

Cooperative Management of Transboundary Water Resources in Central Asia

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Since independence a little more than a decade ago, the Central Asian republics have been striving to develop fair and rational bases for sharing and using their water and energy resources. Inheriting a legacy of unsustainable economic development and environmental mismanagement, these former Soviet countries have faced extreme economic inefficiencies and ecological damage in their attempts to transition to market economies. The Central Asian republics depend on the rivers of the Aral Sea Basin for drinking water, irrigation, and hydroelectric power. In the upstream countries of the Basin, Kyrgyzstan and Tajikistan, the rivers are used for hydroelectric power, especially during winter months, while downstream, in Turkmenistan, Kazakhstan, and Uzbekistan, they are used for agricultural purposes in the summertime. The post-independence upstream shift in water use away from irrigation has created disputes between the upstream and downstream countries over how the region's transboundary waters should be managed. Successful cooperative sharing of water and other natural resources is essential for the long-term prosperity and security of the region.

Agriculture is the largest water consumer in the region and a major employer of the region's workforce, producing a large percentage of each country's gross domestic product (GDP). Yet water diversions for irrigation have resulted in severe problems in the downstream areas of the Syr Darya and Amu Darya Basins near the Aral Sea. Improving water quality and increasing water quantity to meet basic human needs in these environmentally damaged and economically depressed areas is an urgent need. However, providing this water through reduced agricultural water use may impose great economic damage on the basin countries. How does one

choose? The ongoing questions of water management in Central Asia center on such paradoxical and too often restrictive choices. Finding solutions will not be easy because the problems are inherently complicated.

The main infrastructure systems of Central Asia were developed when the countries were part of one centrally administered area, in which natural and economic resources were shared and costs were subsidized. This is no longer the case, and the countries of Central Asia have each developed their own national approaches to resource use and economic development. The past decade has brought greater national self-sufficiency and governance but, at the same time, has contributed to a decline in economic integration and personal living standards among the republics.

Given the great dependence of the Central Asian economies on irrigated agriculture, the issue of water allocation, involving both quantity of water and timing of allocations, has emerged as a major factor in the republics' development. Agreements on the use of the region's shared water resources are evolving. How the use of water resources is finally settled will have substantial consequences for the long-term prosperity of these nations. In addition, the ongoing process of regional cooperation in the arena of natural resources management is a major factor in the long-term security of the region.

The Central Asian states have made great progress during the past 10 years in cooperative management of shared water resources. However, many issues remain unresolved and need continued development, including:

- Harmonizing, or at least coordinating, water management strategies and water codes among the nations of the region;
- Enhancing and strengthening the roles of regional water management bodies;
- Improving the 1998 Agreement on water and energy use in the Syr Darya Basin, which is due to renew itself for an additional five years in 2003;
- Improving water allocation in the Basin to account for the developing agricultural and hydropower sectors in the upstream countries, and the use of the water in downstream countries; and
- Proper financing of water infrastructure of interstate significance.

Central Asia is a region perpetually dependent on its water resources for existence and prosperity. Recent political changes in the region have created a situation in which a resource once managed by a single, cen-

tralized authority must now be jointly developed and managed by five sovereign nations. Many past decisions must be dealt with by the new governments, such as the tragedy of the Aral Sea decline and the legacy of over-developed irrigation systems. While new relations between the fledgling countries have been established in the area of water resources, much remains to be done to achieve secure and productive use of this resource. This chapter will examine the history of the region in terms of water issues, examine the ongoing strategies to deal with water management and finally discuss conclusions and challenges which remain within the region.

Figure 9–1. Aral Sea Basin.



The Aral Sea Basin

The Aral Sea Basin, the dominant geographic feature of the region in terms of water, comprises parts of Afghanistan and Kazakhstan, and most of the Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan. Figure 9–1 shows the size of the Basin in relation to the region. The Aral Sea Basin

occupies 1.51 million square kilometers (km²) of the total four million km² area of these countries. Topographically, the Aral Sea Basin ranges from the vast Turanian plains in the west to the tremendous mountain ranges of the Pamirs and Tien Shan in the east.

