Afghanistan's Effective Contribution toward Mitigation of Aral Sea Crisis

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Abstract— This article traces the historical development of water resource management in Central Asia, focusing on the causes of the current Aral Sea Basin crisis. It examines the obstacles facing the Central Asian republics in addressing this problem and offers predictions regarding the future state of the region's ecology, economy, and stability, as well as the health of the region's people. Moreover, in this research paper, I explain why Afghanistan was excluded from most of agreements related to Amu Darya River, which is the main source of Aral Sea. In addition, this article will explain how existing plans of action have been largely ineffective and why restoring the Aral Sea to its original condition is an impossible task. Finally, this paper will provide feasible policy recommendations on how to prevent the further mismanagement of the region's water while maintaining viable levels of economic development and population growth.

Index Terms— Aral Sea, ADRB (Amu Darya River Basin), Central Asia Republics (CARs), riparian countries, IFAS (International Fund for the Aral Sea)

1 INTRODUCTION

THE The five Central Asian republics of Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan are facing a nearly unsolvable crisis in the Aral Sea Basin, the site of an environmental and human catastrophe. Considering economic and time constraints, the mitigation of the catastrophe, rather than the reconstruction of the Basin's original ecosystem, is the only possible Approach to the problem. Damage control must be the course of action for the Central Asian community. It is necessary that the republics collaborative work with Afghanistan in a highly integrated and cooperative manner to manage the limited water resources in the region in an equitable and sustainable way. Without such an approach, the region is destined for an unique economic, social, and humanitarian crisis. The value, productivity, and measure of land in Central Asia have always been firmly linked to its access to water. As a result, a high degree of sociopolitical organization developed to maintain, monitor, and secure water resources in these "hydraulic societies" (Gleason 1991, 11; Wittfogel 1957). The Aral Sea, once the world's fourth largest inland body of water, is at the very heart of the region, measuring some 67,000 square kilometers (Weinthal 2002, 5). Prior to Soviet presence in Central Asia, the Aral Sea Basin supported 75 percent of Central Asia's population, contained nearly 90 percent of its surface water, and acted as a cultural, economic, and geographical core for the region (Allison and Jonson 2001, 70).

Formation of Aral Sea:

The Aral Sea is situated in Central Asia, between the southern part of Kazakhstan and northern Uzbekistan. Until the third quarter of the 20th century, it was the world's fourth largest saline lake, and contained 10 grams of salt per litter. The two rivers that feed the Aral Sea are the Amu Darya River and Syr Darya River, respectively reaching the Sea through the south and the north. The Soviet government decided to divert those rivers so that they could irrigate the desert region surrounding the Sea in favor of agriculture rather than supply the Aral Sea basin.

Amu Darya River Basin:

The Amu Darya River is one of the two major rivers in Central Asia. It begins at the convergence of the Pyanj and Vakhsh Rivers in the Pamir mountains in Tajikistan and flows northwest through Tajikistan, Afghanistan, Turkmenistan and Uzbekistan. Sixty-one percent of the Amu Darya River is located in the Central Asian Republics (CARs), whilst thirty-nine percent of Amu Darya River is located in Afghanistan. Mentioning earlier, Amu Darya River reaches the Aral Sea, making it an important source of water for the landlocked and crisis-ridden Aral Sea basin. . The Amu Darya River Basin (ADRB) is formed of the surrounding regions that rely on the river's water supply to sustain the ecosystem and provide water for human consumption. The Amu Darya River Basin can be split into two distinct geographical regions, as shown in Figure 1. The southeastern or upstream, region is largely mountainous. It includes the Pamir and Tian Shan Mountains range in Tajikistan and Afghanistan, which are 5000- 6000 meters above sea level. Although largely arid, the southeastern mountains provide most of the water for the Amu Darya River. Winter rainfall is stored mountainside in the form of snow and ice and is discharged in the spring and summer as runoff. In contrast, the southeastern region contains little to no natural gas deposits or oil reserves or storages. Water is the biggest resource in Tajikistan, and one of the most significant in northern Afghanistan. The northwestern or downstream region of the ADRB is made up of desert and steppe lands. This region is low-lying lands with a maximum elevation of 200 meters above sea level. Downstream, the ADRB receives generally less rainfall. Like the upstream region, the northwest is largely arid, but contains large oil and natural gas reserves. (El Oifi et

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Al 2010, Akmurdov et al 2011). Since the place is good for agriculture, the population of the Amu Darya River Basin was incredibly increased. In 2010 the population of the Amu Darya River Basin was recorded as 5o millions. Of the basin regions, the most densely populated are southwest Uzbekistan, southern Tajikistan, and northern Afghanistan.

Figure 1.1: The Southeast Region of the Amu Darya River Basin

Figure 1.2: The Northwest Region of the Amu Darya River Basin

Sources: Tirdad Gorgani, Welcome to Xoroq (Khorogh), 2005

Modern History of the Amu Darya River Basin

Under the Soviet Union's regime, the Central Asian Republics (CARs) were ruled as one entity and resources were centralized. However, extensive resource and economic development did not occur until 1953, when Nikita Khrushchev implemented the "Virgin Land" policy, leading to a huge expansion of agriculture. The Soviet Ministry of Land Reclamation and Water Resources managed the Republics' water systems. Under this centralized administration, the upstream and downstream states were divided in terms of development. The upstream region was awarded control of the water flow and developed for hydro-power, while the downstream region was irrigated in order to grow more cotton and mined for gas and oil. The Ministry set up a system of mutual interdependence. According to this policy, water provided to downstream crops was compensated by the provision of oil and gas to upstream villages in the winter, as shown in the figure 2. Although the majority of the river (39%) flows in Northern Afghanistan, this country was not part of this agreement. (Wegerich 2008, page 73, 76 and Akmurdov et al 2011, page 24).

Figure 6: The Water-Energy Trade-off
Source: Author

In order to regulate water and put some limitation on the use of water from Amu Darya River by the Union of Soviet Socialist Republics (USSR), the aforementioned union created the Basin Valley Organization (BVO). The main purpose of the organization was to set and oversee water limits in each of the Soviet Socialist Republics, so that annual water use could be regulated. Damming water by Tajikistan from one side, and diverting Amu Darya River flow path for the irrigation of arid lands of cotton from other side, led to sharply decrease in the surface level of Aral Sea. How it happens will be explained in the following title.

Soviet Mismanagement of Water Resources and the Creation of a "White Gold" Monoculture

This harmonious balance changed once the Soviet Union began a massive cultivation of water-intensive cash crops in the upstream regions of the Amu Darya and the Syr Darya. Soviet planners emphasized agricultural products, rather than finished products or other crops appropriate for the climate, and rapidly expanded the production of such goods. As a result of these irrigation practices, the Aral Sea received less than 1,000 cubic kilometers of river water during the past 35 years, leading to a lower sea level and a sharp reduction in the sea's volume of water (Engelman2001, 149).

Even though Soviet scientists understood the economic and environmental ramifications of such water diversion schemes as early as1927, the Soviet Union continued to emphasize short-term production over long-term sustainable growth and development (Glantz 1999, page 3). It was irresponsible Soviet planning, therefore, that created the trend of poor water resource management and unsustainable development in Central Asia. The cotton monoculture worsened the situation and resulted in the destruction of the Aral Sea, the Central Asian ecosystem, and sustainable water resources for present and future generations. Historically, cotton had been widely cultivated in the Syr Darya and Amu Darya river val-

leys of Central Asia long before the Russians arrived in the region (Spoor 1993, 4–5). Uzbeks historically used a highly successful crop rotation system, which consisted of growing cotton one year, alfalfa the next, herding livestock on the fallow fields the third year, and then repeating the cycle. This process maintained soil fertility levels and continued until the 1940s (Rumer 1989, 82).

