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Water Conflict and Cooperation in Central Asia

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The numerous rivers that meander through Central Asia's rugged terrain of mountains, steppe and desert have for centuries shaped its socio-political and economic landscape. As different rulers have sought to demarcate political borders and establish varied systems of governance, water continues to link the diverse populations that now inhabit the newly independent Central Asian states of the former Soviet Union -- Kyrgyzstan, Kazakhstan, Tajikistan, Turkmenistan, and Uzbekistan.¹ Water also physically connects the Soviet successor states with their neighbors to the South, East and North. The Amu Darya or what once was referred to as the Oxus provides a vivid illustration. After originating in the mountains of northern Afghanistan and Tajikistan, the Amu Darya traverses the territory of Tajikistan before flowing downstream through Khorazm province in Uzbekistan and Dashhowuz province in Turkmenistan on its long journey toward the autonomous republic of Karakalpakstan, Uzbekistan before ultimately emptying into the Aral Sea. Historically, the intersection of rivers in Central Asia, such as the point where the Surkhan Darya enters the Amu Darya at Termez, has offered traders and pilgrims from India, Central Asia, and Russia a natural meeting place both to rest and exchange their wares (Soucek 2000, 12). Other rivers such as the Irtysh River encapsulate Central Asia's strategic location as a buffer zone between two of the world's largest countries -- China to the east and Russia to the north, as its course takes it from the Altai Mountains in Xinjiang province in western China into Kazakhstan and then northwest to join the Ob River near Khanty-Mansiysk in Russian Siberia. Similarly, the Ili River connects China with Central Asia, as its path takes it from Xinjiang province in western China through eastern Kazakhstan before emptying into Lake Balkhash -- a major landlocked body of water in Central Asia.

Surface water is the main source of drinking and agricultural water for the majority of Central Asia's inhabitants owing to the presence of mountain glaciers that supply a large volume of melt water in the spring months. For centuries, Central Asia's massive rivers have enabled both the sedentary and nomadic populations to inhabit and cultivate agriculture in the artificial oases that are sprinkled throughout the lower reaches of the Amu Darya and Syr Darya rivers (Khazanov 1992). Because Central Asia's climate is largely arid and its water resources are unevenly distributed, its main urban centers have arisen in close proximity to its rivers. For example, the Zarafshon that originates in Tajikistan has provided the main source of drinking water for the

¹During the Soviet period, these countries were, in fact, referred to as the Central Asian Republics (CAR) and Kazakhstan. After independence, Kazakhstan was also included in the definition of Central Asia. Afghanistan and western China are sometimes included as part of a more far-reaching Central Asia owing to the cultural, linguistic and religious similarities between the peoples.

majestic cities of Samarqand and Bukhoro that are located within Uzbekistan.² Yet at the same time, the dearth of water has contributed to the demise of other ancient communities. The Amu Darya did not always enter into the Aral Sea, but at one time flowed toward the Caspian Sea and supported the town of Old Urgench before it changed its course in 1576 and swerved back again toward the Aral Sea, resulting in Old Urgench's downfall (Soucek 2000, 7).

In short, water has for centuries been the main focal point for the Central Asia peoples, linking them physically, economically, and culturally. In fact, during the Soviet period, the region referred to as Central Asia largely coincided with the boundaries of the Aral Sea basin. However, when the Soviet Union broke up, new state borders ceased to coincide with the physical borders of the Aral Sea basin. Rather, the introduction of new political borders has transformed a large number of domestic rivers in the former Soviet Union into international rivers (e.g., Amu Darya, Syr Darya, Chu, Talas, and Zarafshon) and accordingly turned water into a source of potential interstate conflict. With the creation of the five independent Central Asian states, 18 transboundary rivers are currently shared between the Central Asian states and/or with its neighbors (See Appendix 1).

This background paper examines the potential for conflict and cooperation within Central Asia fifteen years after the Soviet Union's dissolution. First, it lays out the main axes of conflict that have emerged over water following the creation of five new sovereign nation-states. Second, it elucidates why early attempts at water cooperation have achieved limited success and provides insights into the underlying constraints that have precluded effective cooperation in Central Asia.³ Third, this paper suggests that successful water cooperation in the region will only emerge when the following issues are adequately addressed: energy, Afghanistan, cotton, and other water problems outside of the Aral basin. Finally, it concludes with a few recommendations for fostering water cooperation.

Central Asia's Water Resources

Central Asia is incredibly rich in water resources. Most of its rivers either drain into interior lakes or disappear into the desert through evaporation. Its two most well-known rivers are the Amu Darya (formerly called the Oxus) and the Syr Darya (formerly called the Jaxartes). They originate in the eastern mountains of Central Asia and then flow across the Kara Kum and Kyzyl Kum deserts, respectively, before emptying into the Aral Sea, a large terminal lake in the midst of the desert. The flow of the Amu Darya is 73 cubic kilometers per year and the flow of the Syr Darya is 37 cubic kilometers per year on average (Micklin 1991). The Aral Sea basin occupies approximately 1.8 million square kilometers, extending across Turkmenistan, Kyrgyzstan, Tajikistan, Uzbekistan, Kazakhstan, Iran and Afghanistan (Micklin 2000, 1). Approximately 83 percent of the basin resides in what was once part of the Soviet Union with the remaining percentage originating in Iran and Afghanistan (Micklin 2000, 1).

The Amu Darya is formed by the Panj River in Afghanistan and the Vakhsh River in Tajikistan and then continues into Uzbekistan and Turkmenistan and ultimately into the autonomous republic of Karakalpakstan in Uzbekistan before emptying into the Aral Sea. The Amu Darya

² Historically, Samarqand and Bukoro were more closely tied to Tajikistan owing to their large Tajik populations.

³ The Caspian basin is not discussed, as it is beyond the scope of this paper.

also receives a small contribution from the Kyzyl Suu, a small tributary in the southwestern part of Kyrgyzstan (FAO, <http://www.fao.org/ag/agl/aglw/aquastat/countries/kyrgyzstan/index.stm>). The Syr Darya is formed in the Tien Shan mountains in eastern Kyrgyzstan (known as the Naryn) and flows westward toward Uzbekistan through the Fergana Valley where it receives the Kara Darya near Andijon and then continues into Tajikistan near Khujand before it reenters Uzbekistan and passes by the capital Tashkent on its journey into Kazakhstan and ultimately emptying into the Aral Sea. The catchments of the following rivers also contribute to the Aral drainage basin: Zarafshon, Kashkadarya, Kafirnigan, Murghab, Tejen, Turgai, Sarysu, and Chu. The Zarafshon originates in the Pamir Mountains and then disappears into the Kyzyl Kum desert in Uzbekistan before reaching the Amu Darya. The Tejen with its small contribution to the Amu Darya basin forms the border between Afghanistan and Iran and then Iran and Turkmenistan before it disappears into the Kara Kum desert.

The Aral Sea basin essentially defines Central Asia's physical environment and political economy. In ancient times, Central Asia was often referred to as Transoxiana, which denoted the land between the two rivers (i.e., the Amu Darya and the Syr Darya). Until 1960, about 56 cubic kilometers of water flowed into the sea annually, but by the 1970s the Syr Darya no longer reached the Aral Sea and by the late 1980s the Amu Darya also ceased to flow into the Aral (Rakhimov 1990, 9). Massive water diversions for irrigated agriculture in the second half of the 20th century resulted in the desiccation of the Aral Sea and the calamitous pollution that still permeates the region. Where it once was the fourth largest lake in the world, by the late 1980s it had split into two separate water bodies – a "small" sea in the north and a "large" sea in the south. By 1991 sea level had fallen by about 15 meters, surface area had been reduced by one-half, and the volume had diminished by two-thirds (Micklin 1992, 275). During this same period, salinity levels tripled, increasing from 10 grams per liter to over 30 grams per liter (Micklin 1992).

The ecological and health effects on the population are harrowing. Approximately 35 million people in the Soviet successor states live in the Aral basin of which 3.5 million live in the disaster zone that encompasses Karakalpakstan and the Khorazm region of Uzbekistan, Dashhowuz in Turkmenistan, Qyzlorda province in Kazakhstan (Vinogradov and Langford 2001, 348). If Afghanistan is included in the basin, then another 8 million people live in the basin (Micklin 2000, 14). Dust storms that transport the toxic salt residue from the exposed sea bed have exacerbated the ecological and health crisis (Smith 1994). One of the most disturbing manifestations of the deteriorating ecological situation was the high rate of infant mortality during the Soviet period. Recorded rates in Karakalpakstan, Uzbekistan reached 60/1000 live births and 75/1000 live births on average in Dashhowuz, Turkmenistan (Vinogradov and Langford 2001, 348). More disconcerting is that even a decade after independence, there are still instances in which infant mortality rates have approached 100/1000 live births (Bucknall et al. 2003, 8). In the downstream regions, the public health crisis remains omnipresent. For example, in Karakalpakstan some 70 percent of its 1.1 million people are ill and suffer from such chronic conditions that include respiratory illnesses, esophageal cancers, typhoid, paratyphoid, and hepatitis (Vinogradov and Langford 2001, 349). Overuse of the waters from the Amu Darya and Syr Darya has contributed to the decimation of the downstream economy. The vibrant fishing industry that provided the mainstay of the population in Karakalpakstan has been wiped out because many of the native fish were unable to adapt to the rising levels of salinity. By the early

1980s, 20 of the 24 native fish species disappeared (IFAS, UNDP, and the World Bank 1997, 23-24). The once booming fishing port of Muynak in Uzbekistan now resides 150 kilometers from the Aral shoreline (Glantz 2002, 25).

Central Asia's other less infamous water bodies are also highly polluted. In particular, the Irtysh River, which is a tributary of the Ob, has been classified as "very dirty" (ADB 1997, 38). The Irtysh is Kazakhstan's main river and covers one-third of its territory (i.e., in northern and eastern Kazakhstan), providing water to three of its largest oblasts – East Kazakhstan, Pavlodar, and Semipalatinsk. These three oblasts are home to some of the largest water consuming enterprises that include non-ferrous metallurgy, chemical production, manufacturing, oil refining, and food production (ADB 1997). These enterprises are notorious for their toxic discharges into the river.

Lake Balkhash, the final destination of the Ili River that flows from western China into Kazakhstan (through Almaty and Taldy-Kurgan Oblasts), is also heavily contaminated from industrial pollution and agricultural discharges. One of the main sources of pollution is the noxious discharge from Balkhashmed (Balkhash Copper) Production Company, which deposits copper, lead, and arsenic wastes into the lake (ADB 1997, 40). The Ili is mainly used for agricultural purposes in Kazakhstan, and as a result, pesticide residues and mineral fertilizers discharged into the river have also raised the level of lake pollution (ADB 1997).