The climate in the northern part of the Basin is continental, whereas the southern part is subtropical. The high mountain areas are humid and account for the high volume of runoff in the Amu and Syr Darya rivers which run from the mountains through the desert to the Aral Sea. Water resources are mainly surface waters formed in the Tien Shan and Pamir mountain ranges. Melt water from extensive permanent snowfields and glaciers (more than 18,000 km² of ice cover) feeds the major rivers of the Aral Sea Basin, the Syr Darya, and Amu Darya, mostly during the spring and early summer thaw.

The Amu Darya Basin covers a broad area, about 1.33 million km², and the river—the largest river in Central Asia—has a length of 2574 km from the headwaters of the Pyanj River on the Afghan–Tajik border to the Aral Sea.¹ The Syr Darya Basin occupies about 484,000 km² and the river stretches some 2,337 km from the Naryn River headwaters in Kyrgyzstan through the Ferghana Valley, the Hunger Steppe, the Kyzyl Kum desert, before finally reaching the Aral Sea.² These two rivers account for about 90 percent of the region's annual river flow and provide roughly 75 percent (by area) of the water to Central Asia's irrigated agriculture. The Amu Darya has an average annual flow of 79.3 billion cubic meters (bcm), and the Syr Darya has a flow of 37.2 bcm.

Figure 9–2 and Table 9–1 show that Tajikistan and Kyrgyzstan together produce about 77 percent of the water in the Aral Sea Basin. Afghanistan contributes about 10 percent of the inflow to the Basin, but it has not been a party to the recent Aral Sea Basin management because of its political instability. However, this is likely to change in the future as agricultural development proceeds in Afghanistan. Afghanistan's participation in Amu Darya management notwithstanding, eventually its water needs will have to be considered along with the other Central Asian states. Historically, demand for water in Central Asia has been dominated by the needs of agriculture, which accounts for more than 90 percent of total water use. The downstream countries use about 85 percent of the Aral Sea Basin waters, while the upstream countries use the rest. Most of the countries have increased their demands for water in the last few years and there is little likelihood this situation will change any time soon.

Central Asia's agricultural expansion and population growth over the past three decades have placed a great strain on the water resources

of the region. In 1960, the Aral Sea occupied an area of 66,000 km² and had a volume of 1060 bcm. Since 1960 the population in the Basin has grown from 13 million to more than 40 million people, water diversions have increased from 60 to 105 bcm, and irrigated lands have risen from 4.5 million hectares (ha) to just over eight million. As a result, the Aral Sea has lost half of its surface area and two-thirds of its volume and become an environmentally challenged area. Figure 9–3 charts the increase in irrigated lane and the corresponding diminished flow. In addition to the dwindling flow, inefficient irrigation systems and mismanagement of irrigation water diversions have resulted in elevated water and soil salinity levels, widespread environmental degradation, and diminished agricultural productivity.

Figure 9–2. Aral Sea Basin Selected Characteristics: Population; Surface Water Flow Formation; ICWC Water Allocation; and Irrigated Lands.