Russian influence in the region began as early as the time of the U.S. Civil War, when, due to shortages, Russia began to colonize it in search of a raw cotton source (Carlisle 1998). In the 1950s, planners in Moscow, as a result of Khrushchev's "Virgin Lands" campaign, expanded the agricultural development of Central Asia by 88.6 million hectares on the basis of a concept called "cotton first," which assumed that specializing in cotton would create economies of scale (Wegerich 2001, 9; Gleason 1991, 13). A monoculture developed while food and industrial inputs were brought from elsewhere in the Soviet Union. In addition, a structural dependency emerged between the Central Asian republics and the other Soviet republics because cotton and other agricultural goods were sold to other republics in a raw state, while the republics paid extremely high prices for the finished goods and agricultural staples (Spoor 1999, 5).

The Soviet Union's white-golden dreams (cotton production) eventually turned brown, however, as the ill effects of its destructive and unsustainable planning began to be manifest. The transition to a cotton monoculture, combined with the destruction of traditional lifestyles and the impoverishment of Central Asian populations, eventually took a severe toll on economic productivity. This was exacerbated by increased irrigation and the intense use of pesticides and fertilizer. These factors contributed to the Aral Sea Basin crisis the region faces today.

The Central Asian economy became highly vulnerable to climate change and environmental conditions from year to year, and, by the 1990s, cotton yields were severely declining due to water logging and salinization (Glantz 1999, 9). Water quality decreased due to increased effluence discharged into rivers from areas of high population concentration as well as from upstream industries and mines (Spoor 1998, 410; Wegerich 2001, 16). Furthermore, the increase in the prevalence of pesticides and herbicides due to irrigation runoff into the rivers made the water unfit for human consumption. Some 202-205 kilograms per hectare were used, compared to only 3 kilograms per hectare elsewhere in the Soviet Union (Olcott 2002, 204). Even though cotton output increased between the 1950s and the late 1980s, varieties of worsened quality increased as a proportion of output from 14 to 29 percent (Rumer, 1989, 78). Much of this change was due to soil exhaustion, desertification, salinization, the spread of the cotton wilt virus, and the difficulty of maintaining a large number of mechanical harvesters (Gleason 1990, 20).

The Aral Sea Basin Crisis

Disastrous Soviet planning led to serious environmental, economic, and social consequences in Central Asia. First, because of steady irrigation upstream, the decreased flow into the Aral Sea resulted in a lowering of the sea level by an average of 17 meters and a reduction in the volume of water in the sea of 75 percent (Micklin 2001, 140–141). In 1987, the sea split in two—the Large (Bol'shoi) Sea and the Small (Maloi) Sea, and salinity in the remaining waters increased by as much as 450 percent (Micklin 2001, 149). Currently, desertification is spreading, and salt-hardy vegetation is replacing native, more salt-sensitive plants. Native bird populations and waterfowl are also endangered or have already become extinct because of the loss of wetlands and increased pesticide concentration in the water (Micklin 2001, 153).

Second, the destruction of the Aral Sea disrupted the climatic balance of the region. January temperatures from 1981 to 1988 were 3-3 1/2 degrees Celsius lower in the Aral Sea region than the previous average and during that same period, July temperatures were 1-4 degrees Celsius warmer than average (Glantz 1999, 90). Additionally, during the Soviet period the frequency of sunny and very hot, dry weather increased by 15 percent, and the vegetative season decreased to 170 days, far short of the 200 frost-free days needed to grow cotton (Glantz 1999, 94; Kriner 2002).

Furthermore, pasture productivity decreased by 50 percent, the evaporation of surface water increased markedly, and air moisture diminished by 10 percent from its rate of 50 years ago (United Nations Environmental Program GRID-Arendal 2000). These drastic changes resulted in a decrease in the quantity and quality of cotton yields. Farmers who had less access to better farming techniques, pesticides, herbicides, or adequate water suffered the most. They were the biggest losers in this catastrophe because they were unable to compete economically with wealthier, better endowed farmers, which exacerbated their impoverished state.

Third, an increase in the number of dust storms in the region has led to arise in the amount of dust on glacial surfaces, and the mineralization of precipitation on glaciers has caused them to melt. At present, 1,081 glaciers have disappeared and what is most troubling is the following: On average valley glaciers in the Tien-Shan area retreat 7.5 to 13.1 meters per year and grow thicker at the same time. Glacial retreat and disintegration is dangerous and will have long-term development implications because these glaciers are the only ancient remaining storage of fresh water supply and are the main atmospheric moisture condensation of the region (United Nations Environment Program GRID-Arendal 2000). The disappearance of these glaciers will lead to an even greater shortage of water and could pose a security threat that might destabilize the region as tensions over this scarce resource grow. Equitable management of this limited resource will become more important as each country wishes to maximize its economic growth and exploit its water resources fully. This could lead to conflict as each republic—or perhaps ethnic group—tries to exert its influence over other countries or groups for control and use of water.

Impact of the Soviet Union's Collapse on the Economy of the Aral Sea Basin

The collapse of the Soviet Union threw the five Central Asian republics into non-plotted territory. The rapid change affected the republics' political and economic systems, which had clear tributaries for the Aral Sea Basin. The economic shocks to the system were considerable. Median incomes decreased sharply from $300 per month at the turn of the decade to roughly $60 by 2000, and half of the population came to live below the poverty line. There was no capital to maintain the antiquated and obsolete Soviet infrastructure. Privatization efforts took hold, but they resulted in the formation of an extremely wealthy class of former Soviet nomenklatura who took advantage of the turbulent situation and procured state-owned infrastructure at minimal prices (Sievers 2003, 197–98).

The economic crisis also had a major impact on the output of agricultural products, most notably water-intensive crops such as wheat and cotton. Cotton output dropped in Uzbekistan, Central Asia's major producer, from 5,058,000 tons in 1990 to 3,002,000 tons in 1998 (Spoor 1999, 4–5; Gleason 2003, 120). A major part of this decrease was due to the breakup of the Soviet Union itself, as the collapse of the system eliminated Central Asia's access to agricultural inputs, technology, and capital as well as its access to markets for cotton. A less important factor was the desire of countries like Uzbekistan to reduce their dependency on external states, particularly Russia. The mono cultivistic character of the economy also made the economy more susceptible to externalities like price shocks and changes in weather from year to year. Furthermore, some estimates indicate that an estimated $300 million in crop production is lost annually due to wasteful irrigation, the waterlogging of soils, and salinization (Uitto 2002, 372).

Though water is both the cause and the cure of salinization, it only serves to intensify the problems in Central Asia. Water is used to flush out existing salts in the soil; however, it carries with it more salts, exacerbating the unwanted process (Spoor 1998, 421–22). This is especially the case in the desert-like regions of Central Asia, where a dry, hot climate increases the rate of evaporation, leaving minerals and salts in the soil. This process represents an additional reason to advance economic reform and diversification, particularly given the region's finite water supplies and the unsustainability of these flushing techniques.

Start of the Conflict

The demarcations of republic boundaries, a significant population increase, limited water resources, and a depressed economic situation are all important factors that could lead to conflict within and among Central Asian states. The new boundaries of these five republics, irrespective of the Aral Sea Basin boundaries, mean that over 50 percent of the water supplies for Uzbekistan and the Kazakhstani oblasti (provinces) of Kyzl-Orda and Shymkent come from foreign sources. For Turkmenistan, this problem is worse—98 percent of its water resources are imported. These three states are the major downstream states, and they rely heavily on Kyrgyzstan and Tajikistan, which possess 90 percent of all Aral Basin water resources, for their water. Despite their relatively rich endowment, collectively Kyrgyzstan and Tajikistan only withdraw 11.4 percent of the Basin's water (Allison and Jonson 2001, 70–71).

These contrasting figures between downstream extraction and upstream water inputs do not by them constitute a significant reason for concern; however, there are a number of related issues that could potentially present a security threat to the region. Irrigated land, for example, is responsible for producing 90 percent of the region's crops, and this agriculture employs 44 percent of Turkmenistan's work-force while providing for 75 percent of Uzbekistan's hard currency value. Furthermore, the Basin water produces 50 percent of Kyrgyzstan and Tajikistan's electricity (Allison and Jonson 71). Water, therefore, serves as the economic catalyst for the region and is the primary resource on which its growth relies. Because of this, leaders in Central Asia will safeguard and protect their water rights and resources as demand for it increases in the years to come. This will increase the potential for militarization and conflict among actors in the region as states vie for control of this vital limited natural resource. As a result, water will be seen increasingly as a matter of national security.

