XI. The ‘Power of Water’ in a Divided Central Asia

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ABSTRACT

In the not-too-distant future, the former Soviet Central Asia could be confronted with resource-based conflicts or even, as some observers have suggested, with a “water war.”* Water is the scarce commodity in a region that is rich in oil, gas, and mineral resources. Most of the water comes from two rivers, the Syr Darya and the Amu Darya. These feed the Aral Sea, previously the fourth largest inland fresh (actually brackish) water reservoir in the world. These rivers and their tributaries, together, form the Aral Sea basin. Since the 1960s, the Aral Sea has shrunk rapidly in surface area and in volume of water, representing “one of the world’s worst ecological disasters.” Increased demand for water for irrigation and hydroelectric power by the competing newly independent states, both upstream and downstream, is a potential source of interstate and even interethnic conflict. The latter could occur in the densely populated Ferghana Valley, where various countries such as Kyrgyzstan, Tajikistan, and Uzbekistan share common borders.

Introduction

During the past decade of transition, the newly independent Central Asian States (CAS) have been unable to tackle the root causes of the desiccation of the Aral Sea. This seemingly irreversible process has continued as the total irrigated agricultural acreage has expanded and

*“Water Wars” is the title of a series of short video documentaries produced by the BBC dealing with conflicts over water in the Colorado River Valley, the Jordan Valley, the Volga River, and the Aral Sea Basin (1991).
hydroelectric power generation has increased. The upstream “supplier” countries, such as Kyrgyzstan, Tajikistan, and Southeastern Kazakhstan, and the downstream “user” countries Turkmenistan, Uzbekistan, and Southwestern Kazakhstan, are increasingly finding themselves competing for the scarce resource of the region. Hydroelectric power is particularly important for Kyrgyzstan and Tajikistan, which have no hydrocarbons.
Competition for water comes mainly from agriculture, which is dominated by the cotton crop.

Cotton is a crucial foreign currency earner and a major provider of employment, especially in Turkmenistan, Uzbekistan, Tajikistan, and Southwestern Kazakhstan. Indiscriminate use of water for cotton since the early 1960s has led to the drying out of the Aral Sea and is causing severe environmental problems, such as climate change, soil and water salinity and air, soil and water pollution. The rapidly growing population in the downstream countries, increasing impoverishment in rural areas and the “economic nationalism” that the authoritarian regimes of Central Asia tend to pursue at the expense of regional cooperation are further ingredients for possible tension, social instability, and conflict.

This article will situate these developments in a political economy framework, departing from the Soviet legacy of forced cotton production, which will be analyzed in the second section. It emphasizes that water is an increasingly scarce resource that is under pressure from a variety of economic interests, including agricultural production and hydroelectric power generation. Environmental interests in the form of biodiversity, improved livelihoods of the Central Asian population, and the “voice” of the Aral Sea itself are underrepresented and are losing out.

The third section examines the environmental degradation of the Aral Sea basin in more detail. The drying out of the Aral Sea is having far-reaching consequences for the climate and biodiversity of the surrounding regions, while desert winds are transporting sand and salt over long distances, depositing millions of tons of (often polluted) salts on agricultural land all over the basin area. Due to inadequate and badly maintained drainage systems, water logging is widespread and soil salinity is an increasing environmental problem. The worsening ecology of the region makes living in many areas—such as Karakalpakstan in Uzbekistan and Kyzlorda in Kazakhstan, where poverty and environmental degradation are linked in a vicious downward spiral—quite inhospitable.

The fourth section discusses the institutional framework in which water is managed in the region. A transition has taken place in which the centralized allocation of water by the Ministry of Land Reclamation and Water Resources (Minvodkhov) in Moscow via the Ministries of Water of the five Soviet republics has now been replaced by a new situation following the collapse of the Soviet Union. Since then, upstream and downstream countries must jointly allocate water resources. In the early 1990s, new institutions have been created to oversee this process, and each year agreements are negotiated at presidential level specifying the volume of water that is allocated to each country. At micro-level, there has been little change, except in Kyrgyzstan and Kazakhstan, where Water
Users’ Associations (WUA) have been introduced in various regions. In Uzbekistan and Turkmenistan, the main “water user” countries, water is still centrally allocated and managed in the absence of reforms at local level. The principle of “use it or lose it” which was the outcome of centrally planned water allocation, is still in force as there are no sanctions against misuse or incentives for conserving water (Lerman, Garcia-Garcia, and Wichelns 1996: 170).

The final section argues that the environmental situation in the Aral Sea basin is critical. Continued water consumption at the current level and with a low efficiency ratio will lead to the further spread of soil salinity and the irreversible deterioration of the Aral Sea over the next decade. The power of water in a divided Central Asia, therefore may well lead to conflicts and tensions over an increasingly scarce resource within the context of a deteriorating environment in which water is critical. Although many in the region believe that water is “God-given,” the current environmental disaster is man-made, and only a reduced and more efficient use of the scarce resource, supervised by well-designed micro and macro-institutions and subject to interregional cooperation, will be able to turn the tide.

The Soviet Legacy of Water Management

Most of the area covered by former Soviet Central Asia consists of steppes and deserts. Ever since ancient times, settlements and agricultural activities have only emerged in the traditional oases, which are fed by rivers or underground water reservoirs. During the Soviet period, and especially during and after the forced collectivization of the early 1930s, much of the existing sustainable cropping patterns (using grains, cotton, and fruits) were altered and traditional water management was destroyed and replaced by large-scale surface irrigation systems.