Axes of Water Conflict

The dissolution of the Soviet Union shattered a highly centralized system of water management that had been in place for over a half century. During the Soviet period, authorities in Moscow managed the Aral Sea Basin as an integrated economic unit wherein the center (i.e., the Ministry for Land Reclamation and Water Resources or *Minvodkhoz*) determined water allocations and use from the Amu Darya and Syr Darya rivers to advance its economic priorities. For the Central Asian republics, this meant cultivating 90 percent of the Soviet Union's cotton (Micklin 1991, 10-11).

From the 1950s-1980s, Soviet planners erected an elaborate system of canals, reservoirs, and pumping stations to support cotton as the mainstay of the region's economy. In Uzbekistan alone, they built approximately 170,000 kilometers of canals to irrigate 4.2 million hectares of land (IMF 1992, 1). The most notorious project, however, was the construction of the colossal Kara Kum Canal that diverts water from the Amu Darya and transports it across 1,400 kilometers of desert in Turkmenistan. Irrigation is so vital to the region that a recent World Bank study noted that "without irrigation, much of the land would revert to desert scrub" (Bucknall et al. 2003, v). In fact, most of the cultivated land in Central Asia is irrigated: 75 percent of Kyrgyzstan's cultivated land is irrigated, 84 percent of Tajikistan's, 89 percent of Uzbekistan's and 100 percent of Turkmenistan's (ICG 2005, 28). Irrigated agriculture, furthermore, accounts for a substantial percentage of GDP in the Central Asian states; in 2003, it totaled 8 percent of GDP in Kazakhstan (most of which is in southern Kazakhstan), 23 percent in Tajikistan, 25 percent in Turkmenistan, 35 percent in Uzbekistan and 39 percent in Kyrgyzstan (World Bank 2005).

The vast system of water infrastructure physically linked different populations along the course of the rivers during the Soviet period. For example, upstream reservoirs and dams along the Naryn River in Kyrgyzstan (e.g., the Toktogul hydraulic complex) were connected to downstream irrigation systems at the farm level in both Uzbekistan and Kazakhstan. Similarly, in the Amu Darya basin the upstream hydroelectric complexes on the Vakhsh River linked the irrigated lands in Tajikistan with other agricultural users in Turkmenistan and then with the downstream populations in Khorazm and Karakalpakstan in Uzbekistan. The whole system, however, was assembled with the sole objective to promote regional economic specialization of cotton production in the downstream states and not toward the provision of hydroelectricity for upstream consumption.

The Soviet Union's collapse disrupted the economic basis upon which the water infrastructure was designed and brought to the fore new asymmetries of capabilities and competing interests between the upstream and downstream users. For example, with independence Uzbekistan discovered that it did not control the sources of the three main rivers – the Syr Darya, Amu Darya, and Zarafshon – on which it depended for its irrigated crop production. Although its interests are totally geared toward cotton cultivation, ninety-one percent of its water sources originate outside its territorial borders (Smith 1995, 361). Similarly, ninety-eight percent of Turkmenistan's water sources form outside its borders (Smith 1995, 361). Even a substantial amount of Kazakhstan's average yearly water flow from rivers (43 percent) is generated outside its borders in China, Uzbekistan, Kyrgyzstan and Russia. Simply, the collapse of the Soviet Union altered who controls the water and for what purposes water would be directed. The downstream states that are the main water consumers for irrigated agriculture, therefore, found that they were in a weaker position physically vis-à-vis the upstream countries. Moreover, Moscow no longer possessed the legitimate authority to resolve conflicts over water use and allocation.

With independence, as each country began to redefine its own economic priorities, it became evident that their respective goals conflicted regarding for what purposes water should be used. All the basin states except Kazakhstan intend to increase their amount of irrigated land to meet the mounting food requirements of their growing populations: Kyrgyzstan would like to expand its irrigated land total by over 400,000 hectares, Tajikistan by between 40,000-140,000 hectares, Turkmenistan by 600,000 hectares and Uzbekistan by between 420,000-600,000 hectares (Micklin 2002, 37). At present, the total irrigated area in the Soviet successor states in Central Asia is about 7.9 million hectares of which approximately 4.2 million hectares are within Uzbekistan, 1.7 million hectares in Turkmenistan, 719,000 million hectares in Tajikistan, 422,000 million hectares within Kyrgyzstan's territory within the Aral Sea basin, and 786,000 million hectares within Kazakhstan's territory within the Aral Sea basin (Dukhovny and Sokolov 2003, 4).

For upstream Tajikistan and downstream Turkmenistan, expansion of their irrigated land would most likely result in increasing withdrawals from the Amu Darya. Turkmenistan, in particular, is seeking to extend the Kara Kum canal in order to reclaim additional land to expand cotton production. In contrast, the downstream populations in Karakalpakstan were hoping to increase water allocations for the Aral Sea and surrounding populations. In the Syr Darya basin, Kyrgyzstan sought to find foreign investors to harness its hydroelectric potential. In particular, it

hoped to complete the Kambarata power plant on the Naryn River so that it could produce electricity primarily for export. As of October 2003, the Integration Committee of the Eurasian Economic Community (EEC), which includes Belarus, Kazakhstan, Kyrgyzstan, Russia, and Tajikistan, agreed to finance Kyrgyzstan's Kambarata-2 power station and Tajikistan's Sangtuda-1 power stations. If these projects go ahead, they would allow the Central Asian states to export electricity directly to Russia (17 October 2003 *RFE/RL*). In short, upstream water development in Kyrgyzstan and Tajikistan for agriculture or hydroelectricity would most likely obstruct the downstream states' interests in maintaining and even expanding their cotton production. Upstream development could also potentially hinder regional solutions for mitigating the Aral Sea crisis that mostly affects the downstream populations in Turkmenistan, Uzbekistan, and Kazakhstan.

In fact, potential conflicts over equity, human development and economic development are most pronounced when it comes to the future of the downstream populations. Most of the water that reaches the Aral Sea is of a much poorer quality since a substantial amount consists of polluted drainage water that has been returned to the river. The downstream populations in Qyzlorda province in Kazakhstan, Karakalpakstan, Uzbekistan, and Dashhowuz, Turkmenistan receive water contaminated with fertilizers and other chemicals from the agricultural runoff. The clash of interests and capabilities between upstream and midstream agricultural users and the downstream populations that are seeking clean potable water represents a situation in which the disincentives for cooperation are starkest. The downstream users in Karakalpakstan possess limited, if any, bargaining leverage over the upstream users since they lack any resources needed by the upstream users. Because Karakalpakstan is furthest downstream, they simply receive all the pollution.

Aral Sea Basin Cooperation

Cooperation over transboundary water resources is extremely arduous because the benefits from cooperation are highly asymmetrical and unevenly distributed (see e.g., Waterbury 1994). In fact, because of the asymmetries of capabilities and interests between the upstream and downstream states in Central Asia following the Soviet Union's collapse, it was expected that acute conflict over water would ignite among the newly independent states in the immediate years after independence (for details, see Weinthal 2002). These premonitions were based upon the region's turbulent history of small-scale violent conflicts over water and land resources that took place in the late 1980s. In particular, in 1989 Tajiks and Uzbeks quarreled over land and water rights in the Vakhsh Valley; deadly ethnic strife erupted between Uzbeks and Meskhetian Turks in the Fergana Valley; and Tajiks and Kyrgyz fought over land and water rights in the Isfara-Batken districts along the border of the two republics.

Yet, acute conflict over Central Asia's transboundary water resources was not the norm after independence; rather, the Central Asian states embarked upon a process of institution building at the interstate level (for details, see Weinthal 2002). They were able to negotiate new interstate agreements to assuage potential water conflicts that were created by the demarcation of new political borders. Because the Central Asian leaders wanted to make certain that the traditional planting season was uninterrupted, they initially signed on February 18, 1992 an agreement on "Cooperation in the Management, Utilization, and Protection of Water Resources of Interstate

Sources" wherein the water resources of the region were defined as "common" and "integral" (Article 1). This agreement allowed the states to continue to cooperate according to historical practices and quantities employed during the Soviet period (UNECE et al. 2003, 7). It also established the Interstate Water Management Coordinating Commission (later referred to as the Interstate Commission for Water Coordination or ICWC), which was authorized to determine water consumption limits (broken down by growing and non-growing periods) for each of the individual states and for region as a whole.⁴ Tied to the ICWC were the two river basin organizations (BVO Syr Darya and BVO Amu Darya) that while originally created in 1986 were responsible for planning and implementing water allocations among the different users (Dukhovny and Sokolov 2003).

Although many assumed that Central Asia would be ridden with water conflicts after independence, it was actually the first region among the Soviet successor states to sign an international multilateral agreement over water (See Appendix II). In short, past precedence guided the Central Asian states. Water cooperation in the Aral Sea basin was bolstered by a several subsequent agreements. In March 1993, the Central Asian states introduced a new institutional framework for water management -- "on joint activities for addressing the crisis of the Aral Sea and the zone around the sea and for improving the environment and ensuring the social and economic development of the Aral Sea region." This agreement and the accompanying statutes created two apex organizations to the original ICWC: the Interstate Council for Addressing the Aral Sea Crisis (ICAS) and the International Fund for the Aral Sea (IFAS) (for details, see TACIS/WARMAP, 1996). Later in July 1994, the Central Asian leaders established the Interstate Commission for Socio-Economic Development and Scientific, Technical, and Ecological Cooperation (ICSDESTEC) or what was the precursor to the Sustainable Development Commission (SDC). ICAS and its executive committee became the main organization for developing and implementing policies and programs in the Aral Sea Basin while IFAS and its executive council was supposed to elicit financial resources from the member states.⁵ Then in 1996 the Heads of State renewed their commitment to water cooperation and signed the Nukus Declaration to strengthen these new institutions for joint water management.

Why did the Central Asian states follow a path of cooperation in which they agreed to build new institutions for regional cooperation immediately after independence rather than pursuing policies that would promote their own individual gains? The short answer is cooperation came about in the early 1990s because of the pivotal role of international organizations that provided the necessary incentives (i.e., financial and technical assistance) to persuade these newly emerging countries to coordinate their policies to prevent acute water sharing conflicts from transpiring (Weinthal 2002). In fact, the Aral Sea basin is only one of a few prominent instances in which international organizations have succeeded to foster cooperation and prevent acute conflict over water resources (Weinthal 2002).⁶ Because the donor community linked financial and material assistance to the creation of new interstate institutions for water management, the

⁴ The vegetation or growing season usually refers to the period between April-September in which most crops are grown, excluding winter wheat.

⁵ In 1997, the Central Asian leaders dissolved ICAS and transferred its responsibilities to IFAS in response to donor concerns about duplication of functions.

⁶ Another notable case is the Indus Water Treaty in which the World Bank helped bring about an agreement between India and Pakistan.

Central Asian states were willing to engage in a process of building multilateral institutions over time rather than pursuing their individual policies. Although these new interstate institutions were fully unable to prevent future forms of discord from arising, this early cooperation is noteworthy since it reflects “a stage in the development of the framework for joint decision making and management of transboundary water resources” (Vinogradov and Langford 2001, 351).