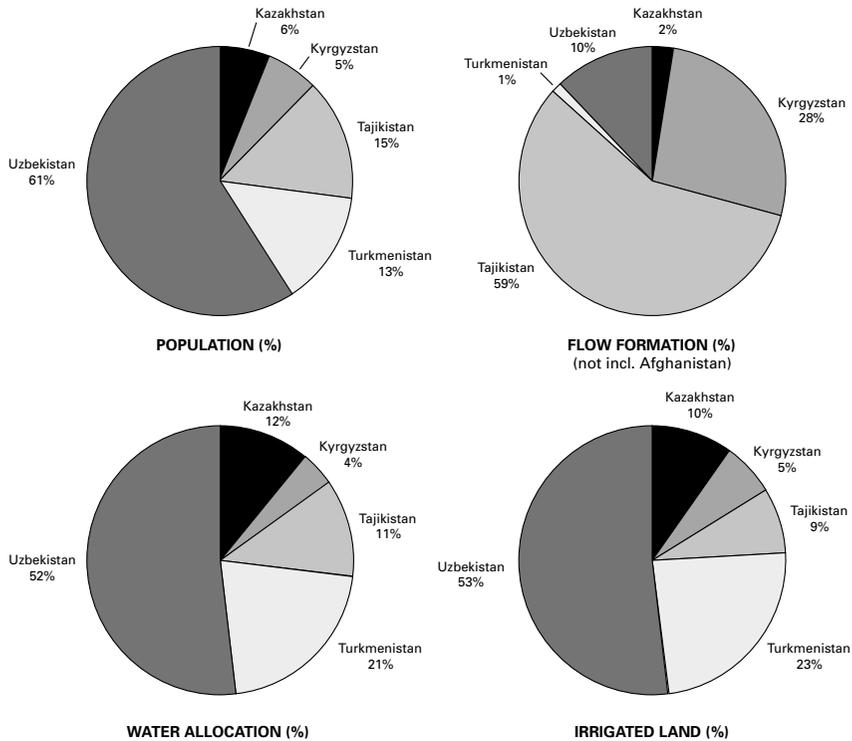
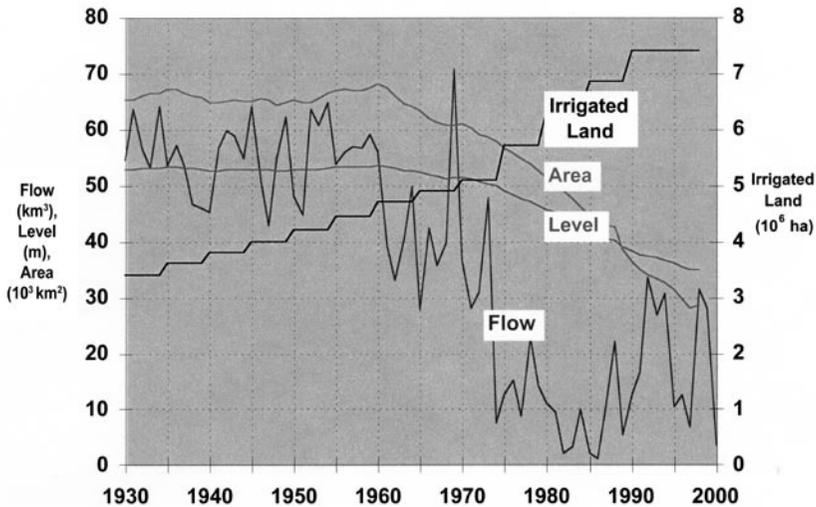


Figure 9–3. Decline of the Aral Sea with Increased Irrigated Area in Central Asia



The Aral Sea Tragedy

Increased diversion of water from the Aral Sea Basin rivers over the past several decades allowed the development of a massive agricultural complex in Central Asia, while at the same time degrading the ecosystem and environment of the region. The Aral Sea level has decreased by more than 20 meters since 1950, causing the sea to separate into two water bodies, the Southern and Northern Aral Seas, each fed by the Amu Darya and Syr Darya, respectively. More recently, the Large Sea has split into western and eastern portions.

The desiccation of the Aral Sea has had major consequences for the population of the region in terms of employment and health. In some villages the majority of the population get their drinking water from irrigation canals and the Amu Darya. In dry years, the population considers the water too saline for drinking, tap water is limited or unavailable, and groundwater and surface water is saline and polluted by bacteria.³ In Karakalpakstan and the lower delta of the Syr Darya, the incidence of common diseases associated with poor drinking water quality (typhoid, paratyphoid, dysentery, and viral hepatitis) is much higher than in the

Table 9–1. Aral Sea Basin Characteristics

		Kazakhstan*	Kyrgyzstan	Tajikistan	Turkmenistan	Uzbekistan	Afghan.	Total
Population	Mln	2.6	2.2	6.1	5.4	24.3	-	40.6
	% Ag	23	55	50	44	44	-	44.2
GDP	\$	1,228	265	177	916	312	-	-
	% Ag	10	39	20	25	28	-	-
Flow Formation (bcm)	AD**	0	1.6	59.9	1.5	4.7	11.6	79.4
	SD	2.4	27.6	1	0	6.2	0	37.2
	Total	2.4	29.2	60.9	1.5	10.9	11.6	116.6
Water Allocation (bcm)	AD	-	0.24	9.08	22.02	33.9	-	65.24
	AD	12.29	4.03	2.46	-	19.69	-	38.47
	Total	12.29	4.27	11.54	22.02	53.59	-	103.71
Water Use	bcm	8.24	3.29	12.52	18.08	62.83	-	104.96
Irrigated Area ('000 ha)	AD	-	15	449	1.86	2.39	-	4.714
	SD	786	400	269	-	1,869	-	3,324
	Total	786	415	718	1.86	4,259	-	8,038

Source: Global Environmental Facility, Water and Environmental Management Project, Component A.1 Joint Report 2 and Regional Report 2, 2002.