Cotton had already been grown for a very long time, and irrigated areas in the Central Asian plains, such as the Ferghana Valley, were found to have comparative advantages in producing this “white gold.” However, since the 1940s and especially since the early 1960s, a cotton quasi-monoculture was introduced on the orders of Moscow (Spoor 1993). Central Asia, thus, increasingly became a peripheral region within the Soviet Union, producing raw materials for the center. Very little cotton processing was carried out in these Soviet republics, and most of the harvest was transported to the central and western parts of the country, where it was used as input for the textile industries. Cotton became a crucial commodity in the political economy of these republics, especially Uzbekistan, which developed into one of the largest cotton producing countries in the world. The power, and, ultimately, the fate of the political elites of some the SSRs (Soviet Socialist Republics) became dependent
on the success or failure of the cotton sector. Corruption, the over and underreporting of the cotton output and the forced organization of labor during peak periods became structural features of the economies of the Uzbek, Turkmen, and Tajik SSRs in particular.

Water was desperately needed to rapidly increase the cotton output of the Central Asian region, since hardly anything can grow without irrigation in the desert climate. Water was—or at least seemed to be—available in sufficient quantities, since the Aral Sea basin is blessed with two main river systems, the Amu Darya and the Syr Darya. The Amu Darya, which flows along the south side of the basin, is the larger of the two, with an average annual flow of 73.6 km$^3$, and a variation of between 47 and 108 km$^3$. Around 19 km$^3$ of this volume is generated in Afghanistan, which falls outside the scope of this article, but should play a role in the institutional development of water management in the Aral Sea basin. The famous Karakum canal that runs into Turkmenistan over a distance of more than 1,100 km substantially taps the Amu Darya. The Syr Darya River, which originates from the Naryn and Karadarya rivers that flow through the Ferghana Valley and then turns northwest into Kazakhstan, has an average annual flow of 38.8 km$^3$, with a variation of between 21 and 54 km$^3$. Both rivers emerge from the mountain areas of Kazakhstan, Kyrgyzstan, and Tajikistan, and are largely consumed in the downstream areas of Turkmenistan and Uzbekistan. This “differential access” is at the root of tensions concerning the use of this precious resource in the region.

The expansion of the cotton acreage caused an increasing volume of water to be diverted to agricultural irrigation. In the region’s largest cotton producer, Uzbekistan, the expansion of cotton cultivation was nothing short of spectacular. Starting from an acreage of 441,600 hectares in 1913, the cotton acreage grew from 1,022,600 hectares in 1940 to 1,427,900 hectares in 1960, and has since increased to even as much as 2,103,000 hectares in 1987 (Spoor 1993: 148).

Cotton became “king” in Uzbekistan, and to some extent also in Turkmenistan and Tajikistan (and to a lesser extent in southwestern Kazakhstan and Kyrgyzstan), and water was the essential ingredient in the success of this forced cultivation policy. The efficiency of water use is very low: canals are unlined, leakage is extremely high, and much of the water does not even reach the fields. As a consequence, progressively less water was available to replenish the Aral Sea, for which approximately 50 km$^3$ was needed annually to maintain 1960s levels. Very soon, only marginal quantities of water were still reaching the shores of what had once been the world’s fourth largest brackish inland water reservoir, and as a result, the Sea started shrinking rapidly in size and volume (see Table 1). In just 30 years (1960-1990), the Aral Sea shrank in surface area to only half
Table 11.1
The Chronology of Desiccation of the Aral Sea (1960-2010)

<table>
<thead>
<tr>
<th>Year</th>
<th>Average level (m)</th>
<th>Average area (km²)</th>
<th>Average volume (km³)</th>
<th>Average salinity (g/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960</td>
<td>53.4</td>
<td>66,900</td>
<td>1,090</td>
<td>10</td>
</tr>
<tr>
<td>1971</td>
<td>51.1</td>
<td>60,200</td>
<td>925</td>
<td>11</td>
</tr>
<tr>
<td>1976</td>
<td>48.3</td>
<td>55,700</td>
<td>763</td>
<td>14</td>
</tr>
<tr>
<td>1980</td>
<td>45.4</td>
<td>–</td>
<td>602</td>
<td>–</td>
</tr>
<tr>
<td>1985</td>
<td>41.5</td>
<td>45,713</td>
<td>468</td>
<td>–</td>
</tr>
<tr>
<td>1988</td>
<td>40.1</td>
<td>–</td>
<td>358</td>
<td>–</td>
</tr>
<tr>
<td>1990</td>
<td></td>
<td>36,500</td>
<td>330</td>
<td></td>
</tr>
<tr>
<td></td>
<td>large sea</td>
<td>38.6</td>
<td>33,500</td>
<td>~30</td>
</tr>
<tr>
<td></td>
<td>small sea</td>
<td>39.5</td>
<td>0,000</td>
<td>~30</td>
</tr>
<tr>
<td>1993</td>
<td>37.1</td>
<td>33,642</td>
<td>300</td>
<td></td>
</tr>
<tr>
<td></td>
<td>large sea</td>
<td>36.9</td>
<td>30,953</td>
<td>~37</td>
</tr>
<tr>
<td></td>
<td>small sea</td>
<td>39.9</td>
<td>2,689</td>
<td>~30</td>
</tr>
<tr>
<td>1998</td>
<td>34.8</td>
<td>28,687</td>
<td>181</td>
<td>~45</td>
</tr>
<tr>
<td>1999*</td>
<td></td>
<td>25,600</td>
<td>187</td>
<td></td>
</tr>
<tr>
<td></td>
<td>large sea</td>
<td>33.4</td>
<td>22,800</td>
<td>59</td>
</tr>
<tr>
<td></td>
<td>small sea</td>
<td>39.4</td>
<td>2,700</td>
<td>19</td>
</tr>
<tr>
<td>2000*</td>
<td></td>
<td>24,003</td>
<td>173</td>
<td></td>
</tr>
<tr>
<td></td>
<td>large sea</td>
<td>32.5</td>
<td>21,200</td>
<td>67</td>
</tr>
<tr>
<td></td>
<td>small sea</td>
<td>38.6</td>
<td>2,700</td>
<td>17</td>
</tr>
<tr>
<td>2010</td>
<td>(Scenario)</td>
<td>32.4</td>
<td>21,058</td>
<td>~124</td>
</tr>
</tbody>
</table>


Note: *The latest data for 2000 are slightly worse than the estimates made by Micklin (1992: 275).