The Aral Sea crisis initially attracted a larger share of international interest in transboundary water cooperation than many other transboundary water resources in the former Soviet Union because it offered the international community an extraordinary opportunity to link economic and political reforms with environment and conflict issues. In fact, since independence there have been approximately 15 to 20 donor organizations at any one time involved in projects related to the Aral Sea (LeMoigne 2003). Large multilateral institutions such as the World Bank, the European Union (TACIS), the United Nations (UNDP, UNEP, and UNESCO), North Atlantic Treaty Organization (NATO), and the Asian Development Bank (ADB) immediately established programs in the Aral basin after independence. The United States (USAID), Germany (GZT), Israel, the Netherlands, Japan (PHRD), and Switzerland provided direct bilateral assistance. Similarly, a large number of NGOs that include NOVIB (a Dutch organization), the Aral Sea International Committee (USA), ISAR (USA), Doctors without Borders (Medecins Sans Frontieres) and Mercy Corps International had programs in the Aral Sea region. While many of these organizations were interested in providing humanitarian assistance, they were also interested in using the environment as a means to enhance the likelihood that democracies and markets would flourish in Central Asia.

The Central Asian states were willing to accept international assistance from the aforementioned organizations because they could no longer rely upon Moscow to help them address the Aral Sea crisis. Moreover, they greatly needed financial and technical assistance to help them build new state institutions and to join the international community of nation-states (Weinthal 2002).

Owing to the combined desire of international organizations to intervene and the Central Asian states' need for international assistance, international organizations were able to have a pronounced role in facilitating cooperation since they could employ side-payments in the form of financial and technical assistance to foster institution building (Weinthal 2002). The promise of financial and technical assistance right after independence encouraged the Central Asian states to create new interstate agreements in 1993 for the Aral Sea Basin rather than just continuing with past precedence under the 1992 agreement. In particular, the World Bank's operating procedures that require states to commit formally to regional cooperation (e.g., an international water basin institution) before it will render aid also served as a critical inducement. Because Moscow could no longer resolve the Central Asian water sharing problems, the Central Asian countries recognized that mutually agreed upon cooperation would bring much needed donor assistance. Thus, following the establishment of the new apex organizations for managing the Aral Sea basin in 1993, the World Bank and other donors agreed to develop with the Central Asian states an aid package for the Aral Sea, which culminated in the Aral Sea Basin Program (ASBP). This program was intended 1) to stabilize the environment of the Aral Sea Basin; 2) to rehabilitate the disaster zone around the sea; 3) to improve the management of the international waters of the Aral Sea basin and 4) to build the capacity of the

newly created regional institutions (World Bank, UNDP, UNEP 1994). Implementation of the first phase of the ASBP was estimated to cost \$470 million (World Bank 1995). In the end, the ASBP was able to mobilize approximately \$280 million in loans and \$50 million of grant-funded technical assistance for the Central Asian countries in the former Soviet Union (ADB 2003a).

Following the ASBP, the European Union's Technical Assistance for the Commonwealth of Independent States (EU-TACIS) initiated its Water Resources Management and Agricultural Production (WARMAP) project in 1994 to support ICAS. Its main objective was to draft new interstate agreements and national legislation that would be harmonized across the Central Asian states. The UNDP also launched an Aral Sea Basin Capacity Development Project to strengthen the capacity of the SDC and the ICAS. Subsequently, the World Bank and other international donors established the Global Environment Facility's project (1998-2003) to enhance the Central Asian environment and management of the international rivers in the Aral Sea Basin. Most recently, the Central Asian countries under the leadership of IFAS prepared the Program on Concrete Actions on Improvement of Environmental and Socio-economic Situation in the Aral Sea Basin for the period from 2003 to 2010 (also known as the Second Aral Sea Basin Program) that is estimated to cost \$2.5 billion (ADB 2003a).

Cooperation in the form of new interstate institutions was achieved because side-payments (i.e., financial and technical assistance) were employed as a form of compensation to different domestic constituencies that could undermine the water sharing agreements and/or threaten the government's hold on political and social stability (Weinthal 2002). Side-payments helped mitigate the harsh effects of the transition because with the disappearance of the center in Moscow, the Central Asian leadership found it difficult to provide socio-economic goods like environmental and social protection and patronage to republican and regional elites. Thus, the influx of donor assistance, albeit limited, helped the Central Asian leadership appease vital domestic constituencies that were hit hardest by the sweeping economic and political transformations that ensued during the first few years after independence. For example, much of the Aral Sea donor programs directed assistance toward the water and agricultural ministries.

Specifically, the donor community crafted programs that would provide assistance not only to the different government ministries involved in the water and agricultural sectors, but also to the populations hardest hit by the Aral Sea crisis to assure compliance with the agreement. International organizations and non-governmental organizations, therefore, targeted a broad array of domestic interests in both the upstream and downstream states that could want to alter the water sharing arrangements (for details, see Weinthal 2002). For example, the donors introduced specific programs upstream for dam safety and downstream near the Aral for the provision of potable water and wetlands restoration.

Yet, because the Central Asian leaders quickly devised these new water institutions to garner aid and appease the donors, this early phase of cooperation was more about political cooperation than sustainable environmental protection (Weinthal 2002). In fact, several donor evaluations of their programs have found many of their efforts to have produced unsatisfactory results and to have progressed slower than anticipated (World Bank 1997, World Bank 2004b). IFAS, in particular, was unable to fulfill its primary objective to act as a fund for Aral Sea programs early on given that it failed to collect the money promised to it by the Central Asian states. Despite the

one early success whereby the Central Asian states concluded a collective water resources management strategy -- “Fundamental Provisions of Water Management Strategy in the Aral Sea Basin” – a subsequent program such as the Water and Environmental Management Project failed to bolster the ASBP’s efforts to stabilize the environment and improve the management of international waters (World Bank 2004b). As time progressed, it became evident to the donors that the Central Asian countries were also unwilling to defer formal decision-making authority to the executive council of IFAS (EC-IFAS). When the EC-IFAS moved to Turkmenistan (1999-2002), its Project Management and Coordination Unit (PMCU) remained in Tashkent, resulting in IFAS’s weakened institutional capacity to carry out regional programs despite having received about \$32 million in donor assistance in the form of technical assistance for studies as part of the first phase of the ASBP (World Bank 2004b, 12). In 2002, EC-IFAS moved to Tajikistan and has made efforts to rebuild its institutional capacity.

Although international intervention successfully precluded violent conflict from transpiring, cooperation, nonetheless, began to falter in the mid-1990s owing to the Central Asian countries’ inability to agree on a comprehensive regional approach. Rather, the emerging consensus among both the donors and Central Asian countries was that donor efforts should focus on each basin separately (Amu Darya versus Syr Darya), especially given that the Sea had essentially divided into two halves.

Moreover, the 1992 agreement failed to adapt water allocations to the new political reality of divergent physical capabilities and economic interests and hence to take into account upstream demands for increased water allocations. Because the donors focused on propping up ICAS and IFAS, the 1992 agreement continued to determine water quotas, which bolstered the downstream riparians’ interests in maintaining an irrigation regime. Thus, Uzbekistan and Turkmenistan continued to receive the largest allotments of water; in 1996-1997 Uzbekistan and Turkmenistan received 38 percent and 26 percent, respectively of water withdrawals from the basin whereas Kyrgyzstan received the smallest allocation – that is, less than 1 percent of the Syr Darya and 0.2 percent of the Amu Darya (Micklin 2000, 44-45). Simply, the upstream states were less inclined to abide by water allocations that perpetuated a regional economic system based upon cotton monoculture. Thus, early cooperation began to fracture when it became evident that the Central Asian states needed to address energy, Afghanistan, cotton, and other potential water conflicts. These topics are discussed below in greater detail.

Energy

These early water sharing agreements were not sustainable over the long-term owing to the disparity in fossil-fuel resources between the upstream and downstream states. Most important, they did not take into account energy issues and the interdependencies that existed during the Soviet period in which water and energy were exchanged freely between the water-rich upstream states and the fossil fuel-rich downstream states (Weinthal 2002). Mounting pressures for the development of hydroelectricity upstream in Tajikistan and Kyrgyzstan began to trigger new conflicts between upstream and downstream states.

Syr Darya

The first and most prominent conflict between water and energy to emerge was the management regime for water releases from the Toktogul reservoir that is located on the Naryn River – a tributary of the Syr Darya in Kyrgyzstan. As the largest reservoir on the Naryn River and the only one with substantial storage capacity, Toktogul determines how much water is released to the lower reservoirs along the cascade and ultimately how much water reaches the fields and the Aral Sea. After independence, Kyrgyzstan began to consider alternative uses for its upstream infrastructure – that is, the generation of hydroelectricity rather than storage for releases during the spring and summer to support agriculture downstream. Soviet planners, however, originally constructed the Toktogul reservoir to meet irrigation demands downstream (i.e., in Uzbekistan and Kazakhstan) rather than to generate energy for Kyrgyzstan’s consumption.

Initially, the Central Asian states upheld many of these interdependencies in which Kazakhstan, Kyrgyzstan, and Uzbekistan negotiated annual barter agreements for fuel and water resources. According to these barter arrangements that were negotiated either bilaterally or trilaterally, Kyrgyzstan supplied both Uzbekistan and Kazakhstan with water during the summer months in return for gas and coal, respectively, during the winter months.⁷ Kyrgyzstan also sold its excess power generated from running the hydroelectric stations in the summer months to Uzbekistan and Kazakhstan as part of these barter arrangements. These barter arrangements were a relic of Protocol No. 413 (7 February 1984) from the Soviet period in which the upstream reservoirs were designated to support an irrigation regime downstream (World Bank 2004a, 8). According to this protocol, Uzbekistan receives 46 percent of the total surface flow of 22.7 billion cubic meters in the river; Kazakhstan receives 44 percent; Tajikistan receives 8 percent and Kyrgyzstan 2 percent (World Bank 2004a, 8). Although the 1992 agreement sought to maintain an irrigation regime so that the cotton harvests would not be disrupted, the Soviet Union’s collapse, nevertheless, shattered these physical and economic interdependencies and could not prevent competing claims from surfacing.

Conflicts over Toktogul emerged in the mid-1990s when the energy-rich states, Uzbekistan and Kazakhstan, began to formulate their energy development strategies, independently of the needs of each other and Kyrgyzstan. Uzbekistan wanted to be self-sufficient in oil and gas production given that it had to use its cotton revenue to pay Russia for oil at world prices. The Uzbekistan government, as a result, sought to increase energy production for domestic consumption and to demand world market prices for its exports to Kyrgyzstan. Because Kazakhstan did not possess any alternative export revenue and faced high levels of political competition at independence, it chose to privatize its energy sector (i.e., oil, gas, and coal) to foreign investors (Jones Luong and Weinthal 2001). It then also began to demand hard currency for its exports from the other Central Asian countries and in particular, Kyrgyzstan.