*Aral Sea Basin oblasts of Kazakhstan only, South Kazakhstan and Kyzyl Orda oblasts.

**AD = Amu Darya Basin, and SD = Ayr Darya Basin.

rest of the Aral Sea basin. The salt content of Aral Sea now exceeds 60 parts per hundred and has killed the sea's ecosystems, eliminating the once commercially-valuable fishery and causing salt laden windstorms that are detrimental to the population's health. Most of the fish species that once flourished in the Aral Sea have perished as the salinity of the sea has increased over the past decades.⁴ The Aral Sea has completely lost all of its commercial and most of its ecological importance as a fishery.

Karakalpakstan, an autonomous republic located in the delta of the Amu Darya within Uzbekistan, has suffered more than any other region in Central Asia from the cumulative effects of the Aral Sea crisis. Due to decades of agricultural development that paid more attention to centrally-

planned quotas than the state of the environment, nearly the whole of Karakalpakstan is either salinized or waterlogged. Key factors in this disaster are the discharge of highly mineralized, pesticide-rich return flows into rivers; the use of unlined irrigation canals leading to waste and seepage of salts into groundwater; waterlogged fields leading to salty groundwater and salt runoff; and the lack of drainage facilities to remove unwanted water and chemicals from the fields.

The Aral Sea cannot be returned to its prior grandeur without totally disrupting the economies of the Basin states. In fact, there is little hope for even stabilizing the large, Southern Sea at its present level. Efforts are underway to stabilize or reverse the shrinkage of the Northern Sea, including a World Bank funded program of rehabilitation and reconstruction of hydraulic structures in the lower Syr Darya Basin; however, the area still ranks as one of the world's largest manmade ecological disasters and the outlook for future improvement is grim.

Regional Water Management in Central Asia

Pre-Independence

Soviet Water Management

Spurred by major directives for land reclamation and increased agricultural production beginning in the 1950s, Soviet planners developed comprehensive plans for the utilization of Central Asia's river basins. During this period, central planning organizations and ministries in Moscow directed water management in Central Asia. Each republic developed five-year plans that were coordinated by the state planning agencies and funded through the republican or central budgets of the Soviet Union. For transboundary basins, such as those in Central Asia, basin plans were developed by regional design institutes and included inter-republic and multisectoral aspects, as well as allocation of water for various uses. For the Syr Darya Basin, the last plan of the Soviet period was approved in 1982; for the Amu Darya Basin, in 1987. These plans included limits for water allocation between republics and targets for the development of irrigated lands within these limits.

During the drought years in the late 1970s, local authorities interfered in water allocation among the Aral Sea Basin republics. In the Syr Darya Basin, the situation became so tense that Moscow had to send authorities to ensure that water from the upper and middle areas of the Basin reached lower areas. In order to ensure compliance with inter-republican

water allocations, region-wide Basin Water Organizations (BVOs) were established in 1986 in the Amu Darya and Syr Darya Basins. The BVOs were charged with managing water resources of the Basins according to the plans approved by the Soviet Ministry of Water Management. The BVOs had barely begun to function when the Soviet Union began its decline in 1988 and finally collapsed in 1991. As discussed below, these institutions were some of the only regional Soviet institutions to survive into the post-Soviet era.

Post-Independence

Interstate Coordination Water Commission (ICWC)

Given the heavy dependence of the Central Asian republics economies on irrigated agriculture, it was necessary to stabilize interstate water relations immediately after independence. In October 1991, the heads of the Republican water sectors developed a regional water resources management mechanism to replace the centralized system of the Soviet period. The newly independent countries signed an agreement "On Cooperation in the Field of Joint Management and Conservation of Interstate Water Resources."⁵ This agreement established the ICWC for control, rational use, and protection of interstate water resources. The agreement acknowledged the equal rights of member states to use, and their responsibility to protect, the interstate water resources of Central Asia. The agreement affirmed the continuation of existing Soviet structures and principles of interstate water allocation, and was approved by the presidents of the Central Asian Republics.⁶ The presidents later signed a declaration confirming the validity of previously signed agreements on water resources in the Aral Sea Basin.⁷