The shoreline of the Aral Sea has withdrawn in some places by more than 100 km, which means that towns such as Muynak (Uzbekistan) and Aralsk (Kazakhstan), which were built with sea-side promenades, are now in the middle of the desert. Due to the continued evaporation and the

its original size (from 66,900 to 36,500 km²), and its volume went down to a third (from 1,090 to 310 km³). By the year 2000, this volume was less than a quarter of what it had been in 1960. The latest data on the Aral Sea are close to, and even slightly worse than, the estimates for 2000 made by Micklin (1993) in the early 1990s (P. 275). The scenario that was calculated for 2010 suggests a somewhat slower process due to the smaller water surface. However, a recent satellite photograph from Uzbek Hydromet Services (July 26, 2002) is close to the scenario for 2010 given in Table 1.
insufficient inflow of river water, the Aral Sea is not only disappearing and splitting into three different smaller areas (northern, western, and eastern), but it is also becoming a saline sea in which most of the fish population has since died out. Figure 2, which is based on satellite photos and other data, shows the shrinkage of the Aral Sea. Based on current data, it also projects a scenario for 2010, which takes into account the fact that this shrinkage will slow down as less water evaporates due to increased salinity and the substantially smaller water surface.

The data presented above shows that the drying out of the Aral Sea did not stop or decelerate during the decade of transition. Clearly, the newly independent countries of former Soviet Central Asia were primarily concerned with their own survival; employment and the generation of foreign currency for Uzbekistan, Turkmenistan, Tajikistan, and the
Table 11.2
Irrigated Land and Water Use in Central Asia (1990-1999)

<table>
<thead>
<tr>
<th>Country</th>
<th>Actual Water Use</th>
<th>Irrigated Areas in the Basin (x1,000 ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kazakhstan</td>
<td>11.9</td>
<td>10.9</td>
</tr>
<tr>
<td>Kyrgyzstan</td>
<td>5.2</td>
<td>5.1</td>
</tr>
<tr>
<td>Tajikistan</td>
<td>13.3</td>
<td>13.3</td>
</tr>
<tr>
<td>Turkmenistan</td>
<td>24.4</td>
<td>23.8</td>
</tr>
<tr>
<td>Uzbekistan</td>
<td>63.3</td>
<td>58.6</td>
</tr>
<tr>
<td>Total</td>
<td>118.1</td>
<td>111.7</td>
</tr>
</tbody>
</table>

Note: The two data sets do not coincide for the earlier years. Moreover, the ICWC reports that all countries, especially the downstream ones, withdrew more water than was allocated to them.

southwestern regions of Kazakhstan and Kyrgyzstan very much depended on cotton. Politically there was no choice, even if the governments had wanted to embark on a more sustainable resource management path, other than to keep most of the cotton production intact, while even expanding irrigated areas, mostly for grain production (Table 2).

As can be seen from Table 2, the irrigated area in the five Central Asian countries increased in the space of a decade from 7.5 to 8.1 million hectares. The expansion of the irrigated acreage in Turkmenistan, even though water consumption remained unchanged, can be explained by the introduction of new grain-producing areas that use less water per hectare. The tendency to expand irrigated areas, which can be seen in the 1990s, is expected to continue. According to a recent report by the International Crisis Group (ICG), Turkmenistan intends to increase its irrigated acreage by 450,000 hectares over the next few years, Kyrgyzstan by 230,000 hectares, and Tajikistan by 500,000 hectares. Not only will this expansion put more pressure on water resources but also a rising ground water table will also occasionally cause problems in the adjacent provinces of neighboring countries (ICG 2002: 3-4).

While water allocation has gradually been decreasing, it was reported that actual water consumption has been going up. The last two years, 2000-2001 (not shown in the table), were years of extreme drought, with a strongly reduced water availability and consumption, causing repeated loss of crops and increased poverty in areas such as Karakalpakstan, Kashkadarya, and Khorezm in Uzbekistan and Dashkhovuz in Turkmenistan. These areas received only very small shares of their water allocations, with disastrous consequences for their agricultural sectors. In 2001,
The farmed acreage in Karakalpakstan fell by 44%, and there was an 80% reduction in grain output (ICG 2002: 22).

The twin competing demands for water by agriculture and hydroelectric power have not been contained over the past decade. Water use for agriculture has remained more or less constant, although there has been a shift in the crop mix of the downstream countries, with a slight reduction in the cotton acreage and a strong expansion in wheat, targeted towards self-sufficiency in wheat production. In 1990, the overall cropping pattern for the five Central Asian countries was 40% for cotton and 7% for wheat, while in 2000 this had shifted to 35% for cotton and 30% for wheat (World Bank 2001: 18). This shift involves no reduction in water demand; since wheat is grown using less water per hectare than cotton, the positive impact of the shift is cancelled out by increased water leaching to combat soil salinity and the further deterioration of irrigation systems in the 1990s due to lack of investment. The consumption of water is highly inefficient. Cotton requires around 13,000 m³/ha, which is substantially higher than in other cotton-producing countries. Land has been used for cotton growing for several decades in a row, with no crop rotation or fallow periods, since irrigated land is extremely limited and pressure to comply with centrally planned output was high. Furthermore, on-farm and off-farm drainage systems are usually weak or nonexistent, which means that water logging is an ongoing problem, thereby increasing soil salinity (see next section).