Thus, without the hard currency to purchase energy and lacking its own indigenous fuel supplies, energy shortages ensued during the winter months in Kyrgyzstan. In response, Kyrgyzstan periodically began to operate the Toktogul power plant for electricity generation in the winter

⁷ For example, see “Protocol of the Meeting of Representatives of Fuel-Energy and Water Management Complexes of Kazakhstan, Kyrgyzstan, and Uzbekistan on Problem of the Toktogul Cascade Water-Energy Resources Use in 1996,” *ICWC Bulletin* 11 (November 1996) and “Agreement Between the Governments of the Kyrgyz Republic and the Republic of Uzbekistan on the Question of the Use of Hydro-electric Resources of the Naryn-Syr Darya Hydro-Electric Power Station,” 1996.

months rather than to adhere to an irrigation regime. Kyrgyzstan, moreover, faced a collective action dilemma because even if Kyrgyzstan abided by the irrigation scheme for Toktogul and delivered water to Uzbekistan and Kazakhstan, it had no guarantee that it would receive gas and coal in return as under the former Soviet barter arrangements. Uzbekistan and Kazakhstan could easily cheat since the above-mentioned agreements primarily dealt with water and not energy allocations. In fact, from 1990-2000, summer releases from the upstream reservoirs on the Naryn declined to 45 percent of their annual discharges where winter releases increased to 55 percent (World Bank 2004a, iv). This sharply contrasts with the Soviet period wherein annual releases were 75 percent in the summer and only 25 percent in the winter (World Bank 2004a, 2). The 1992 agreement also lacked effective dispute resolution mechanisms. It only stipulated that water disputes were to be resolved by the Ministers of Water; no provisions were made if they could not resolve such disputes (Vinogradov and Langford 2001).

The operation of Toktogul in the winter months also placed new stresses on the downstream states' economy and ecological predicament because upstream water consumption in the winter months diminishes the amount of irrigation water available for the downstream users during the summer months. Since independence, Uzbekistan has sought to ensure ample water deliveries to maintain its agricultural sector, which accounted for approximately half of its GDP in the immediate years after independence (ADB 1997). Moreover, the downstream users in Kazakhstan (i.e., Qyzlorda) feared that operating Toktogul in the winter months could have further deleterious effects on the Aral Sea, as less water would be available to sustain what became the smaller sea. To aggravate the situation further, water released from Toktogul in the winter months does not reach the Aral Sea, but is diverted to a local depression, the Arnasai lowland, because of the winter freezing of the lower Syr Darya and adjoining canals, which block the large volume of water from reaching the sea (Solodennikof 1996, World Bank 2004a, iii). These water diversions, instead, have formed the Aydarkul Lake and have damaged land and infrastructure in the Syr Darya delta (World Bank 2004a, 6). If it is a dry year, Kyrgyzstan can reduce the water flow to Uzbekistan in the spring and summer when the demand for irrigation is at its highest peak downstream. Thus, in drought years, like the few years from 1999 to 2002, the Aral Sea and the surrounding regions is sacrificed to the upstream demands for irrigation (Glantz 2002).

Overall, state elites in Kyrgyzstan feel that they should receive payments from Uzbekistan and Kazakhstan for water deliveries from the rivers originating within their territorial borders. In 1997 the President of Kyrgyzstan, Askar Akaev, signed an edict that declared Kyrgyzstan's "right to profit" from its water resources, which includes selling water to its neighbors (Hogan 2000). More so, they want the downstream riparians to contribute to the maintenance of the Toktogul reservoir, especially since the downstream riparians are still the main beneficiaries. As a result, in 1997 a few members of the Kyrgyzstan Parliament (*Jogorku Kenesh*) sent a letter to the head of the World Bank's mission in Kyrgyzstan that expressed their concern that the status quo 1992 water agreement, which they felt unfairly, reflected only the downstream interests.⁸

By breaking down the former interdependencies of the Soviet system and treating the Aral Sea crisis as merely a water problem after independence, the international community and the

⁸ Letter from Kyrgyzstan Parliament to Michael Rathnam, World Bank, Bishkek, Kyrgyzstan, 28.06.97, No. 01-12/94.

Central Asian governments failed to use to their advantage the Soviet legacy of interdependence to foster more sustainable cooperation. Only in the mid-1990s did the international community begin to realize that mutual gains could be reached from trading energy for water. The first to recognize the potential of linking water with energy was USAID that began in 1996 to focus on a limited water sharing agreement over the Syr Darya River (for details, see Weinthal 2002). Thus, rather than to work with the entrenched water *nomenklatura* (i.e., state elites) from the downstream states, USAID began to promote another regional institution in which Kyrgyzstan was a prominent player -- the Interstate Council for Kazakhstan, Kyrgyzstan, and Uzbekistan (ICKKU) -- and formed a working group called the Water and Energy Uses Roundtable composed of one water official and one energy official from each Syr Darya riparian state. USAID was hoping to break the impasse between the Syr Darya states, who each year were having to renegotiate the above mentioned barter exchanges between water for energy. Specifically, USAID aimed to redefine the scope and form of environmental cooperation in the Aral Sea basin by dealing only with the potential and real disputes over water management schemes for the Toktogul reservoir.

USAID relied upon a strategy of issue-linkage to balance the asymmetry of interests and capabilities among the Central Asian countries. Issue-linkage is a negotiating technique that creates different options for building institutions for cooperation by increasing the opportunities for trade-offs and for generating mutual benefits to trade (for details, see Susskind 1994, Sebenius 1983). As a result, USAID worked to encourage the Central Asian participants to broaden the number of actors and issues on the agenda, which had the added benefit of bringing additional parties to the bargaining table that if excluded, could undermine cooperation. Through a series of roundtables it convened between 1996 and 1997, USAID was able to give the energy sector in Kyrgyzstan a prominent role in the negotiations whereas in earlier efforts to address the Aral Sea basin, it was marginalized.

USAID's efforts resulted in an interstate water compact between the Syr Darya riparians in 1998 that was to cover a 5-year period. Central to this agreement was the concept of compensation for energy losses from the upstream storage of water during the winter months (World Bank 2004a, 9). This agreement recognized that Kyrgyzstan wanted to exploit the upper watershed for hydroelectricity and took into account Uzbekistan and Kazakhstan's desire to receive the same quantity and quality of water they historically received for irrigation and agricultural purposes. Tajikistan subsequently joined the ICKKU, which then became the ICKKTU. In contrast to earlier donor programs that focused solely on water in the Aral Sea basin, USAID succeeded because it added the energy sector to the bargaining agenda while simultaneously subtracting the Amu Darya basin from the negotiations. By breaking down the Aral Sea Basin into two separate river basins, USAID was able to remove the most difficult riparian, Turkmenistan, from the bargaining forum. Turkmenistan, of all the riparians, was and remains the most resistant to outside intervention in the Aral Sea basin.

Although this water agreement was an improvement to the 1992 agreement, it has yet to mitigate water conflicts fully in the region. Because this 1998 agreement was not exhaustive, the Syr Darya riparians have had to continue to negotiate annually the exact terms of the barter arrangements, including the actual volumes of water releases and amount of compensation (World Bank 2004a, 10). The result is that Uzbekistan has still

periodically ceased its gas deliveries to Kyrgyzstan (*RFE/RL* 29 November 1999, *RFE/RL* 22 October 2001). Moreover, in 2003 and 2004, the Syr Darya riparians were unable to conclude annual agreements (Abbink et al. 2005, 4).

The breakdown in cooperation is most evident by Uzbekistan's unilateral steps to offset Kyrgyzstan's use of water in the winter months (Abbink et al. 2005, 4). In trying to achieve sufficient water supplies during the summer months for its agricultural production, Uzbekistan has sought to increase its storage capacity downstream in the Fergana Valley near UchKurgan. It has built two reservoirs with a total of 1 km³ of active storage (personal communication with Professor Daene C. McKinney, University of Texas at Austin, 23 January 2006). Yet, a recent study has found that while Uzbekistan's unilateral measures might help diminish its dependence upon Kyrgyzstan, it does not maximize basin wide efficiency (Abbink et al. 2005, 1). In addition, Abbink et al. (2005, 17) found that for the Syr Darya countries to benefit from cooperation, Uzbekistan needs to compensate Kyrgyzstan for its summer releases of water. Kazakhstan has, nevertheless, followed suit and has begun to consider taking a similar action to decrease its dependence upon Kyrgyzstan's and Uzbekistan's control of the water flow through self-financing the Koksarai Reservoir downstream of the Chardara Dam (Abbink et al. 2005, 5, World Bank 2004a, 9).

Because of their individual pursuit of self-sufficiency in water and energy, the Syr Darya riparian countries have become invested in pursuing extremely costly solutions instead of adhering to the mutual interdependence of the water system. Moreover, trading energy for water is not sufficient, but rather a need still remains to address energy even more broadly. Another complementary option to strengthen cooperation in the Syr Darya basin so that downstream countries have enough water during the summer and the upstream countries have enough energy resources during the long winter months is to improve Kyrgyzstan's energy efficiency. In particular, technical improvements might mitigate electricity losses in Kyrgyzstan that currently deprive it of about 40 percent of its energy production (Blua 2003).

Amu Darya

At the same time that the Central Asian states have made limited progress on allocating the waters of the Syr Darya, the exclusion of the Amu Darya from the negotiations has left Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan, and Afghanistan without a real institutional mechanism for managing the Amu Darya. Because Iran's usage is almost negligible, it is not a major player in the Amu Darya basin. Initially, many of the upstream-downstream disparities in the Amu Darya basin were not as apparent after independence like in the Syr Darya basin because Tajikistan, which contributes approximately 80 percent of the flow into the Amu Darya (Zonn 2002, 8), found itself engulfed in a 5-year civil war (1992-97). Rather, it was only after the cessation of hostilities that Tajikistan's new upstream position began to impinge upon its interstate relations with its downstream neighbors. That Tajikistan may increase its water withdrawals has precipitated fears among the downstream riparians that their water allocations may be reduced. At present, Tajikistan is allotted 9 billion cubic meters annually, which is based upon past Soviet allocations from 1987 and then reaffirmed with the 1992 Agreement (Ahmad

and Wasiq 2004, 26). The need for new water institutions in the Amu Darya, therefore, may be even more pressing given that both Tajikistan and Afghanistan would like to harness their upstream waters to accelerate their economic recovery following years of civil strife and economic upheaval.

Even before the civil war, Tajikistan was one of the poorest of the republics in the former Soviet Union. Close to 70 percent of its six million people live in rural areas with 50 percent employed in the agricultural sector (McKinney 2004, 202). Only seven percent of its territory is suitable for agricultural production of which most is devoted to cotton (ICG 2003, 3). Similar to Uzbekistan and Turkmenistan, cotton cultivation is its major cash crop. Cotton is grown in the irrigated valleys of the Amu Darya and Syr Darya rivers and accounts for approximately two-thirds of the gross production value of the agricultural sector (McKinney 2004). The end result is that Tajikistan only grows 40 percent of its cereal needs (ICG 2003, 3).