In fact, international and ethnic resource-based conflicts have already begun to proliferate. In June 1990, a clash over access to land and water between Kyrgyz and Uzbeks in the Osh region left 300 people dead (Spoor 1998, 425). Perhaps these tensions have always been present and the current socioeconomic situation is such that these situations are becoming more pronounced. However, given the high and relatively concentrated population growth, especially in the Fergana Valley, the increasing scarcity of land and water could easily serve as a precursor to greater manifestations of tension over resources. This possibility might become more likely as migration to urban centers increases people's frustration with their inability to achieve economic betterment. Whatever I have covered till now was about the Central Asian Republics (CARs). I will now talk about why Afghanistan's portfolio was overlooked by the ex-soviet union. I will also cover that why CARs collaboratively did not work with Afghanistan for the crisis of Aral Sea.

The Amu Darya: Hydrological Background

The Amu Darya River is regionally important. It is the

largest river in Central Asia (i.e. the five post- Soviet republics) and the second largest in terms of flow in Afghanistan. It is shared by six states, Afghanistan, Kazakhstan, the Kyrgyz Republic, Tajikistan, Turkmenistan and Uzbekistan, (seven if Iran and the terminal river, Tedjen, it shares with Afghanistan and Turkmenistan is included). The river then flows for 2400 km through these states, Turkmenistan and Uzbekistan before terminating in Aral Sea.

Table 1: Flow and withdrawal from the Amu Darya River

Countries	Average Annual Flow (Km^3)	Withdrawals (Km^3)
Afghanistan	17.0	5.0 estimated
Iran	<3.0	NA
Kyrgyz Republic	1.6	.15
Tajikistan	19.6	7.9
Turkmenistan	1.5	22
Uzbekistan	5.1	22
Aral Sea	-	9.3
Total	79.00	66.35

Sources: Glantz; Micklin, 2000; Ahmad and Wasiq 2003

Table 2: Irrigated Lands in the Amu Darya Basin

Countries	Irrigated Land in Amu Darya Basin (Million Hectares)
Northern Afghanistan	1.16
Iran	-
Kyrgyz Republic	0.1
Tajikistan	0.5
Turkmenistan	1.7
Uzbekistan	2.3
Total	5.76

Sources: USAID, 2002 quoted in Ahmad and Wasiq, 2004, page 26

Traditionally most of the policy and academic interest on the river has focused on the Central Asian riparian. Afghanistan has generally been ignored although there have been notable exceptions such as the "Water, Climate, and Development Issues in the Amu Darya Basin" workshop in Philadelphia 1992. This is however understandable given that collectively these states are the majority of the riparian countries and the largest water users. However, Afghanistan cannot be ignored. It is the second largest contributor to the river after Tajikistan, contributing nearly a quarter of the river's 79 km3 flow (Ahmad & Wasiq, 2003). Northern Afghanistan accounts for 15% of Amu Darya basin area and 17 % of its population (Micklin, 2000, p 4). Afghanistan is also the source of other ASB rivers, the Atrek, Murghab and Tedjen. All three terminate in Turkmenistan, although the Tedjen also travels across Iran.

The Amu Darya is an equally important asset for Afghanistan. For half of its length, it flows either inside Afghanistan or it flows along its border (Ahmad & Wasiq, 2003, p 10). Between 13-40% of Afghanistan's area and more than 25% of its population are within the river basin (Glantz, 2005, p 26; Micklin, 2000, p 4, Ahmad & Wasiq, 2003). The Amu Darya area is the most agriculturally productive in Afghanistan, containing 1.16 million ha of irrigated land (a third of country's total). Only 385,000 ha of this are in sub-basins with permanent flow to the Amu Darya, however (Ahmad & Wasiq, 2003, pp. 2-17).

Reasons for Afghanistan's exclusion

The absence of Afghanistan from IFAS and the Amu Darya BVO seems a serious omission on practical and legal grounds. Afghanistan's exclusion runs contrary to the spirit if not wording of IFAS and Central Asian riparian regulations and declarations. IFAS's regulations for example state that the organization takes account of "the interests of all the states of the region" (IFAS Regulations, 2008).

1. Practical Reasons

Ahmad & Wasiq (2004) argue that Afghanistan has been absent from Soviet and post-Soviet allocation agreements because its past and future water demands have been and will be modest. They believe that Afghanistan could technically increase land under irrigation in the Amu Darya basin by 20%. This will only raise Afghanistan's total extraction from 5 to 6 km3, still be less than 2% of the river's total supply. And this expansion could take up to two decades to achieve. Consequently, they argue that Afghanistan's neighbors do not feel a sense of competition or urgency to reach an allocation agreement with Kabul (2004, pp. 3 & 41). There is some merit in this argument. There is, however, debate about Afghanistan's future water demands, its ability to implement potential irrigation and HEP projects and the implications for the other riparian countries. The key problem is the absence of contemporary credible hydro-data to base such an assessment on. As noted earlier, 20-30 year old plans and data are the source of our present understanding. Therefore, Ahmad and Wasiq's (2004) analysis contrasts with analysis which was done by Zonn's (2002). He believes that Afghanistan's demands could increase to 16 km3, nearly a quarter of the river's supply (2002, quoted in Rycroft and Wegerich, 2008). The magnitude of difference between 2 and 16 km3 and the implications for other water users is considerable. It is probably fair to assume that any increase in Afghanistan's demands will be gradual and slow to achieve, although at some point its neighbors will have

to face this future. They may, as Ahmad and Wasiq (2004) suggest, take more than two decades to achieve.

2. Regional Relations

A key factor has been Afghanistan's domestic situation and the implications for its relations with its neighbors. As Gleick noted that the political context is important for trans-state water management (1995, p 85) for most of the last thirty years Afghanistan has been weak, unstable and its government either unable or uninterested in cooperating with its neighbors. During this period, relations with Moscow and the Central Asian capitals have fluctuated between clientism and antagonism. In the crucial years for the ASB water management structures, 1992, Kabul had four different presidents and in 1997 when ICAS merged with IFAS, the Taliban was in power.

Central Asian governments held little respect for the numerous and weak Kabul governments between 1991 and 1996 and antipathy towards the Taliban thereafter. None formally recognized the Taliban and some actively sought to remove it (ICG 2001). This probably meant that the Central Asian government felt little need to consult with Kabul over water for over a decade. It is harder to use this line of analysis to explain why post-2001 cooperation has been poor however. After the fall of the Taliban government, Afghanistan's neighbors were signatories to a number of agreements with it. These include the Good Neighborly Relations Declaration (2002) and the Berlin Agreements (2003). However, rhetoric has not been matched by substance (Bosin, Gleason & Hanks) Afghanistan's place in the Amu Darya is still denied. In one instance this may have taken a retrospective dimension. At a NATO workshop held in 2004, specific references to Afghanistan were reportedly removed from the final report, despite having been in the initial draft (Murray & Tarlock, 2005, p 762).

3. Institutional Inertia and Self-Interest

IFAS may be "dysfunctional", lethargic, biased and self-interested (McMurray & Tarlock, 2005, p 761). As such it and its key members may not want a new, potentially challenging member. Regional institutions have an inbuilt resistance to change. Decisions in ICWC, the IFAS sub-body, must be made unanimously and all members have a veto. As a result, "agreement is dependent on the 'political will' of [both] upstream and downstream users." (Wegerich 2004, 338).