Environmental Degradation in the Aral Sea Basin

There is a close link between environmental degradation and water, since water is often the “cause and cure” of many environmental problems. In Uzbekistan, for example, the complexity of the water system can be seen from its sheer size. The availability of water resources for sectors within the Uzbek national economy (mainly agriculture, but also industry and human consumption) depends on the operational reliability of a complex water management system. This consists of 5 regional and 53 national reservoirs, primary and inter-farm canals with a total length of 28,000 km, a drainage infrastructure and 1,465 pumping plants with 4,942 pumps supplying water to 2.3 million hectares of irrigated land. Surface irrigation systems are used to irrigate cotton 2 million tans of land. Many of the water management systems, however, are old and well beyond their service lifetime.

There are many environmental problems in the Aral Sea Basin, some of which are serious in themselves, some of which affect the current state of the Aral Sea, and others that are an indirect spin-off of the drying out of the Sea. Clearing, from the start of this analysis, water is not actually in short supply, but its highly inefficient use causes shortages during various parts of the year, especially in regions within the downstream countries.
In the 1970s and early 1980s, a mega-plan was drawn up to divert the north Russian Ob and Irtysh rivers through the steppes of Kazakhstan and into the Central Asian heartland over a distance of 1,500 km. This idea originated in Moscow and was supported by the Central Asian countries, where the local elites saw the advent of Siberian water as a panacea for their emerging problems. However, the plan was shelved after Gorbachev came to power. Not only was there less support for providing Russian water to “Islamic” Central Asia, but it would also have caused environmental disaster elsewhere, as pointed out by the increasingly vocal Russian environment movements. Interestingly enough, the option to divert Siberian waters to Central Asia never completely disappeared from the minds of the policymakers. Even in UNESCO (2000), the plan is still being mentioned as a possible way of redressing water levels in the Aral Sea.¹

The environmental problems in the Aral Sea basin are as follows. First, a growing proportion of irrigated land in Central Asia is now more or less saline. The major cause of this should be sought in the lack of crop rotation, since in most places, cotton has been a monoculture for many decades. Furthermore, inadequate and archaic drainage systems cannot handle the serious problems of water logging and the upward flow of minerals. It can therefore be argued that there is a salt crisis as well as a water crisis in Central Asia. Soil salinity tends to reduce agricultural yields and to increase water consumption, since farmers get into the habit of water leaching to wash the soil, which consumes large quantities of water at the start of the season.

Salinity is even more severe in the downstream areas of the basin, since the rivers and drainage wash down salt canals, and there is hardly any natural drainage in these relatively flat areas. Table 3 shows that soil salinity increases from south to north in the basin. The upstream countries Kyrgyzstan and Tajikistan have low rates of salinization, while severe soil salinity is seen in the lower reaches of the Amu Darya (Khorezm, Karakalpakstan, and Kashkadarya in Uzbekistan, and Turkmenistan), the Syr Darya (Southern Kazakhstan), and the Zerafshan rivers (Bukhara in Uzbekistan). The regional disparities are quite wide, from 90-94% of the land in the Karakalpakstan, Khorezm and Bukhara provinces of

¹In March 2002, there appears to have been some joint Russian-Uzbek interest in reviving the plans. For the Uzbek government, it would provide easy access to additional water resources, while for the Russian government it could mean a “new lever of influence.” However, it is questionable, taking into account the enormous investment costs involved and the possible environmental impact, whether these reports should be taken seriously (ICG 2002: 27). A “design and science” lobby with the aim of milking donors and producing feasibility reports has also driven the mega-project.
Table 11.3
Soil Salinity of Irrigated Lands (1999 Level)

<table>
<thead>
<tr>
<th>Basin/Country</th>
<th>1999 Irrigated Area (x1,000 Ha)</th>
<th>None 0-2</th>
<th>Slight 2-4</th>
<th>Moderate 4-8</th>
<th>Severe 8-15</th>
<th>Very Severe &gt;15</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Syr Darya Basin</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kazakhstan*</td>
<td>786</td>
<td>157</td>
<td>330</td>
<td>199</td>
<td>84</td>
<td>16</td>
</tr>
<tr>
<td>Kyrgyzstan</td>
<td>424</td>
<td>302</td>
<td>110</td>
<td>7</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Uzbekistan</td>
<td>1,876</td>
<td>797</td>
<td>618</td>
<td>332</td>
<td>115</td>
<td>14</td>
</tr>
<tr>
<td>Total</td>
<td>3,086</td>
<td>1,257</td>
<td>1,058</td>
<td>537</td>
<td>203</td>
<td>32</td>
</tr>
<tr>
<td><strong>Amu Darya Basin</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tajikistan</td>
<td>747</td>
<td>467</td>
<td>219</td>
<td>44</td>
<td>14</td>
<td>2</td>
</tr>
<tr>
<td>Turkmenistan</td>
<td>1,714</td>
<td>53</td>
<td>376</td>
<td>847</td>
<td>389</td>
<td>49</td>
</tr>
<tr>
<td>Uzbekistan</td>
<td>2,372</td>
<td>650</td>
<td>867</td>
<td>592</td>
<td>228</td>
<td>35</td>
</tr>
<tr>
<td>Total</td>
<td>4,832</td>
<td>1,170</td>
<td>1,462</td>
<td>1,482</td>
<td>632</td>
<td>86</td>
</tr>
<tr>
<td><strong>Aral Sea Basin</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>7,919</td>
<td>2,427</td>
<td>2,520</td>
<td>2,020</td>
<td>834</td>
<td>118</td>
</tr>
</tbody>
</table>

Note: *1994 values; **Average root salinity in dS/m (deci-Simens per meter). The total irrigated areas of various countries given by the FAO are not precisely identical to those reported by the World Bank, especially for Tajikistan. The differences (191,000 ha in total) remain unexplained.