Although there is a limited amount of additional land that could be cultivated upstream, if Tajikistan were, indeed, to go ahead and develop this land, it would most likely do so by increasing its withdrawals from the Amu Darya or to divert the Zarafshon River (Ahmad and Wasiq 2004, 26). The latter, in particular, could strain relations with Uzbekistan that already withdraws 95 percent of the Zarafshon's flow (Ahmad and Wasiq 2004, 26).

Among the Soviet successor states, energy resources are also unevenly distributed between the upstream and downstream riparians in the Amu Darya basin. While the downstream countries (i.e., Uzbekistan and Turkmenistan) are rich in oil and gas resources, Tajikistan is only rich in water resources and hence potential hydropower. Overall, Tajikistan is the world's third largest producer of hydropower and 90 percent of the energy generating capacity of the country is hydroelectric (Carius et.al. 2003, 18). Yet, during the Soviet period, hydroelectricity supported the aluminum industry, which provided Tajikistan with a major source of earnings (Carius et.al. 2003, 18). Instead, Tajikistan received fuel from its downstream neighbors for its heating purposes.

Thus, in the post-Soviet period, Tajikistan like Kyrgyzstan is facing a shortage of fuel supplies and could potentially seek to exploit its upstream water resources for electricity. At present, Tajikistan's most important hydroelectric station – Nurek -- is located on the Vakhsh River, a tributary of the Amu Darya and provides seasonal rather than multiyear storage for managing water releases for irrigation purposes. One option that has been under consideration for years to augment Tajikistan's hydropower capacity is to complete the Rogun dam, which would undoubtedly have a negative impact on the downstream riparians' access to water supplies during the irrigation season (ICG 2002). Similar to the challenges raised in finding an equitable solution to the water sharing dilemma in the Syr Darya basin, additional hydropower generation in the winter months to meet Tajikistan's energy needs would shift the operation of its installations to an energy regime and thus reduce the water availability for irrigation in the downstream states during the summer months. Thus, in order to preclude similar conflicts from arising as in the Syr Darya basin, Tajikistan will need to reach an agreement with Turkmenistan and Uzbekistan that also takes into account energy and water issues.

Cooperation along the Amu Darya, however, is even more complicated than in the Syr Darya not

only because of the potential disputes between the upstream riparian (i.e., Tajikistan) and the downstream riparians (i.e., Uzbekistan and Turkmenistan), but also because of the festering conflicts between the two downstream countries – Turkmenistan and Uzbekistan. At present, Turkmenistan and Uzbekistan divide the Amu Darya water equally in which each receives about 40 percent of the flow (Abdullaev 2001), but this allocation could become an international point of contention, as Turkmenistan would like to increase the amount of water it diverts to the Kara Kum canal so that it can bring new land under cultivation. At present, it diverts on average 11.5 billion cubic meters per year (McKinney 2004, 208-209).

Turkmenistan also has plans to create a huge artificial lake in the midst of the Kara Kum Desert that has been called both Golden Century Lake and Lake Turkmen (ICG 2005, 30 and EurasiaNet 2004). Construction of the 1,000 square mile lake (approximately 2,000 square kilometers) began in 2002 and is only expected to be completed in 20 years (*RFE/RL* 7 May 2003). The project is estimated to cost anywhere from \$4.5 - \$9 billion. Although it is supposed to use irrigation runoff, it will also most likely require increasing withdrawals from the Amu Darya. This project has generated far-reaching criticism from abroad because of the government's plan to relocate large numbers of its ethnic minorities (primarily Uzbeks) to the surrounding desert (*RFE/RL* 17 December 2003). Uzbekistan has also voiced its opposition to the above-mentioned projects owing to their negative impact upon the Uzbek minority in Turkmenistan and their potential effects on the downstream flow of the Amu Darya. These projects are clearly a relic of the Soviet Union in which resources were directed toward building large-scale, grandiose projects rather than increasing investment to improve its aging water infrastructure such as lining the Kara Kum canal (EurasiaNet 2004, *RFE/RL* 7 May 2003).

In short, the absence of an agreement among the Amu Darya riparians in the former Soviet Union compounded by an increase in upstream diversions will aggravate the deteriorating ecological and economic situation in the downstream states and in the near Aral region. In fact, in response to Uzbekistan and Turkmenistan's massive diversions of the Amu Darya for cotton cultivation, Kazakhstan has chosen to take unilateral measures to address the Aral Sea crisis in the Syr Darya basin. Specifically, it has overlooked the Amu Darya as a potential source of water for the Aral and has focused its restoration efforts solely on the Syr Darya. As a result, it is constructing a seven-mile dam across the smaller part of the sea (Brown 2003) in order to benefit from what currently flows into the Aral from the Syr Darya. With assistance from the World Bank (i.e., Syr Darya Control and Northern Aral Sea Phase-I Project for Kazakhstan), it is hoping to restore the northern part of the sea and ultimately to revive its fishing industry (<http://web.worldbank.org/WBSITE/EXTERNAL/NEWS/0,,contentMDK:20012934~menuPK:34466~pagePK:34370~piPK:34424~theSitePK:4607,00.html>, Brown 2003).

Afghanistan

One of the biggest challenges for fostering cooperation within the Amu Darya basin is the inclusion of Afghanistan, as it contributes 8 percent of the flow to the Amu Darya (McKinney 2004, 201, Zonn 2002, 8). Although the Amu Darya basin only covers 12 percent of the Afghan territory, it supports about 25 percent of the Afghan population (Ahmad and Wasiq 2004, 1). The total area of irrigated land in Northern Afghanistan is approximately 1.2 million hectares of

which 385,000 hectares is on and along rivers with permanent flow to the Amu Darya (Ahmad and Wasiq 2004, 3, 25).

Although independence introduced new fault lines among the Central Asian states, a long history of cooperation between the Soviet Union and Afghanistan over the Amu Darya and its tributaries preceded the Soviet Union's dissolution. The Soviet Union and Afghanistan signed several regional agreements in 1921, 1946 and 1958 to resolve rights of navigation, water quality, and the delineation of their shared border along the Amu Darya (Ahmad and Wasiq 2004, 4, Caponera 1995).⁹ The 1958 agreement precluded construction on the Panj and the Amu Darya without mutual agreement among the parties (Ahmad and Wasiq 2004, 4). These agreements also established an international commission to contend with the use and quality of the frontier water resources (Caponera 1995).

Yet, after the Soviet Union's collapse, the Soviet successor states in Central Asia were quite adamant that Afghanistan should not be included in the new institutions for water management so as not to interrupt past practices that favored cotton cultivation downstream. The absence of a clear political authority in Afghanistan in the early 1990s, moreover, precluded Afghanistan's participation in the early negotiations over water sharing in the Aral Sea basin. Yet, with the newly elected government in place (i.e., the Karzai government), opportunities for cooperation seem possible. International law, moreover, requires that any water sharing agreement over the Amu Darya must take into account Afghanistan's interests, as it is an upstream riparian (Vinogradov and Langford 2001). More so, some have suggested that the aforementioned agreements between the Soviet Union and Afghanistan are still applicable and will need to be reconciled with any new institutions for water management (Vinogradov and Langford 2001, Ahmad and Wasiq 2004, 4).

The economic reconstruction of Afghanistan depends upon regional cooperation over the Amu Darya. In particular, the revival of the agricultural sector in northern Afghanistan is critical for its success since this area is already considered to be the most productive agricultural region in Afghanistan (Ahmad and Wasiq 2004, 1). At present, agriculture comprises 50 percent of Afghanistan's GDP and employs 85 percent of the labor force (Ahmad and Wasiq 2004, 2) of which women make up a significant proportion (ADB 2003b, 3). Prior to the Soviet invasion, Afghanistan was self-sufficient in cereals and was an exporter of dried fruits and nuts (ADB 2003b, 2). The civil war, however, damaged large tracts of agricultural land and destroyed much of Afghanistan's irrigation infrastructure, which has decreased the amount of land under cultivation, especially for wheat and barley (Zonn 2002, Ahmad and Wasiq 2004, 8). Moreover, recent years of drought has further contributed to erosion of the river banks and levees, making the fields more susceptible to flooding during periods of heavy rainfall (Gerstle 2004).

Overall, water use in Northern Afghanistan from tributaries with permanent flow into the Amu Darya is currently estimated to be at most about 5 billion cubic meters whereas in the 1960s it hovered around 2.5 billion cubic meters (Ahmad and Wasiq 2004, 3).¹⁰ Yet,

⁹ Frontier Agreement between Afghanistan and the USSR, 13 June 1946 and Treaty concerning the regime to the Soviet-Afghan frontier, 18 January 1958.

¹⁰ Ahmad and Wasiq (2004, 3) point out that most current data regarding water flows in Afghanistan is based upon estimates from data collected in the 1960s and 1970s.

the effects of two decades of civil strife on the irrigation systems has probably made total use much lower (Ahmad and Wasiq 2004, 23); some estimate it could be as low as 2 billion cubic meters annually (McKinney 2004, 202). It is expected that Afghanistan will seek to increase its water withdrawals to rebuild its decimated agricultural sector and to develop its hydropower capacity (Zonn 2002, ICG 2002). Yet, any increased withdrawals will have a substantial impact downstream (Zonn 2002). In particular, increased water diversions and steps to reconstruct ailing irrigation systems might exacerbate economic hardship, environmental destruction and fuel interstate conflict over water. The downstream users in the Aral Sea region will experience the dwindling flow of water, especially during dry years unless the Soviet successor states can both come to an agreement with Afghanistan that will accommodate increased withdrawals upstream and improve water management policies downstream in Uzbekistan and Turkmenistan. Yet, one study has suggested that reducing applications at the field level in Uzbekistan and Turkmenistan could compensate for increased upstream withdrawals (Ahmad and Wasiq 2004, 4).

Although donors such as USAID are funding projects such as the International Center for Agricultural Research in the Dry Areas to work on water issues in Afghanistan, the inclusion of Afghanistan in projects for regional cooperation has yet to become a central focus of their development assistance (Gerstle 2004). Rather, USAID, for example, has concentrated on specific infrastructure improvement projects within Afghanistan such as canal renovations and dam reinforcements (Gerstle 2004).

Cotton

Agriculture is an extremely important part of Central Asia's political economy and accordingly a critical component for fostering sustainable cooperation over water in the region. It is the largest consumer of water, accounting for more than 90 percent of total water use of which the downstream countries use about 85 percent of the waters from the Aral Sea basin (McKinney 2004, 190). Agriculture accounts for approximately 30 percent of the region's GDP (Guadagni et.al. 2005, 1). In Uzbekistan, it makes-up 60 percent of foreign exchange receipts and provides 45 percent of employment (World Bank 2004a, 3).