The ICWC is the highest level of transboundary water resources management in Central Asia. It is responsible for water management in both the Amu Darya and Syr Darya Basins. The ICWC makes decisions related to water allocation, monitoring, and management. It is comprised of the most senior water sector officials of the member countries, and it meets quarterly to determine water allocations to member countries. Decisions of the ICWC are by consensus, with each State having an equal vote in decisions. Scientific and information support to the ICWC is provided by the Scientific Information Center (SIC). The two Basin water management organisations, BVO Syr Darya and BVO Amu Darya (holdovers from the Soviet days), the SIC, and the ICWC Secretariat are the executing bodies of the ICWC.

Basin Water Management Organizations (BVOs)

Created at the end of the Soviet era, and operating as the executive organs of the ICWC, the BVOs Amu Darya and Syr Darya are responsible for the day-to-day operation of the main water supply facilities in the two Basins. The BVOs' duties include the following:

- Development of plans for water allocation to users in the Amu Darya and Syr Darya Basins, water diversions, and reservoir operation modes;
- Water supply to users, including those in deltas and the Aral Sea, according to approved limits for water diversion from transboundary water sources;
- Operation of all major hydraulic structures on both rivers, including reservoirs;
- Measurement of water flow through the main water intakes and across national borders;
- Design, construction, rehabilitation and operation of hydraulic structures, head water intakes, and inter-republic canals; and
- Maintenance of water quality in the rivers.

Using forecasts from the Central Asian Hydrometeorology Services, the BVOs prepare water allocation plans for ICWC approval at critical times during the year. These plans set the water releases from reservoirs and delivery to each water management region. The water allocation to each republic is established in accordance with previously mentioned schemes devised during Soviet times. Water delivery to the Aral Sea and its coastal zone is based primarily on the principle of "whatever is remaining." Even though the BVOs have the responsibility to monitor water quality, they do not fulfill these obligations. In addition, they are not responsible for water use in each country. As such, their role is mainly regional flow monitoring organizations. This provides some information that is useful in water management, but operational control and management is largely out of the hands of the BVOs and rests with the national water management agencies, resulting in a conflicting and contradictory role for them, since they were originally established as regional water management institutions and their current status (mainly monitoring water flow with staff and facilities exclusively on Uzbek territory) does not allow them to execute this role effectively.

International Fund for the Aral Sea (IFAS)

The Central Asian presidents created the IFAS to attract outside resources to coordinate and finance regional programs to overcome the problems associated with the desiccation of the Aral Sea.⁸ Later the same year, the presidents established the Interstate Council for the Aral Sea (ICAS)⁹ to manage regional programs.¹⁰ The following year, the Central Asian presidents approved a “Program of Concrete Actions” on improving the situation in the Aral Sea Basin.¹¹ The program called for the development of a general strategy for: water sharing among the countries; rational water use; conservation of water resources in the Basin; and interstate legal acts on the use and protection of water resources from pollution. In 1997, ICAS and IFAS were merged and streamlined as a new IFAS under the rotating chairmanship of the president of one of the five member states.¹² The new IFAS’ primary activities include:

- Raising funds for joint measures to conserve the air, water, and land resources of the Aral Sea Basin, as well as the flora and fauna;
- Financing
 - ◆ Interstate ecological research, programs, and projects aimed at saving the Aral Sea and improving the ecological situation in the region surrounding the Sea as well as resolving general social and ecological problems of the region;
 - ◆ Joint studies and scientific-technical efforts to rehabilitate the ecological balance, establish efficient use of natural resources, and manage transboundary waters;
- Establishing a regional environmental monitoring system in the Aral Sea Basin;
- Participating in implementing international programs on saving the Aral Sea and improving the ecology of the Basin.

An IFAS Management Board, consisting of Deputy Prime Ministers from each member country, also was formed. The Board develops priority measures for alleviation of the Aral Sea problems and organizes and coordinates the implementation of all regional programs associated with the problems of sustainable development in the Aral Sea Basin countries.

These main regional water and energy institutions have very limited capacity and function according to sometimes contradictory principles. The operation modes of hydrosystems in the Aral Sea Basin are determined and approved by ICWC without participation of the energy sector.