Uzbekistan is salinized compared to 60-70% in Kashkadarya province and only 5% in Samarkand province.2

There has also been a marked increase in soil salinity in the downstream “user” countries in the 1990s during the first decade of transition (see Figure 3). This increase has been estimated as 30% for Uzbekistan, 24% for Turkmenistan, and 18% for Kazakhstan, while in Kyrgyzstan and Tajikistan, soil salinity has diminished (World Bank 2002: 10-15).

Soil salinity might seem to be “merely” a technical problem, yet it has major social and economic consequences. Salinity can negatively affect crop yields and, hence, the income of farm households. It is known that only tolerant plants will grow satisfactorily on soils with moderate salinity. On severely saline soils, only a few highly tolerant plants will flourish. If soil salinity is above a certain threshold value, yield losses can easily range between 10-50 percent.

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2 The severe environmental problems in a relatively new area such as Kashkadarya, where much of the agricultural land was taken into production in the 1970s, were visible during a field visit by the first author of this article. He was part of a UNDP mission to Uzbekistan on Macroeconomic Policy and Poverty Reduction in September 2002.
Figure 11.3. Land salinity Uzbekistan and Turkmenistan.

Apart from increased soil salinity, the downstream river water is also increasingly saline, which affects agricultural yields and the quality of water in the aquifers. Average salinity levels are 0.45-0.60 g/l in the upper reaches of the two rivers. In the southern Amu Darya, water salinity increases in the middle and lower reaches (0.60 g/l in Termez, on the border between Uzbekistan and Turkmenistan, and 1 g/l near the Aral Sea). In the northern Syr Darya, it is even slightly higher: 1.1 g/l at the outlet of the Ferghana Valley, rising to 1.4 g/l further on (World Bank 2001). Most of the salt in the river comes from the drainage systems that discharge irrigation water back into the river, while the rest is deposited in desert “sinks.” The total amount of salt transported in the two rivers has increased from 55-60 million tons in the mid-1960s to 135-40 million tons in the 1990s (Ibid). Finally, water pollution is caused not just by salt but also by nutrients. The intensive use of fertilizers and pesticides in cotton production, which has diminished during the 1990s, mainly for financial reasons, caused severe chemical pollution of the rivers in the basin with high concentrations of several toxic substances (Spoor 1998).

Second, the smaller quantities of water that actually flow as far as the deltas of both main rivers and the aforementioned increased water salinity in those areas have had devastating consequences for biodiversity. Part of the rich flora and fauna of these wetlands, which were also the breeding grounds for many birds and fish in the basin system, has disappeared. In the Amu Darya delta, the unique tugai forests have suffered enormously
UNESCO has estimated that around 30,000 ha of lakes and bogs have almost entirely dried out in the same delta. Much of the fish population in the Aral Sea itself has died out, with of course dramatic consequences, of cause, for the populations of the surrounding towns, which were largely dependent on catching fish. Again, loss of biodiversity is far from being an abstract issue in that it has had very negative consequences on employment, income generation, and health.

Third, as noted in Figure 2, there is a rapidly expanding area of exposed seabed in the Aral Sea. This is found on the shores as the Sea has shrunk, but also on the land that separates the deep western and shallow eastern sea, which consists largely of salt. With desert storms blowing during approximately three months per year, large quantities of salt are being deposited on surrounding agricultural lands. Because of desertification, windstorms move an increasing amount of salt in Central Asia, especially near the Aral Sea. An estimated 1.5-6.5 tons of particles per hectare, of which 260-1000 kg/ha is toxic salts, is transferred annually from the dried bed of the Aral Sea (an estimated 1.5 billion tons of salt covering 3.5 million ha) to an expanding area. Wind erosion also carries salts in areas such as the Central Ferghana Steppe. Bukhara Province in Uzbekistan receives a total of 300-400 kg/ha of salt-laden aerosols annually, of which 40-50% comes from the dried bed of the Aral Sea some 300 km distant away (World Bank 2002). This “salt pollution” not only has a negative impact on agricultural production, but also on human health. The number of cases of respiratory disease is relatively high, especially in the downstream areas close to the Aral Sea; this was referred to in the aforementioned BBC documentary as a form of “environmental AIDS.”

Fourth, the shrinking of the Aral Sea has contributed to climate change in the surrounding areas. The planting season has shortened, the number of frost-free days has decreased, and summer temperatures (in the desert) are slightly higher. Previously, the huge size of the Aral Sea helped to regulate temperatures, and its drying out has had a negative impact on this process.

There is a clear relationship between the environmental degradation of soil and water and the increased incidence of poverty, especially downstream of the basin, as mentioned earlier. The environmental stock/capita (Z/N, where Z = environmental stock, including water and land resources and N = the total population in a particular region) has dropped due to the deterioration of the first variable and an increase in the population in the downstream areas (Spoor 1998). As demand for water increases and supply either remains constant or diminishes due to competing use (hydroelectric power, for example, which has become crucial for Kyrgyzstan), tensions can mount between countries, as recently
occurred between Kazakhstan and Kyrgyzstan, and previously between Kyrgyzstan and Uzbekistan with regard to water management in the Ferghana Valley.