Within the Aral Sea basin, cotton is the region's most strategic crop. By 1990 cotton covered 85 percent of irrigated land (Glantz 2002, 4). In Uzbekistan, which is the region's largest producer of cotton, it generates approximately 25 percent of its foreign exchange revenues and a large share of tax revenues (Guadagni et.al. 2005, 1). The cotton sector also provides an important source of employment. At the peak of cotton production during the Soviet period, the cotton sector employed 40 percent of the labor force (Rumer 1989, 62). Even after the Soviet Union's dissolution, cotton still reigns as the leading agricultural export.

In addition to large quantities of water, the cultivation of cotton depends upon the extensive use of fertilizers and pesticides. The Central Asian countries have been able to maintain cotton monoculture as the backbone of their economies despite declining yields that have fallen by about 20 percent since the early 1990s (World Bank 2003, 3) because water is basically free. Historically, water has not been used efficiently since its use is not metered and fields are often

just flooded. One recent study found that farmers in Uzbekistan withdraw on average 14,000 m³ of water per hectare for irrigation in comparison to 9,000-10,000 m³ per hectare in Pakistan and Egypt -- two countries that are not known either for their efficient use of water (Bucknall et al. 2003, 3). Moreover, the cultivation of cotton has relied upon cheap labor in which students, women, children, industrial workers, soldiers, clerks, and drivers are forced to pick cotton during the harvesting season for “a symbolic wage” (Synovitz 1997).

Uzbekistan and Turkmenistan have only decreased the amount of land where cotton is grown when it has been absolutely necessary – that is, for the most part because of increasing salinization of the soil or to make room for food production in some of the more densely populated areas (Craumer 1995, 16). The Uzbekistan government’s decision to promote wheat self-sufficiency is largely responsible for the recent decline in cotton production (Guadagni et.al. 2005). More so, because winter wheat is less water intensive than cotton, a substantial drop in irrigation withdrawals per hectare was recorded during the early 1990s (Micklin 2000, 41). From 1990-1994, the total area in which grain was cultivated increased from 12 percent to 26 percent at the same time that cotton decreased from 40 percent to 32 percent (Micklin 2000, 41). Yet, this shift away from cotton was not intended to improve water efficiency, but rather to promote food security. In fact, cotton and wheat still account for 80 percent of cultivated land (World Bank 2003, 14-15).

Because of the economic and strategic importance of cotton and wheat, Uzbekistan and Turkmenistan have only carried out minimal reform in the agricultural sector. Both retained the Soviet-era system of *goszakaz* after independence in which cotton and grain production targets are set by the state. By maintaining state controls, the governments can decide which land the farmers must devote to these crops. In both countries, state commodity boards control the requisition of cotton by setting artificially low prices at which the government purchases cotton and then resells it for world market prices to foreign countries. Although the amount of cotton that the farmers must sell to the state was dramatically liberalized in Uzbekistan in 2001 (ICG 2005, 4), in practice farmers must still sell almost all of their harvest to the state because they lack direct access to the foreign buyers. Moreover, even with increasing liberalization in prices, farmers in Uzbekistan seldom receive the real price for their cotton since payments are dispensed through government banks, which are often reluctant to pay the farmers and when they do so, it is months late (ICG 2005, 4). Although farmers are still required to sell 50 percent of their wheat harvest to the state, farmers in Uzbekistan prefer to cultivate it instead of cotton because payment is usually immediate and farmers can grow non-strategic crops (e.g., vegetables) during the five months (July-November) in which the fields are fallow (Guadagni et.al. 2005).

To date, the Uzbekistan government has initiated a program to break-up some state and collective farms and transfer some landholdings from the collective farms into private hands (Guadagni et.al. 2005, ICG 2005). Mostly, the government since 1993 has been replacing collective farms with new cooperatives called *shirkhats*, which now cultivate 69 percent of the land (World Bank 2003, 15). Yet, in practice, real production relations have remained largely unchanged since the Soviet period (Craumer 1995, 7). Most of the *shirkhats* are, in fact, the same *kolkhozes* (collective farms) but on a smaller level and are still responsible for meeting government production targets especially for cotton and grain (Ilkhamov 1998). Even private farmers are unable to decide what to grow. Because the government allots them their land, they

are beholden to the regional leadership (i.e., *hakims* in Uzbekistan) that has the authority to revoke their land entitlements (30 October 2003 *RFE/RL*). The result is that in some areas private farmers must plant up to 98 percent of their holdings with state-ordered cotton or wheat (ICG 2005, 3). Similar processes have been observed in Tajikistan. Even when state land has been given to *dehqan* (household farms) associations, the same structure and hierarchy has remained in place as in the Soviet period; farmers are also left with little choice, but to plant cotton, which in some cases amounts to 75 percent of their land (ICG 2003, 3-4).

Despite the above-mentioned steps to reform the agricultural sector in Uzbekistan, the *shirkhats* continue to generate losses. Because the government has always granted them debt relief, they have had little incentive to become more efficient by reducing their inputs and managing their level of debt like individual private farmers (Guadagni et.al. 2005). As a result, the *shirkhats* still operate without any hard-budget constraints. In contrast, the *dehqan* farms in Uzbekistan, which are not subject to state directives, are more productive; yet, because they lack access to the more fertile land and sufficient inputs, they have had a limited role in transforming the agricultural sector (World Bank 2003, 15, ICG 2005, 3).

Why have Uzbekistan and Turkmenistan resisted sweeping agricultural reforms if cotton is irrefutably the source of so many of the region's social and ecological ills? The short answer is that the downstream countries have maintained cotton monoculture because it generates an important source of revenue and props up a system of social and political control that was inherited from the Soviet period (Weinthal 2002). To carry out sweeping agricultural reform, the Central Asian leadership would need to compensate or displace a large number of vested interests engaged in cotton production. The Central Asian states and the international community would also have to replace cotton with less water intensive crops besides just grains. Yet, Turkmenistan and Uzbekistan have shown that they are not willing to forfeit such a vital source of foreign earnings as from cotton. Indeed, the importance of cotton as a source of foreign revenue was immediately evident following the Soviet Union's collapse. In 1991, cotton already comprised approximately 84 percent of Uzbekistan's foreign exports, and by 1992, it provided over three-quarters of Uzbekistan's total export revenue alone (World Bank 1993, 24, IMF 1992, 2). As of 2002 cotton still accounted for approximately 60 percent of Uzbekistan's hard-currency export earnings (Abbink et al. 2005, 2). Cotton over time has also become a significant source of taxation. In Uzbekistan, the World Bank estimates net transfers (taxes minus subsidies) to government coffers at around 20-22 percent of farmers' gross cotton revenue in 2003-2004 (Guadagni et.al. 2005, iv). Simply, the cotton sector is "over-taxed" relative to other crops (Guadagni et.al. 2005, iv). As such, Uzbekistan remains the world's third largest producer of cotton of which nearly all is exported (Micklin 2000).

The governments of Uzbekistan and Turkmenistan have also resisted liberalization of the agricultural sector for several other reasons. First, shifting away from cotton could result in higher levels of unemployment in the countryside and exacerbate the likelihood of political and social instability in the rural areas (Weinthal 2002). Second, privatization of the farms would lead to a situation in which people would only devote themselves to smaller private plots and could potentially create a situation in which the state would be forced to loosen its control on the population. Third, this would break down the system of patronage ties with the local and regional authorities since the population would no longer be required to turn over a certain

percentage of their harvest to the state and could invest in alternative crops. Thus, despite the efforts of international and local NGOs at the end of the Soviet period to halt cotton monoculture in Central Asia, most international programs seeking to promote water cooperation have concurred with the government's desire to resist dismantling cotton as a system of social and political control and instead have concentrated their efforts on either water or energy issues during the 1990s (for details, see Weinthal 2002, Weinthal 2001).

Although the current system of state controls should create disincentives for farmers to produce cotton relative to alternative crops, they have also continued to cultivate cotton and, moreover, remain politically acquiescent owing to the system of social protection inherited from the Soviet period (Weinthal 2002). Even today, revenue generated from the sale of cotton has allowed Uzbekistan and Turkmenistan to sustain an intricate patronage system (Weinthal 2002). In particular, the revenue from cotton sales has helped to provide the population with "cheap energy, low food prices, and a costly social protection system" (World Bank 2003, 3). Farmers are still able to accrue indirect benefits. For example, the government provides them with significant subsidies for irrigation, financing and other inputs (Guadagni et.al. 2005, 2). The obtainment of free inputs is an implicit side-payment from the state to the farmers that allows them to use water for other purposes. Owing to the subsidized farm inputs such as free water and cheap fertilizers and fuel, farmers have few incentives to conserve water. Thus, such subsidies have retarded attempts to introduce water pricing and to devolve decision-making authority to the local level. Although all the countries have taken steps to encourage formation of water users' associations, in Uzbekistan water user associations are still in an infant stage (Bucknall et al. 2003, 4). Until the state extracts itself from the agricultural sector and allows for further liberalization in prices and removal of state control over markets and what can be grown, it will also be difficult to foster viable water user associations (For details, see Wegerich 2000).

The one area outside of the agricultural sector, which has served as a source of economic growth in other transition countries and could provide alternative employment opportunities to cotton cultivation in Central Asia, is the development of small, medium, and micro enterprises. As of 1995, the Uzbekistan government completed privatization of its small enterprises (World Bank 2003, 12). Yet, despite contributing 15 percent of GDP, 5 percent of exports, and 9 percent of total employment in 2003, their growth in Uzbekistan was, nevertheless, "disappointing" (World Bank 2003, 3-4). Because of conflicting and burdensome regulations and a complicated tax system, numerous individual entrepreneurs have moved to the informal economy instead (World Bank 2003, 13). Only a few micro enterprises in Uzbekistan have experienced some growth, largely owing to the introduction of the simplified tax regime (World Bank 2003, Jones Luong 2002). Similarly, only a few local NGOs in Tajikistan have provided alternative employment opportunities. For example, the National Association of Business Women in Tajikistan has distributed micro credits to women entrepreneurs (Jones Luong 2002). Rather, the small number of individual entrepreneurs in Tajikistan has also gravitated to the shadow economy (ICG 2003).

Small-scale Conflicts

Most donor efforts focused on water sharing at the interstate level immediately after the Soviet Union's collapse. Yet, as the prospects for acute interstate conflict over water have faded, small-scale water disputes still remain a major source of interstate tension and political instability (ICG 2002). Because local stakeholders were not included from the onset in the efforts to build new

interstate water institutions, small-scale conflicts have continued to fester at the intrastate level and along the Kyrgyzstan-Tajikistan border and the Kyrgyzstan-Uzbekistan border.

The Fergana Valley, in particular, is often cited as the region where small-scale conflict would erupt (Tabyshliev 1999). Although it only covers 5 percent of Central Asia, the Fergana Valley has the highest population density in Central Asia with over 10 million people. The Fergana Valley is also known for its strong agriculture base. Forty-five percent of the irrigation area of the Syr Darya basin, for example, is located within the Fergana Valley. It contains some of the most productive irrigated areas—such as Jalal-Abad and Osh in Kyrgyzstan; Andijon, Namangan and Fergana in Uzbekistan; and Khujand in Tajikistan—all of which rely upon the Syr Darya and its tributaries for irrigation.