In addition, it is argued that IFAS and the Amu Darya BVO favor Uzbekistan's interests (Wegerich, 2005, 2008). Afghanistan's membership could upset the status quo and especially the downstream states' interests. It may therefore struggle to gain membership as it potentially challenges the interests of the two IFAS members with the most at stake, Turkmenistan and Uzbekistan. Inclusion of Afghanistan in IFAS may raise uncomfortable questions about the organization's and its present member states' working practices and commitment to cooperative goals and adherence to allocation quotas International donor community assistance to Afghanistan may result in its water management laws and practices based on global norms on sustainable development and genuine cooperation (McMurray and Tarlock,2005, pp. 715-6). These are not features some of the other riparian countries entirely respect. Ashgabat and Tashkent may also be wary of engaging with a non- post-Soviet state, closely linked to the international development and donor community.

In addition, the inclusion of another state with legitimate rights to Amu Darya waters could also mean that the current, albeit ineffectual and unequal, allocation system needs revising. On this specific point Afghanistan's present inability to provide reliable water data may be an advantage to some of the other riparian's. That said the Kyrgyz Republic has had similar links to the donor community. Its membership of IFAS has not led increased transparency or inclusivity in the organization.

4. Upstream-Downstream Differences

The upstream-downstream dynamic is perhaps a key factor in explaining Afghanistan's exclusion. It also indicates future areas of cooperation and confrontation. Upstream Afghanistan and Tajikistan sees the Amu Darya as a source of HEP as well as irrigation. Downstream Turkmenistan and Uzbekistan see the river primarily as a source of irrigation water for cotton and rice production. Afghanistan and Tajikistan both have plans to increase their HEP (hydro-electric power) production. Tajikistan's plans are much more advanced and larger in scale (EIU 2008b). It plans to double present electricity production with a number of new HEP plants, Rogun being the largest (EBRD, 2008, p 5).

Afghanistan hopes that the Amu Darya tributaries, Kokcha and Kunduz, may partly address its considerable energy deficiency. It has been claimed that the downstream impact of Afghanistan's smaller schemes with smaller reservoir storage capacity will be limited (Ahmad & Wasiq, 2004, p 23). However, a shared water resource used by both irrigation and HEP users has the potential for inter- state disagreement (Wegerich 2004, pp. 340-1). Afghanistan and Tajikistan's future HEP plans may therefore lead to disputes with Turkmenistan and Uzbekistan. Tashkent has already been critical of Du-

shanbe's plans (EIU 2008b).

Whilst Afghanistan's proposals may have a lesser impact than Tajikistan's schemes they meet opposition from Turkmenistan and Uzbekistan who are dependent on large summer water supplies. If large- scale winter HEP generation is implemented it may have detrimental impacts for the downstream water users. It can cause downstream flooding, damage downstream infrastructure (due to ice) and reduce the amount of water available in summer for irrigation (Wegerich, 2004, p 341). It could also challenge Turkmenistan and Uzbekistan energy policies including exporting thermally- generated electricity to their neighbors. Without an integrated water-energy agreement competing inter-sectorial water use is likely to remain a key source of friction (Wegerich, 2004, pp. 340-1).

In light of this, it is interesting to note that the only riparian that has seriously engaged with Afghanistan is Tajikistan. Both are upstream states. They contribute the majority of the river's flow, and see the water as a potential source of HEP and irrigation. There may be scope for the two to work together to strengthen their position vis-à-vis the downstream states. There are other interesting synergies between them too. They are the two poorest riparians in terms of GDP, and energy and food security (EIU, 2008a & 2008b). Both have emerged from civil war. Tajikistan's civil war ended in 1997. After this it was able to start planning longer-term economic development again. This has included irrigation and HEP projects (Weinthal, 2006, pp. 16-17). Ashgabat and Tashkent have opposed Dushanbe's plans to increase its water demands. Afghanistan emerged later and more fitfully from a much longer and intensive period of conflict. It will take longer for it to increase demands on the Amu Darya but may lead to similar disputes to those arising from Tajikistan's HEP activities.

Annex I. Existing Treaty Law in the Aral Sea Basin

Treaties applicable to the ASB	Afg	Kz	Kg	Tj	Tm	Uz
Post-Soviet Central Asia						
Agreement on Cooperation in the Field of Joint Management of the Use and Conservation of Water Resources of Interstate Sources (1992, Almaty)	-	√	√	√	√	√
Agreement on Joint Actions for Addressing the Problems of the Aral Sea and its Coastal Area, Improving the Environment, and Ensuring the Social and Economic Development of the Aral Sea Region (1993, Kzyl-Orda)	-	√	√	√	√	√
Agreement on Cooperation over Water Management Issues (1996, Chardjev)	-	-	-	-	√	√
Agreement on the Use of Fuel and Water Resources, Construction and Operation of Gas Pipelines in Central Asian Region (1996, Tashkent)	-	√	√	-	-	√
Agreement on the Use of Water and Energy Resources of the Syrdarya Basin (1998, Bishkek)	-	√	√	√	-	√
Agreement on Cooperation in the Area of Environment and Rational Nature Use (1998, Bishkek)	-	√	√	-	-	√
Agreement on the Parallel Operation of the Energy Systems of Central Asian States (1999, Bishkek)	-	√	√	√	-	√
Agreement on Cooperation in the Sphere of Hydromet (1999, Bishkek)	-	√	√	√	-	√
Agreement on the Status of the IFAS and its Organizations (1999, Ashgabad)	-	√	√	√	√	√
Framework Convention on Environmental Protection for Sustainable Development in Central Asia (2006, not in force, Ashgabad)	-	-	s	s	s	-
Commonwealth of Independent States (CIS)	**Afg**	**Kz**	**Kg**	**Tj**	**Tm**	**Uz**
Charter of the CIS (1993, Minsk)	-	√	√	√	√	√
Agreement on Interaction in the Field of Ecology and Environmental Protection (1992, Moscow)	-	√	√	√	√	√
Agreement on the Main Principles of Interaction in the Field of Rational Use and Protection of the Transboundary Water Bodies (1998, Moscow)	-	s	-	√	-	-
Agreement on Informational Cooperation in the Field of Ecology and the Environmental Protection (1998, Moscow)	-	√	√	√	-	-
UN Economic Commission for Europe	**Afg**	**Kz**	**Kg**	**Tj**	**Tm**	**Uz**
Convention on Environmental Impact Assessment in a Transboundary Context (1991, Espoo)	-	√	√	s	-	-
Convention on the Protection and Use of Transboundary Watercourses and International Lakes (1992, Helsinki)	-	√	-	-	-	√
Convention on the Transboundary Effects of Industrial Accidents (1992, Helsinki)	-	√	-	-	-	-
Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (1998, Aarhus)	-	√	√	√	√	-
Global conventions	**Afg**	**Kz**	**Kg**	**Tj**	**Tm**	**Uz**
UN Convention on the Law of the Non-Navigational Uses of International Watercourses (1997, New York)	-	-	-	-	-	√
Convention on Wetlands of International Importance especially as Waterfowl Habitat (1971, Ramsar)	-	√	√	√	√	√
Convention on Biological Diversity (1992, Rio de Janeiro)	√	√	√	√	√	√
UN Framework Convention on Climate Change (1992, New York)	√	√	√	√	√	√
UN Convention to Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa (1994, Paris)	√	√	√	√	√	√
Selected agreements between the Soviet Union and Afghanistan						
Frontier Agreement (1946, Moscow)						
Treaty Concerning the Regime of the Soviet-Afghan State Frontier (1958, Moscow)						
Protocol on the Joint Execution of Works for the Integrated Utilization of the Water Resources in the Frontier Section of the Amudarya (1958, Kabul)						

Afghanistan's current Point of View about Amu Darya River

According to the Ministry of Energy and Water of Afghanistan, currently the country is capable of supplying 20% of its total energy by itself. And the rest, 80% percent of the demand is supplied by neighborhood countries, Turkmenistan, Uzbekistan and Tajikistan. In May 23rd, 2016, High Council of Ministers under the supervision of Dr. Ashraf Ghani Ahmadzai, President of Afghanistan, approved the new request to build twenty-nine small and medium dams over various rivers in Afghanistan in two years meaning that Afghanistan is committed to damming its water. (THE NEW YORKER, GEORGE PACKER). In Recent official meeting of Dr. Ashraf Ghani with the leader of Iran, Ashraf Ghani once again emphasized on damming of the rivers in Afghanistan. 29 dams will be gone to bedding process in November 4th, Tolonews. And 14 dams will be built in four years.