**Water Management, Institutions, and Reforms**

Centralized and regionally focused Soviet water management of the basin was abandoned in the wake of the collapse of the USSR. As UNESCO (2000) concluded in its *Water-Related Vision for the Aral Sea Basin for the year 2025*:

> Regional co-operation was needed to restore a basin-wide mechanism and perspective in water and salt management. Following the independence of the Central Asian republics in 1991, Soviet central authority over basin development gave way to that of five sovereign governments acknowledging distinct interests. Management of water resources came to be undertaken according to national perspectives. If the interests of water users were addressed somewhat inefficiently, the interests of the Sea, deltas and wetlands were nearly orphaned. (P. 19)

Indeed, with national interests prevailing, the voice of the Aral Sea, the anonymous sixth player in the field of Central Asia, became even weaker. However, new national and regional organizations appeared during the first decade of transition, which would fill the institutional vacuum that remained after 1991, at least at macro-level. In February 1992, soon after the independence of the five Central Asian states, a joint agreement was reached establishing an Interstate Commission for Water Coordination (ICWC), which became responsible for the water allocation for the five former Soviet states in the Aral Sea basin. Even so, there were still substantial weaknesses in the agreement, such as the failure to address the problem of water quality or the potential conflict situations that might arise.

A subsequent agreement was signed in March 1993, establishing regional organizations such as the Interstate Council on the Aral Sea (ICAS), an advisory body for the five regional governments, which had an Executive Committee and a Secretariat. An International Fund for the Aral Sea (IFAS) was also established to finance the activities of ICAS, and in 1994, a Sustainable Development Commission (SDC) was formed, which focused on environmental protection and socioeconomic development (UNESCO 2000: 51). A few years later, ICAS and IFAS were merged to form a new IFAS, supported by a high-level board of deputy prime ministers.

The water management of the two main rivers at basin level is undertaken by two Water Basin Associations (*Basseynoe Vodnoe Ob’edinenie*, the Amu Darya BVO and the Syr Darya BVO). These organizations, which had existed since the 1980s, were given the complex task of
managing the same water resources in a basin that was now covered
by five newly independent countries (and one that is not represented,
namely, Afghanistan). The Amu Darya BVO has under its mandate the
water resource systems of the Pyandj Vaksh, Kafirnigan, and Amu Darya
rivers from their source to the Aral Sea, including distribution facilities,
pumping systems, canals, communication infrastructure, and power supply
installations. It has offices in Kurgan-Tyube (Tajikistan), Turkmenabat
(Turkmenistan), Urgench (Uzbekistan), and Tahkiaiash (Karakalpakstan
in Uzbekistan). The Syr Darya BVO manages the flow of the Naryn,
Karadarya, Chirchik, and Syr Darya rivers up to the Chardara reservoir.
It has offices in Tashkent, Charvak, Gulistan, Chirchik, and Uchkurgan
(Uzbekistan). Finally, there is a separate Aral Syr Darya BVO, which is
a purely Kazakh agency with offices in Kyzlorda and Shymkent (both in
Southwestern Kazakhstan). The BVOs do not control or manage drainage
as this falls under the responsibility of the national water authorities, while
local drainage and desert sinks are managed by local institutions.

Apart from the complex and differentiated jurisdiction of the BVOs,
their main problem is that agreements do not have the status of
international law, and that they themselves are not even recognized
by national legislatures, which means that they lack authority over the
national use of resources (Horsman 2001: 73). Shortage of funding
has also hampered their operational capacity. Funding obligations are
linked to water allocation shares, but it seems that only Uzbekistan
and Turkmenistan have complied regularly in recent years. Most of
the financial contributions are used for direct operational costs, and
insufficient quantities are left for capital repairs or replacement investments.
During the 1990s, there was therefore a steady deterioration in the water

IFAS was supposed to be financed by annual budget allocations of 1% of
each individual country’s GNP. However, although these allocations were
later reduced to 0.3% for Kazakhstan, Turkmenistan and Uzbekistan, and
to 0.1% for Kyrgyzstan and Tajikistan, the countries have been very slow
with their payments, thereby limiting IFAS' financial capacity (Horsman
2001: 73). Moreover, during the Almaty Summit of Heads of State in
February 1998, it was agreed that the funds set aside to tackle the Aral
Sea crisis would be utilized on their individual territories and they would
not transfer funds to the central IFAS account.

Throughout the decade, the five Central Asian presidents have at various
times promised closer cooperation and a future sustainable management
of water (and environmental) resources in the region, such as in Nukus
(Karakalpakstan) in 1995, and also most recently in Dushanbe (Tajikistan)
in October 2002. Nevertheless, tensions have remained between the
countries, especially between those upstream and downstream, and also between the two main user countries, Turkmenistan and Uzbekistan. At the end of the first decade of transition, the five Central Asian presidents signed the Ashgabad Declaration (April 9, 1999), in which they clearly acknowledged the need “to work out joint measures for the realization of a regional strategy and concrete actions for the rational use of water resources of the region, based on an ecosystem approach and integrated principle of water management” (UNESCO 2000: 53).