During the late 1980s, the Fergana Valley was also where most local water conflicts emerged. At that time, the conflicts were internal and localized, but with new borders, many canals that were earlier built to support agriculture throughout the Fergana Valley now cross political jurisdictions and have become a source of interstate tension over time. Thus, conflicts have transpired in border regions where water is shared such as between Tajiks and Kyrgyz along the border in the neighboring districts of Isfara in Tajikistan and Batken in Kyrgyzstan.

The Fergana Valley is the most ethnically diverse region in Central Asia in which different ethnic groups are extremely intermingled. As a result, some have suggested that these water and energy disputes could provoke ethnic tensions in the Fergana Valley, especially between the ethnic Uzbeks, Kyrgyz and Tajiks who live in very close proximity with one another (ICG 2002). Indeed, when Kyrgyzstan runs its hydropower plants during the winter months, the downstream populations in the Fergana Valley have experienced winter floods and summer droughts.

The potential for local conflicts exists because of both the failure to build local capacity and the weakening of existing state institutions for water management (Bucknall et al. 2003, 7). Most donor programs (e.g., the World Bank, EU-TACIS, and USAID) were concerned with building national state capacity rather than enhancing local participation and local capacity building (e.g., local NGOs and community participation). In particular, most donor aid was directed toward reinforcing the new interstate institutions created for regional cooperation with the donors such as the IFAS (Weinthal 2002). For those populations in the disaster zones or on the farms, they were often unaware of the international activity that was taking place to improve water cooperation and to mitigate the Aral Sea disaster. Although the international community invested in some local projects, such as supporting water user associations and refitting local canals, most of the large multilateral organizations directed their assistance toward large-scale infrastructure projects such as a drainage collector in the Amu Darya Basin.

Thus, despite such donor projects as the Swiss Agency for Development and Cooperation's project to promote "Integrated Water Resources Management in Fergana Valley" (http://iworm.icwc-aral.uz/index/i_en.htm), projects that have proposed regional cooperation in the Fergana Valley have faltered. Uzbekistan has often refused to participate in projects that deal just with the Fergana Valley since here it is clearly the dominant player due to its military and economic prowess along with having a large concentration of ethnic Uzbeks in the valley.

Moreover, given that much of the opposition to the Karimov government is based in the valley, Uzbekistan has fervently opposed projects that could potentially break down its system of social and political control.

Even if donor programs could redirect their attention toward the local level, increasing NGO participation in water programs has become increasingly difficult, as the governments have introduced more and more restrictions on local NGO activity and donor funding has also diminished. Both local and foreign NGOs are required to officially register with the governments. The Central Asian governments, moreover, have increasingly restricted NGO participation in any political activity, and as a result, the large majority of NGOs shun direct confrontation with the government. There is also increasingly less Western funding available to support the efforts of local NGOs that have worked to address the Aral Sea crisis and that have served as conduits for building civil society in Central Asia.

Central Asia's Other Rivers

Cooperation has also begun to emerge over some of Central Asia's less well-known rivers. For example, Kyrgyzstan and Kazakhstan signed an agreement in January 2000 on water use from the Chu and Talas rivers in Northern Kyrgyzstan that entered into force in 2002 (ICG 2002). Kazakhstan withdraws water from these two rivers for agricultural production. Since 2000, Kazakhstan agreed to pay Kyrgyzstan maintenance costs for the use of their shared water facilities on the Chu and Talas Rivers (World Bank 2004a, iv). This contrasts sharply with relations between Kazakhstan and Kyrgyzstan in the Syr Darya basin and may signal a shift in position in the Syr Darya basin since one of Kyrgyzstan's demands is that the downstream states also contribute to maintenance of the upstream water installations.¹¹ This agreement also reflects a growing acceptance in international law that downstream riparian states should pay for water or water storage and regulation upstream (World Bank 2004a, iv). Here too, international organizations such as the OSCE have intervened to help establish a river commission to manage jointly these rivers (Blua 2003).

The Irtysh River, although not part of the Aral Sea basin, has for decades been linked to the basin because of the controversial "Sibiral Project." During the 1970s, Soviet water planners had proposed reversing the course of the Ob and Irtysh rivers so that they would flow from Siberia toward Central Asia to provide irrigation for cotton monoculture and to replenish the Aral Sea. Yet, in 1986 President Mikhail Gorbachev shelved the project owing to its exorbitant costs. The collapse of the Soviet Union seemed to reinforce the project's defunct status. However, some interests in Uzbekistan including President Karimov along with some Russians have sought, albeit still unsuccessfully, to revive the water diversion scheme (Brown 2002). Unrelenting attention to this project continues to distract both the Central Asian states and the Russian Federation from working together to foster cooperation over their shared water resources in a way that is more ecologically and economically sustainable.

¹¹ Yet, in 2003 a dispute over payments for water had arisen between Kyrgyzstan and Kazakhstan in which Kyrgyzstan was demanding that Kazakhstan pay for the water it receives from the Chu and Talas rivers (30 June 2003 *RFE/RL*).

Limited cooperation over the Irtysh River, however, has begun to emerge between the Russian Federation and Kazakhstan. On 27 August 1992, they signed an agreement over the use and protection of their transboundary waters that included the Irtysh and established a joint commission. Although China is a riparian, it was not part of this agreement, but rather signed a separate agreement on 12 September 2001 with Kazakhstan over the use and protection of their transboundary waters that include the upper tributary of the Irtysh (Black Irtysh) and the Ili (Blua 2004). This agreement also established a joint commission, which, however, is still seen to lack real policy-making authority (Blua 2004).

These separate, albeit related, agreements have, nonetheless, failed to generate a common policy that takes into account the divergent interests and physical asymmetries among the riparians. In particular, China has plans to develop Xinjiang province in northwestern China, which requires increasing water withdrawals from both the Black Irtysh (a tributary of the Irtysh) and Ili River (Blua 2004). Xinjiang occupies one-sixth of the territory of China and forms a long border with Kazakhstan. China has directed enormous resources toward the expansion of the local economy and agricultural development in Xinjiang to encourage ethnic Hans to migrate westward to balance the large Muslim population of Uighurs that are closer akin to their neighbors in Kazakhstan. More so, increased water withdrawals are intended to help China develop the potential oil fields in the Tarim Basin in Xinjiang (Pannier and Magauin 1999). Kazakhstan would also like to use more of the Irtysh's waters to expand development in its north and in the surrounding region near the new capital, Astana (Pannier and Magauin 1999).

China's plans to increase water withdrawals from the Irtysh and Ili upstream will directly affect Kazakhstan's industrial, agricultural, and fishing sectors downstream (Blua 2004). At present, 4 million people depend upon the Irtysh in Kazakhstan (Pannier and Magauin 1999); it is a main source of drinking water for the capital, Astana, and three large industrial cities in Kazakhstan -- Karaganda, Semipalatinsk and Pavlodar (Blua 2004). China's construction of a canal to reroute water from the Irtysh to the Tarim Basin will lessen the amount of water available for many hydropower stations and factories located along the Irtysh and decrease water availability for agriculture in central Kazakhstan that is delivered via a canal from the Irtysh. At a minimum, China intends to increase its current use of the Irtysh's water from approximately 15 percent to 40 percent (Blua 2004). If China dramatically increases its withdrawals from the Ili, some speculate that Lake Balkhash might turn into another Aral Sea (Blua 2004).

As in the other transboundary basins in Central Asia (e.g., the Syr Darya), water cooperation will undoubtedly be linked to energy issues. With one of the fastest growing economies in the world, China is in urgent need of new oil supplies. Thus, China is not only interested in exploiting its own energy reserves in Xinjiang province, but has actively sought to enter the oil and gas sector in Kazakhstan. China's national oil company (CNPC) has signed several oil deals with Kazakhstan and has agreed to build an oil pipeline from western Kazakhstan to China. Thus, as in the Syr Darya basin, for cooperation to emerge, trade-offs will have to be made regarding water and energy. Some have suggested that China might argue that the water canal is vital for supporting the proposed oil pipeline from Kazakhstan to China (Pannier and Magauin 1999). Cooperation might also be linked to the issue of the Uighur population in Xinjiang, which also has a small minority in Kazakhstan. Specifically, Kazakhstan, as in the past, might agree to suppress Uighur nationalists in Kazakhstan that China views as a potential threat to political and

social unrest in China in exchange for increased water flows.

Conclusion

Water cooperation in Central Asia is still in its formative years. While the Central Asian states have successfully precluded violent conflicts from transpiring at the interstate level, a potential for conflict among the states still exists at both the interstate and intrastate levels, largely owing to the increasing large number of demands placed upon the region's water resources. Whereas during the Soviet period, water use favored the cotton sector, independence created new asymmetries of interests and capabilities. Thus, for the Central Asian countries, neighboring states, and the international community to devise robust institutions for water cooperation, they will need to begin to think outside of the "water box" and situate the issue of water within the larger social, economic, and political context. Specifically, this will entail linking cooperation over water to energy and agricultural issues. It will also entail including Afghanistan, China, and Russia in negotiations over their transboundary water resources. In particular, for communities that lie along border regions, projects that promote cross-border cooperation will be essential, especially along the Afghanistan/Tajikistan border, for example. Nevertheless, there are also some steps that the Soviet successor states in Central Asia can take solely within the water sector to improve water management and consequently facilitate cooperation. These are briefly outlined below.

At a minimum, the individual Central Asian states and the donors can invest in repairing the irrigation systems that have fallen into disrepair over the last few decades because of lack of investments or civil war, as in the case of Afghanistan and Tajikistan. For Afghanistan, donor aid could focus on completing the Kunduz-Khanabad Irrigation System, a project initially sponsored by the World Bank and the government of India, which provides water for rice cultivation in Kunduz (Gerstle 2004). Because only 28 percent of irrigation canals were lined in the Soviet successor states in 1994 (Micklin 2000, 29), much water is wasted before it reaches the fields. At present, only 21 percent of water applications are used and the remaining 79 percent is wasted (World Bank 2004, 20). More so, many canals in Central Asia are silted and damaged, and in numerous instances the gates are broken or missing (Bucknall et al. 2003). The Central Asian states must also move away from the Soviet legacy of "bigger is better." In particular, the grandiose project underway in Turkmenistan to build Lake Turkmen should be halted. Such projects are ecologically and economically unsustainable and likely to fuel conflicts with neighboring states. Rather, investments should be directed toward making the current irrigation networks more efficient. One study found that improvements in irrigation would contribute to expanding the per capita income for the poor (Bucknall et al. 2003). Without abetting the social and economic recovery of these disadvantaged populations, they might have no choice but to migrate to the cities in search of alternative livelihoods. There is already a fear that the Aral Sea crisis has spurred the onset of environmental refugees.