In addition, according to the request of the president of Afghanistan, Dr. Ashraf Ghani, India undertook the responsibility of investing around two billion dollars on construction of dams in Afghanistan. Around eight dams will be constructed on Amu Darya River which in turns worsening the current crisis of the Aral Sea. Furthermore, the deputy Minster of Finance in Ministry of Energy and Water of Afghanistan, Abdul Basir Azimi, in an exclusive interview with Tolo news revealed that a Kazakhstani Private Company wills to invest on construction of Hydro-power and Irrigation dams on Kokcha River, one of the main tributaries of Amu Darya River Basin in Badakhshan and Takhar Provinces in Afghanistan. So in order to at least mitigate the crisis of Aral Sea, it is beneficial to invite Afghanistan on Round Table Debate. On the first hand, this will inform Afghanistan's authorities about the importance of Aral Sea. On the second hand, this will lead to an effective

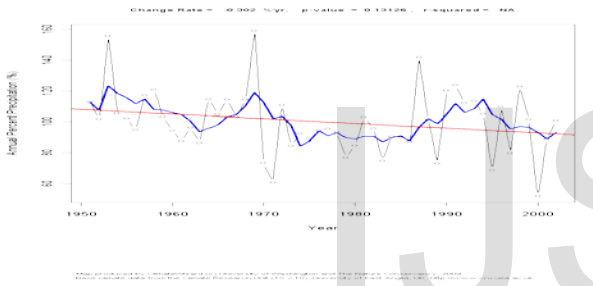
management in water resources between the riparian countries.

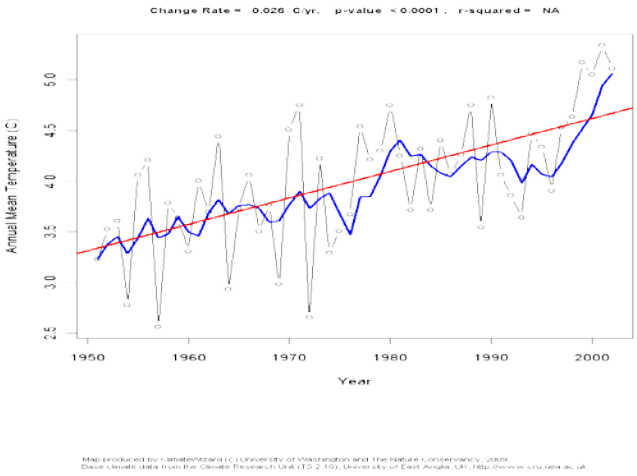
2. SOLUTIONS

2.1 Current Situations of the riparian countries

Precipitation and Temperature in Tajikistan (1951-2002)

Due the massive usage of water for hydro-power, Tajikistan is drastically facing climate change. According to figure 3, the temperature has been increasing in this country since 1950. After the collapse of Soviet Union, Tajikistan emphasized on sufficing itself in power and electricity by constructing large dams on Vakhsh and pynj Rivers. Scientifically speaking, relying on hydro-power energy for long terms is not wise because hydro-power needs sufficient water. As rainfall and snow happens in winter and the snow melts in summer. In addition, according to the figures, there is a sharp decrease in annual precipitation of Tajikistan. Therefore, for the maintainability of Aral Sea current level, it is recommended to substitute hydro-power energy to Renewable Energy. Renewable energy such as wind energy, solar energy is the only purest energy.



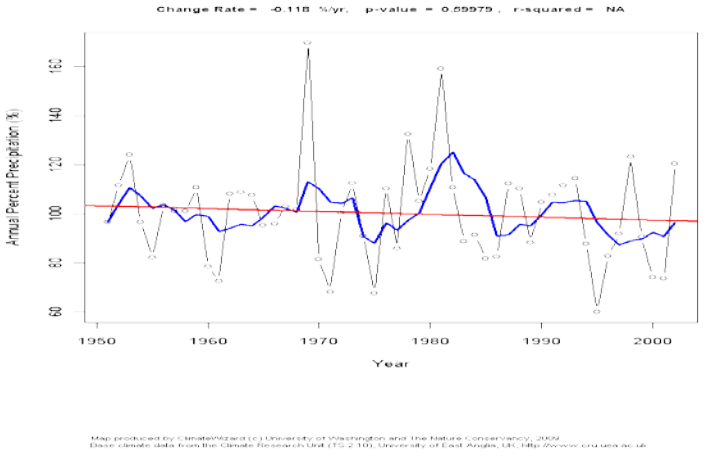


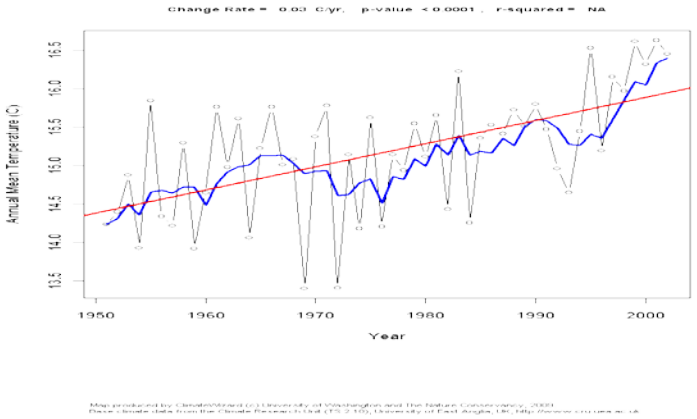
Sources: www.climatewizard.org

Map Sources: ESRI, HERE, DeLorme, Inter-map

Precipitation and Temperature in Turkmenistan (1951-2002)

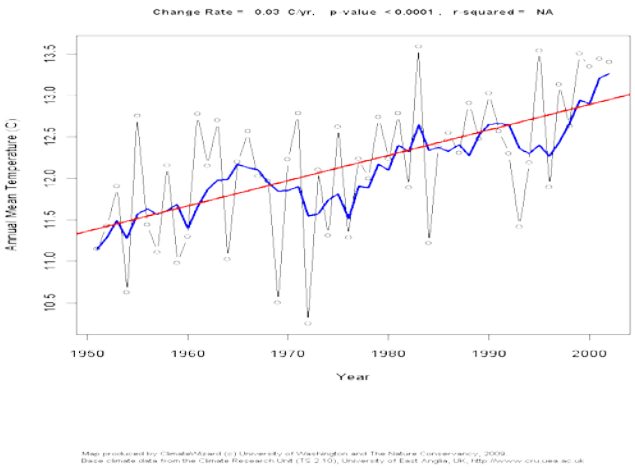
: As previously mentioned, Turkmenistan is nearly 100 percent (98%) dependent on Amu Darya River for its irrigation. It is due to the fact, that Turkmenistan is the downstream. On the other hand, this country has plentiful of oil and gas reserves. Hence, this country is provided with electricity by burning oil and gas which has a significantly high position in environmental disasters as well as global warming. Considering the current temperature and precipitation graphs of this country will lead us to the conclusion that this country should find alternatives for its electrification. The most reliable and viable and safe energy is Renewable Energy.