The Ashgabad Declaration reflected an important foundation of regional cooperation. However, in reality, the political economy is inwardly focused, and national interests weigh more heavily than transboundary ones. In an interview in Kazakhstan, the then ICAS/IFAS chairman Almabek Nurushev asked:

Who will have the bravery to tell the farmers: ‘reduce production and perish’? It will take quite some time to have rational production systems, where instead of cotton and rice, in some places the farms will produce wine and other products. Nevertheless, currently all states want to be independent in the production of grains, although nature defines the production of which commodities can be grown in each place. In fact, it is too hot during the summer in Turkmenistan and Uzbekistan to produce grains. At the same time, cotton is the foreign exchange earner. The question is a very important one, and has to be faced in the very near future. (Spoor 1998: 427)

Clearly, it is precisely this scenario that unfolded in the following years, with no concomitant reduction in overall water use. Institutional arrangements for water management have not changed in the downstream countries Turkmenistan and Uzbekistan. Irrigation is carried out mainly by gravity methods. The water supply is organized through planned allocations, mostly to the existing and predominantly shirkat farms, the successors of the former sovkhozy and kolkhozy. Only very small water charges have been introduced, and these are nowhere near enough to finance the costs of operation and maintenance. One example of these symbolic payments was given by Wegerich (2000: 5), who noted that a Water Users’ Association in the Syr Darya oblast paid a water tax of 0.11 Soum/m³, while, according to Uzbek experts, the real price of water was 0.9 Soum/m³.

3 Since both countries are highly dependent on the Amu Darya (Turkmenistan is entirely dependent), they compete for water consumption for the same economic activity, namely, cotton. There are many places where tensions can arise, such as in the Kashkadarya pumping cascade, which takes water from Turkmenistan through a series of pumps to southwest Uzbekistan. The World Bank has a project in place to renovate the cascade, but a final decision to implement has not yet been reached between the two countries. Another contentious issue is a large drainage canal leading from Urgench (Uzbekistan) into Southwestern Turkmenistan.
A new externally funded project, “Integrated Water Resources Management in the Ferghana Valley,” will introduce WAUs to pilot areas, using the experience gained by these local institutions in Kyrgyzstan and Kazakhstan over the past five years (Dukhovny 2002). However, it should be noted that agricultural reform in Turkmenistan and Uzbekistan is far less advanced than it is in neighboring countries, which makes locally or even privately managed water systems more problematic. Early experiments with WAUs in Uzbekistan were complicated by the fact that much of the farm produce (cotton and wheat) was still covered by the obligatory state order system. As a result, farms and even “private farmers” (Spoor 2003, forthcoming) still have little room for maneuver when it comes to deciding the allocation of inputs and the choice of crop mix, and this makes it almost impossible to provide incentives for water savings.

The current irrigation and drainage infrastructure is in a fairly shaky state, since for many years now hardly any investments have been made. Many of the irrigation canals are unlined (i.e., 34,200 of the total 47,700 km), causing a high level of seepage. A recent survey of farms in Uzbekistan found that 60% of the water supplied to them did not reach the fields, and it characterized the deficiencies in management, leakage, and similar losses as very significant (World Bank 2001: 21). On-farm drainage systems in the Basin are in an even worse state, and drainage canals are filled with weeds and silt due to insufficient cleaning. Finally, one aspect that is often forgotten is the high cost of irrigation in the newly developed agricultural areas, where cascades of water pumps sometimes have to bring water up to levels of 100-200 meters. Since the pumps are often old, electricity costs have gradually risen.

As indicated above, much still needs to be done to improve cross-border water legislation and the legal acceptance of regional agencies making decisions concerning water allocations and conflict management. However, fundamental institutional change also needs to be based on an appropriate national legal framework, a clear definition of property and user rights, the introduction of the “polluter pays” and “beneficiary pays” principles, and water pricing.

In Uzbekistan, the latter will be introduced on a two-phase basis. Payments for irrigation in the agricultural sector will be introduced in two stages. During the first stage (2002-2004), producers who are not within the state order system (of cotton and wheat) will begin paying. By the end of this period, 30-35% of the costs of irrigation will be covered, while during the following stage (2003-2005) all producers (and therefore consumers of water) will have to be covered. By the end of the period, only 15-25% will still be compensated.
Economic mechanisms for conserving water in different sectors of the economy will take the form of fines for the excessive use of irrigation water (compared with the allocated volume) and the establishment of special incentive funds (using a portion of the water fees) to encourage the reduction of water use per hectare. However, the effectiveness of these measures will depend largely on the progress in agrarian reform, since the shirkat farms are currently still entangled in systems of obligatory procurement for cotton and wheat with low administrative prices, political interference, and “missing markets.”

**Conclusion: Cooperation or Conflict over Water?**

There is no doubt that the seriousness of the Aral Sea environmental disaster has now started to penetrate the minds of the Central Asian authorities. However, this is clearly not enough, given that their response is confined to strictly defined national interests. The planned reduction of water quota allocated to the countries in the Basin (as agreed in 1993) has not really materialized, since irrigated areas are still being expanded and water efficiency has worsened rather than improved. As analyzed above, there is also what can be termed the “salinity trap,” namely, that agricultural enterprises in areas with increased salinity will start leaching farmland, thereby using more water than before and entering into a vicious circle of environmental degradation. Moreover, current water allocation quotas are not much lower than they were before independence and the volume of water reaching the Aral Sea shores is still negligible—and in the dry years 2000 and 2001, it was in fact nil. The drying out of the Sea therefore seems to have entered into a stage that will be irreversible if no dramatic changes are made at national and regional level, and especially at the macro- and micro- and the transboundary basin level.