The operation plans are implemented by the energy sector without participation of the water sector. All of the executive bodies of the BVOs are located in Uzbekistan, and their staffs are formed entirely of Uzbeks. These organizations have, in principle, the status of interstate organizations, yet, due to the predominant influence of Uzbekistan, they do not rotate management staff or hire specialists from other republics. Until this system is remedied, the increased coordination necessary to ensure equitable water allocation and control is unlikely.

Framework Agreement on Water and Energy Use

Syr Darya Basin Agreements

Toktogul Reservoir in Kyrgyzstan is the largest in the Syr Darya Basin and the only one with multiyear storage capacity (14 bcm active storage volume). The reservoir was designed to operate in an irrigation mode with non-growing season (October through March) releases providing minimum electricity generation. Commissioned in 1974, the reservoir did not operate according to design until 1990, after the high water winter of 1988 filled the reservoir to capacity for the first time. The irrigation release regime follows natural cycles, but the reservoir's large storage can be used to continue these releases in periods of drought.

Before 1991, surplus power generated by irrigation releases in the growing season (April to September) from the Toktogul system was transmitted to neighboring regions of the Soviet Union. In return, these regions sent electric power and fuels (natural gas, coal and fuel oil) for Kyrgyzstan's two thermal power plants for winter heating needs.

This situation changed drastically in 1991 when independent states were established in Central Asia. Because of complications in intergovernmental relations and account settlements, the introduction of national currencies, and the increasing prices of oil, coal, natural gas and transportation, the supply of fuel and electricity sent to Kyrgyzstan from the other republics was reduced. This radically affected the structure of the Kyrgyz fuel-and-energy balance. Because of decreased fuel production in Kyrgyzstan, the output and distribution of heat from thermal power plants decreased by half and organic fuel consumption fell, resulting in a marked increase in the demand for electric power by the population for heating, cooking, and hot water supply. The Kyrgyz government responded to this demand by increasing wintertime hydroelectric generation from the Toktogul system.

Intensive use of water resources for power generation, along with changes in the Toktogul operating regime from summertime irrigation releases to wintertime energy releases, created serious problems in the Syr Darya Basin in the winter. Downstream reservoirs were not able to store the increased releases, and, in order to prevent flooding of the lower reaches of the Syr Darya Basin, discharges into the Arnasai depression in Uzbekistan were required. With no means to store the water, the discharges in Uzbekistan, more than one cubic kilometer per year, were, essentially, wasted for agricultural use.

Beginning in 1995, to alleviate these problems and reduce the waste, Kazakhstan, Kyrgyzstan, and Uzbekistan signed interstate protocols and agreements on the use of water and energy resources in the Syr Darya Basin. These specified the amount of compensatory deliveries of fuel and energy resources and releases from Toktogul reservoir. Based on these agreements, Uzbekistan and Kazakhstan receive excess energy from Kyrgyzstan generated by Toktogul reservoir in the summer, and in winter, they provide Kyrgyzstan with energy, respectively, by deliveries of natural gas and coal. To monitor this delicate arrangement, the Heads of State of the countries involved turned to their regional integration and development organization, the Executive Committee of the Interstate Council of the Central Asian Economic Community (EC CAEC). In 1996, the EC CAEC formed a Water and Energy Uses Round Table to develop a framework agreement addressing the Syr Darya Basin riparian republics competing uses for water. The work of the Round Table resulted in an agreement that created a framework addressing trade-offs between the competing uses of water for energy and agricultural production in the Basin.¹³ Compensation is associated with a water release schedule that takes into account both upstream winter energy needs and downstream summer irrigation water demand. To date, the system has remained stable without major conflict and the agreement has entered the second five-year implementation period without major revision.¹⁴

Regional Cooperation Organizations

Over the past decade, the Central Asian states have sought to promote their separate national interests while also acting to enhance their common goals.¹⁵ However, in many areas the losses from interstate competition exceed the gains from cooperation. The presidents of these countries have acknowledged the need to create a regional concert of interests. Several Central Asian organizations have been formed or joined over the past decade, many concerned with regional cooperation, security, and

economic development. Some of the organizations, the most important being the CAEC and IFAS, have had a mandate to consider problems of the water, environment, and energy sectors.