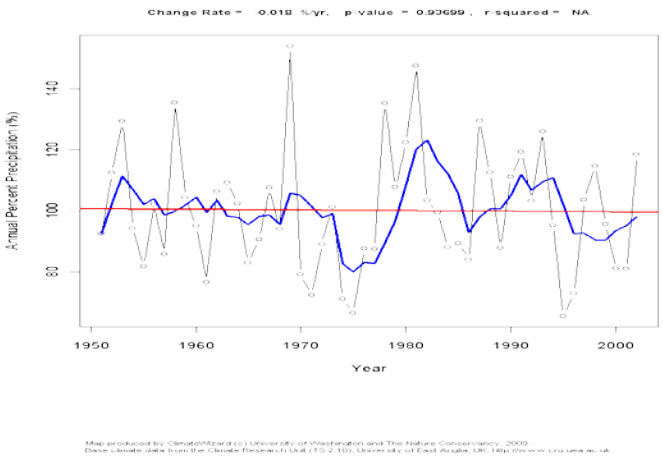
Precipitation and Temperature in Uzbekistan (1951-2002)

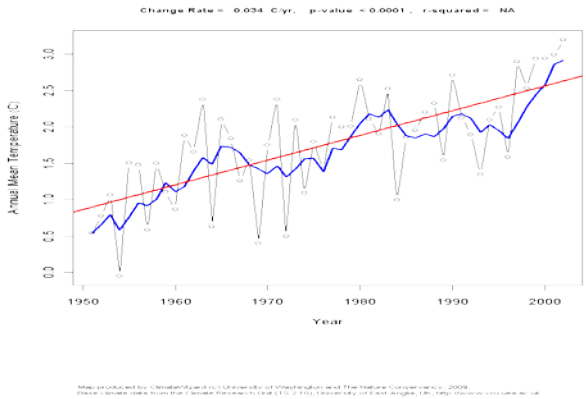
During the Soviet Union, Uzbekistan diverted most of the Amu Darya as well as Syr Darya Rivers, main sources of Aral Sea, to un-lining canals to irrigate cottons lands. This increasingly declined the surface level of the Aral Sea to around 17 meters. Due to miserable production of cotton near Aral Sea in Uzbekistan, the Aral Sea lost its fame in terms of socio-economics, tourism, environmental aspects and bio-diversity. It is time to rethink and restructure our plans by exploring new scientific approaches for agriculture, and electrifications. By adopting this new approach, we will at least mitigate the crisis of Aral Sea and hopefully, we will be witness one day that Aral Sea is at least maintain at its current level and situation. So, for Uzbekistan, it is necessary to think for renewable energy and reducing the volume of oil and gas for the provision of electricity. This is because that in recent study, it was unfortunately predicted that the temperature will rise up to three to four degree Celsius in Central Asia in upcoming decades.

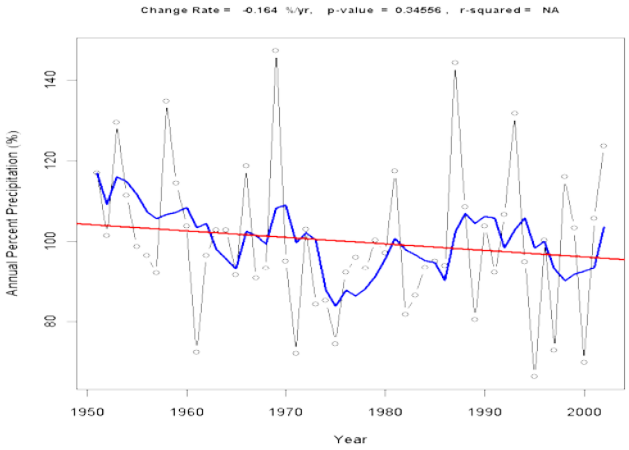


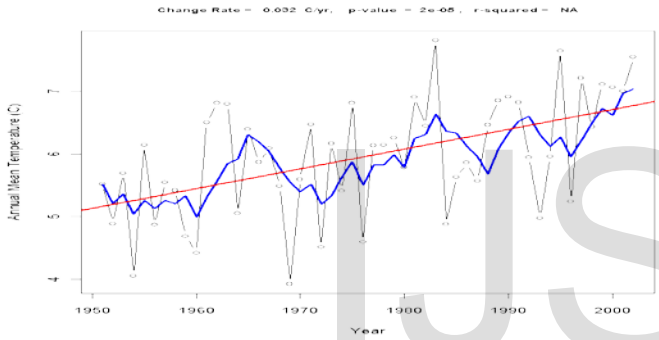
Precipitation and Temperature in Kazakhstan (1951-2002)

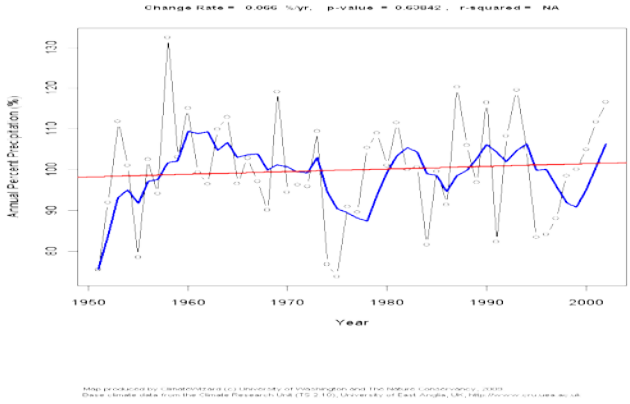
Kazakhstan, as a downstream riparian country of Aral Sea, was constantly focused on High fossil fuel energy generation since the collapse of Soviet Union. This in turn, leads to the warming of the temperature in the area. When the temperature gets warmer in Aral Sea, water is more evaporated and makes the sea level to decline. By observing the annual mean temperature and annual percent precipitation (1951-2002) of Kazakhstan, we can easily come to the conclusion that one of the main factors that declined the level of water in Aral Sea is the increasingly high temperature in Aral Sea basin, which is situated in Kazakhstan.











Precipitation and Temperature in Kyrgyzstan (1951-2002)

Syr Darya River is situated between Tajikistan and its major parts in Kyrgyzstan. Syr Darya River is the second source of Aral Sea. During the Soviet Union, Kyrgyzstan, as the upstream riparian country of Aral Sea, started damming Syr Darya River's water by constructing hydro-power and irrigation dam projects. Damming Syr Darya River caused the Aral Sea to not receive sufficient inflow and this led to the declining of Aral Sea water level. In contrast, construction of such dam projects made Kyrgyzstan self-sufficient in power generation. When all is said and done, these riparian countries (Tajikistan, Uzbekistan, Turkmenistan, Kyrgyzstan, and Kazakhstan) under the mismanagement of ex-Soviet Union worsened the condition of Aral Sea, which was the fourth biggest lake of the world before 1950.

Sources: www.climatewizard.org

Capacity of Central Asia Countries in Renewable Energy

Central Asia has a high potential for renewable energy (RE) power generation and solar water heating. Wind power in Kazakhstan, solar energy in Uzbekistan, the energy of small rivers in Kyrgyzstan, solar and hydro energy in Tajikistan and solar energy in Turkmenistan have especially high prospects. Yet, public awareness of RE benefits remains low and institutional mechanisms which would foster investments in the sector are lacking.

Current trends in the RE and EE sector across Central Asia: A number of positive developments on sustainable energy can be observed in the region:

All Central Asian countries with the exception of Turkmenistan have adopted primary legislation on RE/EE and formally introduced a number of incentives, e.g. grid-access, tax exemptions and feed-in tariffs which, nevertheless, need to be negotiated for each project. Kazakhstan is by far leading in the region. The country has adopted a national plan on transition to a green economy, made voluntary pledges on reduction of its greenhouse gas emissions and introduced a pilot emissions trading system. In 2017, Kazakhstan is hosting the World Expo on "Future Energy" which should give an additional boost to RE/EE projects.

Uzbekistan is constructing the first on-grid photovoltaic power park in the region with Asian Development Bank (ADB) loans. Tajikistan and Kyrgyzstan are implementing several projects on small hydropower, supported by the ADB and Russia and on energy efficiency, financed by the European Bank for Reconstruction and Development (EBRD) and the World Bank. Although RE is still seen in Central Asia as a prerogative of economically rich countries, the region demonstrates well-developed and increasingly growing interest in EE measures. Kazakhstan, Uzbekistan and Turkmenistan see it as way of increasing their fossil-fuel exports, whereas Tajikistan and Kyrgyzstan hope to reduce their dependence on energy imports from the neighboring countries.