A continuation of the water shortages, the increased soil salinity, the drying out of the Aral Sea and its disastrous environmental spin-offs (salt storms, climate change, diminished biodiversity, worsening human health conditions) can also fuel tensions between (and within) countries. In the mid-1990s, some analysts were already warning of possible resource-based conflicts. And while new institutions and organizations have replaced the central plan directives from Moscow, the potential for future conflict remains:

In Central Asia, regional tensions may be enhanced by current water allocation practices. In recent years, Central Asia has experienced an increase in irredentist activities and inter-ethnic conflicts. Competition over natural resources may intensify such irredentist sentiments, with some viewing escalating future inter-ethnic confrontation in Central Asia as being driven in part by water allocation problems. (Smith 1995: 333)
Horsman (2001) notes that there are various examples of recent conflicts between the Central Asian states. For example, in 1998 Kyrgyzstan concluded agreements with Kazakhstan and Uzbekistan to release water for cotton irrigation in these (downstream) countries instead of keeping more for the generation of hydroelectric power. This water was traded for energy supplies (coal, gas, and mazout, a concentrated oil product). However, in 1997-98 there were fierce conflicts over these “water-energy swaps,” which led to harsh words between governments and threats to cut off supplies. Following insufficient (or non-timely) “payments” in these barter agreements from the Kazakh and Uzbek side, the Kyrgyz decided to keep more water in the main Toktogul Reservoir during the summer. This caused water shortages in the downstream areas during the peak period in the irrigation season.

In the winter, more water was released due to increased electricity production, causing winter flooding in the western part of the Fergana Valley and further downstream along the Syr Darya River. The vicious circle was then completed when the Uzbek government retaliated by cutting the gas supply during the winter of 1999-2000. Finally, in July 2000, there was a serious shortage of water in Southern Kazakhstan (Shymkent and Kyzlorda, where most of the cotton is grown) when Kyrgyzstan cut supplies (because Kazakhstan was not keeping its side of the water-energy swap agreement), and Uzbekistan used more water to combat a severe drought. Although the energy-water swaps were a first step towards multilateral management and agreement, it seems that much of the bilateral accords failed due to default. Lack of trust is also typical of the fate of these agreements, which follow the perverted logic of a prisoner’s dilemma. The costs of individual behavior (speculating on the noncompliance of the partner or opponent) are higher than in the case of transparent cooperation.

There are also disputes concerning the Amu Darya, notably between Uzbekistan and Turkmenistan. These disputes primarily involve new plans and infrastructure being developed in one country and being viewed with suspicion in the other. In 2000, Turkmenistan began the construction of a huge desert sink known as Golden Century Lake. The Turkmen maintain that it will be filled only with drainage water, but the Uzbek suspect that in the future, the lake will also take more water from the Amu Darya, thereby reducing the Uzbek allocation, while more water to this lake will also mean that there will be less available for the Aral Sea. The project also appears to have an ethnic or irredentist connotation, since it has been reported that a large number of ethnic Uzbeks in Turkmenistan will be resettled in the Karakum desert (ICG 2002: 25-26).
Another problem is that when the civil war ended, Tajikistan claimed that it had a very small share of the water in the Amu Darya and that it intended to increase this allocation. It wants to expand its irrigated acreage and needs water to do so. Tajikistan is also seeking international finance to complete the Rogun Dam on the Vakhs River. This would bring it into conflict with Uzbekistan since a new large reservoir would put Tajikistan completely in control of the water supply to Uzbekistan. In view of the balance of power in the region, the latter will never allow this to happen. Finally, now that Afghanistan is entering a new era of peace and reconstruction, it will need water to develop its own agricultural sector. In the near future, it is therefore likely to demand new allocations of water, mainly from the Panj River. Once again, it is Uzbekistan that will suffer if Afghanistan uses more water (ICG 2002: 27), which could, therefore, give rise to new tensions.

In spite of the bellicose language that is bandied around, and even the threat of military intervention, Horsman (2001) does not believe that there will be an armed conflict since, in all these cases, the governments have reached a compromise and negotiated a solution. Even so, these water resource-based tensions seem to occur increasingly more often. Closer international cooperation between the Central Asian countries is crucial for diminishing these tensions, especially if each country is prepared to relinquish some its national authority to transboundary-based regional water and environmental agencies, which can then operate under international water and environmental law. International assistance also remains crucial, as noted by Hogan (2000):

> Central Asia has not ignited in the wide-scale resource war that some experts predicted. Early intervention—and large side payments—by international donors may stave off conflict in the near term. Nevertheless, as long as the region's leaders insist on making unilateral decisions that affect their neighbors, water will still remain a potential source of conflict in Central Asia.

The tendency to conclude agreements and resolve conflicts in a bilateral rather than a multilateral setting, especially by Turkmenistan and Uzbek-

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4 Tajikistan already controls around 40% of the flow of the Amu Darya, through the Nurek Reservoir. It now wants to build a hydroelectric power station near this dam (at Sangtuda). The Uzbek government is not against the plan, but it is highly critical of the Rogun Reservoir plan. It may simply be that the costs are prohibitive and international donors—who are already wary of large dam projects—see the project as potentially sensitive.

5 He noted (2001: 76) that it was reported in 1996 that Uzbekistan had drawn up tactical plans to take the Toktogul Dam by force. While this was never confirmed, it is not impossible, since part of its water supply passes through the reservoir on Kyrgyz territory, and this is seen as a matter of national security.
istan, is not a good sign. However, the improvements made in the functioning of the regionally operating BVOs and other agencies, with the assistance of multilateral and bilateral donors, are moderately promising. The main bottleneck remains the fact that all the Central Asian governments, especially those of the downstream countries, remain very strongly focused on their own national interests and are reluctant to make compromises in this seemingly zero sum game. Current debates are still dominated by technical solutions and ignore the fact that only institutional and political change can contain the environmental crisis and potential conflicts.

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It is seemingly a zero sum game since the available water supply could substantially increase following an improvement in water efficiency (through water savings, for example).

Unfortunately, the debate was recently fueled by a technocratic and not very realistic UNESCO (2000) report, which presented a Water Related Vision for the Aral Sea for the year 2025.

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