekistan	31.0	46.2
Kyrgyzstan	45.4	38.2
Tajikistan	45.9	46.7
Turkmenistan	46.1	58.2
Kazakhstan	25.9	29.0
USSR	24.7	25.4

of the Aral Sea and Aral Area," recorded that sixty percent of the children in Nukus, Uzbekistan, and sixty-four percent of the children in Karakalpakistan were suffering from some health problem. Between 1970 and 1986, the number of children's clinics grew 2.6 times in Turkmenistan, 2.9 times in Tajikistan, and 3.5 times in Uzbekistan (Glazovsky 2002).

Near the Aral Sea, especially in the Bozataus section of Karakalpakistan, infant mortality rates exceed eleven percent as compared to approximately 3.5 percent in other areas. Between 1970 and 1985, Kazakhstan and Kyrgyzstan had the highest levels of infant mortality on the whole observed in the USSR (Glazovsky 2002).

Clean water supplies are severely limited; thirteen percent of the water sampled from open reservoirs and thirty-seven percent of food was found contaminated with pesticides to the point of being unfit for human consumption. Sampling of piped water revealed that state bacterial standards were unmet in twenty-five out of forty-seven cases. Ninety percent of the rural population gets their drinking water from the irrigation network (Glazovsky 2002).

THE FISHING INDUSTRY

In the deltas of the Amudarya and Syrdarya, a fishing industry flourished that has been totally annihilated. Historically the fishing industry used to bring in 40,000 to 60,000 fish per year, while employing approximately 500,000 people. A striking and bleak example of this demise is Moynaq, which was once a flourishing city and shipping port. Hundreds of ships came through every day, a large canning industry developed, and the city became a picturesque vacation spot in Central Asia. Moynaq is now eighty miles from the sea. As the waters began to recede, fishermen dug canals further and further each year until they finally abandoned their boats in the sand. In an effort to keep the canning industry alive, Soviet planners flew in fish from hundreds

of miles away for over ten years. The collapse of this industry caused the collapse of the economy in the greater Nukus region.

ECONOMIC LOSSES

An environmental disaster of this magnitude is difficult to measure, but a few researchers have tried to estimate some of the financial costs over the years. In 1973, researchers at the Institute of Water Problems in the USSR Academy of Sciences predicted a decrease in annual gross income of fifteen to thirty million Roubles in the Aral Sea Basin. In 1980, the annual income losses were estimated at 92.6 million Roubles for the lower part of the Amudarya alone. The collapse has had a trickle down effect on the local economy, leading to widespread workforce emigration. The unemployment rate remains the highest in Uzbekistan at about eighteen percent (Pyle 2004). Economic costs of fixing the problem are even steeper with current estimates exceeding thirty-seven billion Roubles. There are other costs that are harder to measure such as the cost of medical services and loss of agricultural productivity. However, while the estimates for economic losses grow, the resources available to mitigate the crisis are steadily decreasing.

INTERNATIONAL CONFLICT

Unfortunately, while those downstream are still being victimized, independence has exacerbated rather than calmed some of the problems. There is still extensive agriculture and cotton production midstream, and the states are slow to modify inefficient water systems or use more water efficient agricultural techniques. Today, flood irrigation is still the most common means of irrigation, with only 1.5 percent of all arable land in the basin irrigated by sprinklers.

Upstream states are beginning to assert ownership rights. One of the first major conflicts is over the Toktogul Reservoir. Kyrgyzstan controlled the Toktogul Reservoir, which was the largest dam on the Naryn River, a tributary of the Syrdarya. The reservoir had been constructed initially by central government planners to meet irrigation needs downstream. Uzbekistan farmers were used to getting free water under the former government, and Kyrgyzstan's energy needs were supplemented by Uzbekistan's oil and gas reserves. When cheap outside energy supplies began to wane, Kyrgyzstan had winter energy shortages and started using the plant to generate electricity. This caused a lack of flow during the spring and summer months, when it was most needed for agriculture in downstream Uzbekistan.

Kyrgyzstan was also in a severe economic crisis. The head of the Energy and Natural Resources division said, "Uzbekistan should pay for the water if they want to maintain an irrigation regime. Kyrgyzstan should sell water or at least exchange water for gas." The upper echelons of the government echoed this. An agreement was reached, with Uzbekistan trading oil for water with Kyrgyzstan, but the situation remains tenuous.

Torn by years of war, Afghanistan has not used its fair share of the water. When

stability settles on the region, an increased demand will be placed on the Amudarya river system. This possibility could increase conflict in downstream states.

INTERNATIONAL EFFORT

Fortunately, these states have not collapsed into chaos. There has been notable diplomatic progress towards solving the problem, and the states have shown a remarkable capacity to work together. The first agreement was signed in February 1992, concerning water management, utilization and protection in the transitional government period and the creation of an agency called the Interstate Commission for Water Coordination. The heads of state met again in Qyzlorda, Kazakhstan in March 1993, to sign an agreement on solving the problems of the Aral Basin. In 1994 they approved an action plan addressing the basic medical needs of the basin and outlined a plan for economic development.

In 1996 the states renewed their commitment to water sharing in the Nukus Declaration, strengthening international institutions for joint water management. This was further improved in March 1998, when the prime ministers signed a water sharing agreement on the Syrdarya River.

Currently, the main international organization overseeing the Aral Sea is the International Fund to Save the Aral Sea (IFAS). Unfortunately, international collaboration has only produced modest changes. The mentality that led to the desiccation of the countries has been slow to change since many people addressing the problems on the new committees are the same people that headed the ministries that caused the problem.

Conclusion

Shortsighted policies developing cotton as a monoculture crop, and wasteful water systems have caused environmental destruction on a massive scale. The Aral Sea has died as an ecosystem, and is continuing to decrease in size. More than forty species of fish have disappeared from the two rivers. The flora and fauna around the Aral Sea have been seriously reduced. The climate in the Aral Sea Region and the mountains has changed. There are hotter and longer summers, colder and longer winters. Forests along the rivers were cut down or perished due to lack of water. Hundreds of lakes near the former seabed have vanished, while hundreds of artificial dams and reservoirs have appeared upstream. Over-irrigation has caused soil salting. Environmental degradation has caused large-scale water shortages and contamination, as well as terrible dust storms. These consequences have had massive economic and health impacts on the people closest to the sea, with a higher health impact on women and children. The problem has left a difficult legacy behind with conflicts upstream and a growing population putting further demands on an already over-burdened system.

Catastrophes like the Aral Sea occur when human impact on the environment is clinically disregarded. Environmental disasters have happened all over the world, including in the United States, but they were made worse in the former USSR, and

in any society where the population affected is stifled and ignored. However, the problem will not be solved by blindly blaming the past. The states involved have left the root causes of the problem largely unaddressed, while wondering what to do with the affected population. Massive political effort has not led to great remediation of the current problem. More drastic improvements and concessions need to be adopted soon to prevent the problem from getting worse. States must give up some water rights in order to lead to the greater good.

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