Despite excellent RE growth potential, the actual deployment in the region remains very low. Currently, the share of RE in electricity generation varies from less than one per cent in Ka-

zakhstan and Turkmenistan to up to three per cent in Uzbekistan and Tajikistan. A number of barriers hinder investments in RE across Central Asia. High fossil fuel subsidies and low electricity prices significantly reduce the competitiveness of RE. Due to limited access to affordable bank loans, potential investors cannot afford the relatively high initial investment costs. The number of local technology providers and technical specialists on sustainable energy as well as feasibility studies and economic analyses on RE in the region are lacking. Public awareness and media coverage of RE/EE benefits is low.

What Are the Solutions?

The inadequate state of water resources has forced the seven Aral Sea Basin states (the five Central Asian republics as well as Afghanistan and Iran) to address this issue collectively, a relatively new concept for the republics since all directives came from Moscow during the Soviet era. As Garret Hardin illustrated in the Tragedy of the Commons, if one country attempts to maximize its own utility, it can lead to the destruction of the common good—in this case, the entire Aral Sea Basin ecosystem. All actors would then lose. Therefore, integrated, streamlined involvement and cooperation must take place at all levels to address the issues of equitable distribution and usage of the Aral Sea Basin waters before the situation becomes direr.

Funding and Reform Mechanisms: Vying for Control

Unfortunately, the involvement of the seven states in addressing these issues has been uneven. Upstream states such as Kyrgyzstan, Tajikistan, and, to a lesser extent, Turkmenistan, have not been very involved, while Iran and Afghanistan have not participated in the dialogue at all. Kazakhstan and Uzbekistan, the two countries facing the greatest problems, are the most involved in negotiations. Varying levels of political commitment from the governments do not create a level playing field from which to address the issues at hand. Nonetheless, in the time frame between the republics' independence and 1994, as many as 300 agreements concerning the Aral Sea region were signed (Allison and Jonson 2001, 73).

Discussions on the crisis began to take place shortly after the five republics gained their independence. They signed the Almaty Agreement on February 18, 1992, with the intent of resolving water disputes. In this Agreement, the states recognized that "only through unification and joint coordination of action" could they effectively manage the region's water resources (Allison and Jonson, 70–71). The agreement also established a working group to oversee its enforcement and the development of a single program of exploitation and water consumption in the interest of both supporting national economies and protecting water resources (Elance 1997, 214). The Almaty Agreement is a major part of the existing framework for the regional dialogue on Aral Sea issues. It serves as a solid springboard for action; yet, its vagueness and generality leave it ineffective as a functional plan of action.

Although many of the 300 Aral Sea Basin-related agreements promoted idealistic aims, few established mechanisms to enforce their clauses. The Almaty Agreement, for example, mandates that disputes be settled by the ministers of water resources of the five republics, but the problem is that the various ministers cannot agree on solutions, and there seem to be no measures in the agreements stipulating how to break such deadlocks (Vinogradov and Langford, 11). The creation of strong, effective, and meaningful treaties and agreements requires water resource distribution plans that are acceptable and equitable to all actors involved. Stringent enforcement mechanisms also need to be written into these standards to ensure adherence to the agreements.

In order to procure World Bank funding for various water resource management programs, the republics took further action and created the Interstate Council for Addressing the Aral Sea Crisis (ICAS) and the International Fund for the Aral Sea (IFAS). The ICAS is a body of twenty- five high-level representatives from the five states who meet biannually to "hold discussions, reconcile the issues of the member nations, and decide on the programs, policies, and institutional proposals recommended by the EC [European Community]" (Carlisle 1998). It is the main organization responsible for developing Aral Sea-related policies and proposals. The ICAS was intended to become the leading management organization for making decisions regarding water use and distribution among the new Central Asian states. Unfortunately, the body's legal status remains unclear, and its jurisdiction overlaps with the Interstate Water Management Coordinating Commission (IWMCC), created prior to the ICAS (Elance 1997, 217) at the Almaty Conference in February 1992.

The ICAS oversees two organizations, the Interstate Commission for Water Coordination (ICWC) and the Sustainable Development Commission (SDC). The ICWC meets five times a year to determine water allocations among the five basin states, which are based on the 1991 Soviet-era water withdrawal levels. These ICWC directives concern issues including the control of hydroelectric facilities, the maintenance of water control structures, and diversions to canals. Its decisions are implemented by two Soviet-era Basin Valley Organizations

(BVOs), one relating to the Syr Darya and the other to the Amu Darya (Carlisle 1998).

The U.S. Agency for International Development (USAID) notes, however, that these BVOs are "seriously underfunded," despite the fact that at any given time, fifteen to twenty international donor agencies are involved in Aral Sea Basin projects (USAID in Central Asia Natural Resources Management Program 2002; Le Moigne 2003, 4). Indeed, the BVOs have been crippled by staff cuts, and water control structures and hydrotechnical facilities for which they are responsible are falling into disrepair due to a lack of adequate operation and maintenance funds. Additionally, their divisional offices lack basic equipment such as reliable telephones, fax machines, and computers that are necessary to log and process data and operate programs effectively (USAID in Central Asia Natural Resources Management Program 2002). Despite the good intentions and potential efficacy of the Aral Sea BVOs, this lack of funding—particularly from the governments of the states in the Basin—can undermine the potential sustainability of the Basin as well as any reform and modernization projects that could help to decrease water consumption and inefficiency.

The IFAS, for its part, was established to serve as a funding mechanism for Aral Sea programs. It was mandated to rely on contributions of 0.3 percent of the GNP of Kazakhstan, Turkmenistan, and Uzbekistan, and 0.1 percent of the GNP of Kyrgyzstan and Tajikistan. It is also intended to serve as a mechanism to channel funds from donor countries and international agencies to Basin-related projects. Despite the minimal level of mandated state contributions—which has been lowered from the original percentage amounts noted above—the republics have been slow in paying their shares (Allison and Jonson 2001, 73).

Not only have various commissions and organizations been fighting over authority in addressing the Basin crisis, but the actions of international donors have further complicated the situation. The World Bank, in conjunction with the United Nations Development Program (UNDP) and the United Nations Environment Program (UNEP), named strengthening the institutional capacity of the ICAS and the IFAS as one of its main objectives in the region. USAID, however, worked through the Interstate Council for Kazakhstan, Kyrgyzstan, and Uzbekistan (ICKKU), an economic cooperative organization created in 1993 to strengthen cooperation among the Syr Darya states, which were unable to negotiate a sustainable agreement regarding water and energy resources (Weinthal 2000, 2). USAID's approach was to deal with each tributary separately to promote coordination among these states. It further argued that by supporting the ICAS/IFAS, the World Bank was only propagating control by for monomenklatura instead of facilitating meaningful progress and reform. Conversely, the World Bank claimed it was necessary to work with these scientists and bureaucrats because they could subvert donor attempts at reform and development by refusing to cooperate with other initiatives in which they were not included.

Privatization and Pricing

Some researchers claim that there is really no natural water resource shortage in Central Asia and that the problem stems from misallocation and mismanagement (Wegerich 2001, 2, 14). Given that the efficiency of water usage in the region is low, a more sustainable method of management could emerge from the establishment of more private enterprises, which could replace the system of centralized organization handed down from the Soviet era. Another strategy that is largely unutilized is appropriate water pricing. In the countries of the former Soviet Union, consumers do not pay for the true economic cost of water, and pricing seems to be primarily nominal. This is a result of the Soviet practice of squandering natural resources without giving adequate thought to the consequences of such action. Water pricing and tradable water credits could prove effective in reducing water consumption—or at least changing behavioral norms about water consumption—at the regional and local level (Spoor1998, 430).

Prediction and Policy Options

As the Central Asian republics struggle with their newfound independence and desire for economic prosperity, they are unsuccessfully grappling with the imperative to balance self-interest and the need to address a regional issue cooperatively.