Beyond the technical level, at the institutional level the Central Asian states must strengthen the interstate institutions for water management. Many have criticized the ICWC, in particular, for being beholden to the Uzbekistan water *nomenklatura*. Thus, for the new interstate water institutions to become viable, they will need to ensure that different interests from the different riparian states are represented equally. To begin, the Central Asian leadership should invite

Afghanistan to join the new interstate institutions. In order to advance Afghanistan's economic recovery and improve the Aral Sea environment, the Central Asian states will also have to revisit the current quotas from the Amu Darya and Syr Darya rivers. Initially, research will be needed to update data from Afghanistan since most of the current data is from prior to the Soviet invasion (Zonn 2002). Thus, donor assistance should also focus on improving technical expertise in Afghanistan, much of which has been lost over the last 20 years from internal strife.

Although barter arrangements over water and energy exist for the Syr Darya basin, much more effort should be made to encourage the Amu Darya riparians downstream to take into account upstream demands for energy. By not linking energy and water, cooperation will continue to falter and at a minimum result in annual barter agreements that are negotiated ad hoc after a conflict has already erupted. Thus, there is a need to move from the conflict resolution stage to conflict prevention. In particular, the 1998 energy-water agreement that technically expired in 2003 should be amended to prevent further conflicts from taking place.

Integral to whether the Central Asian states will cooperate over water is the role of cotton that has still kept a large percentage of the population in an informal state of indentured servitude to the state. Broader reform is needed in the agricultural sector, which will undoubtedly have economic and social implications for the state. The governments – in particular, Uzbekistan and Turkmenistan -- need to diversify their agricultural sector and expand the role of private farms. Yet, this will both reduce the amount of revenue that accrues to the state from the sale of cotton and lessen the hold on the population at the farm level. While in the long-run, this will produce a more efficient agricultural sector, in the short-term, the leadership will be forced to address some highly volatile issues such as how to tax these individual farmers and how to expand the revenue bases in their countries. In short, the Central Asian states will need to invest in state building – that is, to build fiscal institutions that are broad-based and not solely dependent upon either the cotton or the oil and gas sectors such as in Uzbekistan and Turkmenistan (Jones Luong and Weinthal, forthcoming 2006). The lessening of price controls in the agriculture sector might also help to support the emergence of water user associations at the farm level. Combined, these changes might create a set of stakeholders that have an interest in sustainable water management.

Because the Central Asian states are poor and weakly institutionalized, donor funding will still be needed to help them carry out any technical improvements and to build institutional capacity at both the local and international levels. Yet, the donors must work with the population at large and not just with the state elites. Whereas, immediately after independence, the donors were welcomed with open arms, they will most likely face greater resistance today from the Central Asian governments, as they fear that programs that encourage public participation and sweeping agricultural reform could create the conditions for societal opposition to emerge and challenge their increasingly authoritarian hold on power.

Lastly, attention solely to the Aral basin has detracted attention from other potential conflicts such as in the Irtysh and Ili River basins. Thus, international donor activity needs to help establish a framework for cooperation over the Irtysh that will include both China and Russia, for example. Yet, as in the Aral Sea basin, the complex geopolitical history of the region

requires that any form of cooperation must be based upon situating the water question within broader economic and social issues such as energy and agriculture.

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Appendix 1: Transboundary Rivers/Lakes in Central Asia (source: UNECE 2003)

Transboundary River/ Lake	Countries Concerned	Length of River, km	Area of water basin/lake, 10 ³ km ²	Water Discharge, m ³ /s	Agreement
River Bolshoy Uzen	Russian Federation/ Kazakhstan	650	15,6		4
River Maliy Uzen	Russian Federation/ Kazakhstan	638	18,2		4
River Irtysh	Russian Federation/ Kazakhstan	4248	1643	2830	4
River Ural	Russian Federation/ Kazakhstan	248	231	400	4, 6
River Tobol	Russian Federation/ Kazakhstan	1591	426	805	4, 7
River Ishim	Russian Federation/ Kazakhstan	2540	177	56,3	4, 9
River Volga (only east branches of Volga delta)	Russian Federation/ Kazakhstan				4
River Chu	Kazakhstan/ Kyrgyzstan	1067	6265	70	10
River Talas	Kazakhstan/ Kyrgyzstan	661	52,7		10
River Syr Darya	Kazakhstan/ Kyrgyzstan/ Uzbekistan/ Tajikistan/ Turkmenistan (note this is Aral Basin) Kyrgyzstan/ Uzbekistan	2212 (3019)	219	446-703	1, 2 8
River Amu Darya	Kazakhstan/ Kyrgyzstan/ Uzbekistan/ Tajikistan/ Turkmenistan (note this is Aral Basin) Uzbekistan/ Turkmenistan	1415	309	2000(?)	1, 3 5
River Zerafshan	Uzbekistan/ Tajikistan	877	1767	*{total discharge used for irrigation}	1
River Murgab	Turkmenistan/ Afghanistan	978	46,9	52	
River Atrek	Turkmenistan/ Iran	669	27,3		
River Tejen	Turkmenistan/ Iran	1150	70,6	30 (from river head of the Argun)	
River Pjanj	Tajikistan/ Afghanistan	971	114	1000	
River Black Irtysh (Irtysh)	Kazakhstan/ China				11
River Ily	Kazakhstan/ China	1001	140	329	11

Appendix II: Water Agreements among Central Asia and with its Neighbors (Source: UNECE 2003)

No.	Title of Agreement	Field of Application	River Basin	Area of Application	Signatories and/or contracting parties	Date of Agreement and place of signature	Joint body
1	Agreement between the Republic of Kazakhstan, the Kyrgyz Republic, Republic of Uzbekistan, Republic of Tajikistan and Turkmenistan on Cooperation in Joint Management, Use and Protection of Water Resources of Interstate Sources	Regulating; Qualitative and quantitative protection of water resources, water supply, irrigation	Basins of Amu Darya, Syr Darya, and Aral Sea	All transboundary watercourses and lakes between the parties of the agreement, basin of the Aral Sea	Kazakhstan, Kyrgyzstan, Uzbekistan, Tajikistan, Turkmenistan	Signed 18.02.1992 in Almaty Entered into force on the same date	Inter-state Coordination Water-management Commission (ICWC)
2	Status of the Basin Water-Management Joint Company "Amu Darya"	Regulating of the use of the waters in the basin of Amu Darya	Amu Darya	Rivers, lakes, interstate channels, hydro-technical installations in basin of Amu Darya	Kazakhstan, Kyrgyzstan, Uzbekistan, Tajikistan, Turkmenistan	Signed 06.04.1992 at Ashgabat Entered into force the same date	
3	Status of the Basin Water-Management Joint Company "Syr Darya"	Regulating of the waters in the basin of the Syr Darya	Syr Darya	Rivers, lakes, interstate channels, hydro-technical installations in basin of Syr Darya	Kazakhstan, Kyrgyzstan, Uzbekistan, Tajikistan, Turkmenistan	Signed 06.04.1992 at Ashgabat Entered into force the same date	
4	Agreement between the Government of the Russian Federation and the Government of the Republic of Kazakhstan	Qualitative and Quantitative Protection of Water Resources; Water Supply, Irrigation; Floods; Regulating	Ob, Ural, Volga	All surface waters and ground waters which form or cross the frontier between the two states include transboundary	Kazakhstan and Russian Federation	Signed 27/08/1992 at Orenburg Entered into force the same day	Joint Russian-Kazakhstan Commission on Transboundary Waters

	concerning the Use and Protection of Transboundary Waters			waters in the catchment areas of the Rivers Ishim, Irtysh, Ural, Tobol and Volga (eastern part of the delta)			
5	Agreement between Turkmenistan and Republic of Uzbekistan on Cooperation on Questions of Water Management	Regulating of Water Use	Amu Darya	Basin of the River Amu Darya	Turkmenistan, Uzbekistan	Signed 16.01.1996 in Chartzjou	BWO Amu Darya
6	Protocol on Joint Use and Protection of Transboundary Water Bodies, Coordination of Water Management in Basin of River Ural	Qualitative and quantitative protection of water resources; water supply, irrigation; floods; regulating	Ural	Rivers Ural, Chagan, Or, Ilek, Khobda	Russian Federation, Kazakhstan	Signed 20.06.1996 at Kurgan	Joint Working Group on Basin of River Ural
7	Protocol on Joint Use and Protection of Transboundary Water Bodies, Coordination of Water Management in Basin of River Tobol	Qualitative and quantitative protection of water resources; water supply, irrigation; floods; regulating	Tobol	Rivers Tobol, Sintashti, Ayat, Upper-Tobol reservoir, Karamatarsky reservoir	Russian Federation, Kazakhstan	Signed 20.06.1996 at Kurgan	Joint Working Group on Basin of River Tobol
8	Agreement between the Government of the Republic of Uzbekistan and the Government of Republic of Kyrgyzstan on the Questions of Use Water Energy resources of Naryn Syr Darya's Hydropower	Regulating of use waters of Syr Darya taking in mind providing for vegetation watering	Syr Darya	Basin of River Syr Darya	Uzbekistan, Kyrgyzstan	Signed 25.12.1996 in Tashkent	BWO Syr Darya

	Station Cascade in 1997						
9	Protocol on Joint Use and Protection of Transboundary Water Bodies, Coordination of Water Management in Basin of River Ishim	Qualitative and quantitative protection of water resources, irrigation, floods, regulating	Ishim	River Ishim, Sergeevskiy and Petropavlovsky water-engineering systems	Russian Federation, Kazakhstan	Signed 26.06.1997 at Pavlodar	Joint working Group on Basin River Ishim
10	Agreement between the Government of the Republic of Kazakhstan and the Government of Kyrgyz Republic on Use of Interstate Water Management's Installations on Rivers Chu and Talas	Regulating of use water management's installations	Chu, Talas	Rivers Chu, Talas and water reservoirs on these rivers	Kazakhstan, Kyrgyzstan	Signed 21.02.2000 in Astana Entered into Force 16.04.2002	
11	Agreement between the Government of the Republic of Kazakhstan and the Government of the Republic of China Concerning Cooperation in Use and Protection of Transboundary Waters	Qualitative and quantitative protection of water resources	Black Irtysh (Irtysh), Ily	All surface waters which form or cross the frontiers between the two states, including rivers Black Irtysh (Irtysh) and Ily	Kazakhstan, China	Signed 12.09.2001 in Astana	Joint Commission
12	Decision made by the Heads of the Central Asian countries on "Main Directions of the Action Plan for	Measures on complex water management, hydro-technical installations; solving of social-	Rivers Amu Darya, Syr Darya, Aral Sea	All watercourses and lakes of the Parties of the Decision in basin of the Aral Sea	Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan	Signed on 06.10.2002 in Dushanbe	Existing joint bodies; ICWC, SDC, IFAS

	Improving the Ecological and Social-Economic Situation in the Aral Sea Basin for the Period of 2003-2010	economic problems; development of legal background of interstate organizations					
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