Negativists take a Malthusian approach to the future of Central Asia. They assume that a significant increase in the population of Central Asia would lead to continued resource depletion and the maintenance of the status quo. Such an approach is premised on the belief that all actors in the region wish to have their proverbial cake and eat it too. Accordingly, Hardin's scenario of the destruction of the commons would manifest itself as the Central Asian states strive for independence in food production and continue to produce revenue-earning cotton for export (Wegerich2001, 18).

Others, such as John A. Allan and Massoud Karshena, argue instead that there are three positive potential future scenarios for the Aral Sea Basin: a conventional scenario, a precautionary one, and a scenario of reconstructing the Basin to its original state. A conventional scenario—featuring the maintenance of status quo water withdrawals—would be based on maintaining the Central Asian standard of living and continuing to deplete the region's resources. Allen and Kareshna reject this possible outcome as unacceptable. The precautionary scenario—which would rely on the maintenance of the current sea level as well as setting sustainable water withdrawal limits—would be the most feasible option. It calls for regional stabilization and accepts current levels of resource depletion. However, it does not allow the situation to deteriorate. The third scenario would feature the reconstruction of the natural environment to a pre-1960s state, which is simply no longer possible (Wegerich 2001, 3).

A large part of the problem in the Basin crisis concerns the goals and directives for sustainable development in the region. Because the problem is so complex and involves multiple economic and social sectors, it is difficult to agree on common objectives.

When we talk about a sustainable outcome [for the Aral Sea Basin], we need to ask ourselves, "What is it that the governments are seeking to sustain? Soil Fertility? Human Health? Fish populations? The Economy? A way of life? The well-being of the region's leaders? How long do we wish to sustain it?" In other words, are short-term attempts at sustainability compatible with achieving sustainability in the long run? (Glantz 1999, 19).

It is also important to ask whether or not the economic objectives are at odds with long-term environmental and social objectives. Governments have drafted laws, written action plans, and conducted seminars which establish an optimistic and dynamic base for future action. (Sievers 2003, pp 4). These measures, however well-intentioned, have been largely ineffective due to their vagueness and high degree of overlap, as well as the varying degrees of political will of governments and other actors. There are also competing interests among upstream and downstream communities regarding whether water usage should be for commercial or domestic use, or for irrigation or hydroelectric dams.

Moreover, this discussion does not even begin to address the question of cost. Restoring the Aral Sea Basin and its tributaries to their original boundaries would require the flow of 1,000 cubic kilometers of water per year—that is, 10 years of full flow of both the Amu Darya and Syr Darya rivers (Wegerich 2001, 11). To achieve this, economies would have to be diversified, populations shifted, and consumption reduced (Sievers 2003, 204). The cost of such changes would be in the tens of billions of dollars—a cost the Central Asian republics cannot afford to bear and a price the West is unwilling to subsidize. Restoring the Aral Sea Basin to its original pre-Soviet boundaries, therefore, is not feasible. Funding and policies should focus on mitigating the crisis, stabilizing the region's water resource management, and ensuring its sustainability for future generations.

Effective Solutions

Basin Valley Organizations (BVOs)

The most viable solution to this systemic crisis is, therefore, to rely on "an integrated Basin-wide strategy to optimize water use efficiency and maximize efforts to restore and protect key water related ecosystems" (Allison and Jonson 2001, 85). Successful approaches will be ones that reflect diverse interests, geographies, and applications at the local, national, and regional levels of each republic. A systemic approach also needs to be taken which capitalizes on local, community-based initiatives, which best reflect the needs of the populations they serve. Since communities have the best understanding of their needs and limitations, they are in the best position to address water resource management issues. Involving them in the Decision-making process would give them ownership of and responsibility for their future and the resolutions to the crisis. Community- based micro-institutions can best address local water needs and environmental concerns, while simultaneously monitoring progress, enforcing legislation and encouraging adherence to guidelines and principles (Allison and Jonson 2001, 204).

These localized approaches should be housed within Basin Valley Organizations (BVOs) that serve entire rivers and drainage systems, rather than within national governments or subnational administrations. These BVOs should work in conjunction with regional and local NGOs within the boundaries of each republic to educate citizens about proper irrigation and water management techniques. They should also educate citizens about more sustainable forms of agriculture—for example, traditional crop rotations consisting of alfalfa, cotton, and livestock. In order to discourage excess water consumption

and waste, water should be priced to more adequately reflect its true economic cost. This economic incentive will lead people voluntarily to reduce water consumption and/or adopt more water conserving methods.

Central Asian Republics

The governments of the Central Asian republics (CAR) should work together with independent BVOs to address sectorial needs such as agricultural and industrial diversification, and water withdrawal quotas (Sievers 2003, 204). These governments should also do more to address concerns within their countries, such as the decreasing quality of health due to airborne pollutants, the increase in the prevalence of dust storms, climate change, and the reduction in size of permanent glaciers in upstream states. Central Asian governments should also be held accountable for making timely contributions to the IFAS based on their assessed rates, and monies should be used to fund BVO and NGO activities rather than projects that are internal to individual countries. These states also need to increase their domestic funding of environmental education programs to increase awareness of the critical issues. Finally, downstream countries need to provide economic incentives such as subsidies to farmers to help them transition into producing more crops which are not water-intensive.

International Community

International organizations (such as the UNDP and the UNEP) and bilateral donor institutions (such as USAID) should also play a role in this process, albeit a secondary, supportive one. Their involvement should have three main prongs.

First, their assistance is needed to increase cooperation within the donor community and among regional bodies in order to develop a more coherent and less conflicted management structure. This would maximize the sharing of knowledge, technology transfer, and the efficient use of funds.

In addition, it could shift the focus of Basin-related efforts from the alleviation of the symptoms to the cause of the problems (Allison and Jonson 2001, 86; Wegerich 2001, 19).

Second, international organizations and other donors should work to ensure that states contribute their respective GNP assessments to the IFAS. The application of diplomatic pressure on the Central Asian re publics would illustrate the commitment of the international community to combat this crisis and would help to ensure that payments are made to continue funding BVO and NGO programs and projects.

Third, nations can help address the crisis through bilateral aid. Western governments must understand that the water crisis poses a potential threat to regional stability and security. Given contemporary geopolitical interests in the region, such stability is integral to the promotion of many nations' foreign policy aims. Furthermore, the receipt of much needed aid now could stall the Basin's further degradation and begin to undo some of the damage, whereas delaying action would only result in a situation which is direr and costlier to solve. On a local level, donors should offer assistance to NGOs and environmental or public health groups, among others. In this way, they can help implement directives and goals established at a regional or national level that may otherwise not be implemented.

The Aral Sea Basin crisis, arguably one of the worst man-made systemic disasters in history, is truly an example of the Aristotelian idea that "that which is common … has the least care bestowed on it." Any real solution to the problem will not involve the supply of more water but rather must focus on the use of less water and more efficient use of water withdrawals (Spoor 1998, 425). It is only through cooperative and streamlined initiatives at the local, national, regional, and international levels that any progress will be made to prevent the exacerbation of this ever-worsening crisis and to sustain the ecology, development, and security of the entire region. Further delays will likely result in severe consequences for the health, societies, and economies of the people of Central Asia, ultimately posing a threat to their entire existence.

CONCLUSION

Rivers and Seas are the gifts given by God; everyone is responsible for the protection of them. In order to at least mitigate the current situation of Aral Sea, Effective collaboration and assistance is undoubtedly significant to be started between riparian countries (Tajikistan, Uzbekistan, Kyrgyzstan, Turkmenistan and Kazakhstan). In addition, these countries are responsible to invite Afghanistan to take part in finding solutions and taking effective actions to mitigate the Crisis of Aral Sea. This is because 39% of the Amu Darya River flows in Afghanistan, which is the most important source of Aral Sea. Furthermore, one of the best approaches that works best is the public awareness program. It is essential to raise and hold public awareness programs for all people of the riparian countries, specifically the farmers who are in direct contact with water and teaching them the effective ways of cultivation so that understand the importance of water and the scientific methods of

water efficiency in agriculture. By implementing these policies, we will witness mitigating the current disastrous condition of Aral Sea.

ACKNOWLEDGMENT

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