As previously mentioned, IFAS was formed in 1993 as the leading institution for raising and administering funds to address the Aral Sea crisis. Constraints on IFAS, its credibility as a neutral broker, and its lack of a clear mandate to deal with multi-sectoral issues have, so far, kept it from successfully developing regional water management strategies or negotiating regional water and energy sharing agreements. This is why, in 1996, the CAEC stepped in to mediate the annual agreements on water and energy management for the Syr Darya Basin. IFAS recently has moved its Presidency and Secretariat to Dushanbe, Tajikistan and initiated a series of activities to revitalize this dormant and discredited organization. In late August 2002, the first IFAS Board meeting in three years was held in order to assess the past activities and propose a new agenda. These ideas were confirmed and approved by the IFAS Heads of State in an early October 2002 meeting. In November 2002, the international donor community was asked to support the development of a new phase of IFAS activities. It remains to be seen if the new IFAS management can overcome the poor performance of the past and attract support for new activities.

The CAEC was formed to promote regional integration through economic cooperation in Central Asia. It had a broad mandate to promote regional economic cooperation and to organize and broker negotiations, such as those leading to the 1998 Syr Darya Agreement. Since the CAEC did not have direct competence in water or energy technical matters, it wisely relied on the national water and energy ministries, as well as the ICWC, the BVO Syr Darya, and the United Energy Dispatch Center (UDC Energia) to support negotiations.

The Central Asian Cooperation Organization (CACO) was established in 2002 by the Presidents of Kazakhstan, Kyrgyzstan, Tajikistan, and Uzbekistan under the leadership of the President of Uzbekistan. Turkmenistan has strong reasons for maintaining good relations with Uzbekistan due to the division of the Amu Darya River. However, Turkmenistan puts less emphasis on Central Asian regional cooperation and more emphasis on relations with the Caucasus, the Middle East, Iran, and Caspian egress routes.¹⁶ This is evidenced by Turkmenistan's observer status in most regional cooperation organizations and refusal to participate in most regional water management activities. The four participating Central Asian states have yet to establish a CACO secretariat, although one is planned. There is some speculation that CACO was created to be the successor or-

ganization to the CAEC; however, no decision has yet been made on how CACO will work. Communiqués from recent meetings of the organization have indicated that it will take up the issues of water and energy.¹⁷

Summary of Post-Independence Experience

The experience of the Central Asian countries in addressing trans-boundary water management issues reveal several lessons:¹⁸

- It is essential that the body organizing interstate discussions be considered sufficiently neutral in order to gain the trust of all parties. External support from similarly neutral third parties can play a crucial role in helping participants gain access to international expertise and add credibility to the process, but the riparians must work out the final details themselves.
- Given sufficient high-level commitment to regional cooperation, the primary focus of regional organizations' discussions should be on technical issues, with legal and political matters held for later in negotiations. Without a firm sense that technical issues can be solved, no political progress can be made. However, regional cooperation is unlikely to be achieved through technical activities and projects alone; political will is the key.
- It is important to take on a manageable set of issues rather than attempting to solve the full range of problems. The Central Asian Water and Energy Round Table group achieved positive results by focusing attention on the Syr Darya Basin, rather than taking on the full menu of issues in the Aral Sea Basin.

Country-Specific Issues¹⁹

Afghanistan

Though not part of Soviet Central Asia, Afghanistan borders three other Aral Sea Basin countries: Tajikistan, Uzbekistan, and Turkmenistan. About 8 percent of the flow of the Amu Darya is formed in Afghanistan. The Afghan portions of the Amu Darya Basin include the territory rimmed by the Panj and Amu Darya Rivers on the north, by spurs of the Bandi-Torkestan and the Hindukush Ridges on the south, the Kowkchen River valley in the east, and the Shirintagao River valley on the west.²⁰ Irrigable lands in this area exceed 1.5 million ha. About two-thirds of Afghanistan's GDP is derived from the agricultural sector, and although the country has

large tracts of irrigable lands, only a small portion is used due to the past instabilities and low level of development.

Even though the Afghan lands in the Amu Darya Basin were the least developed in the past, many expect this will change in the future, placing even greater stress on the Aral Sea Basin countries downstream. Some estimate that Afghanistan may divert as much as 10 bcm from the Amu Darya in the future (compared to about 2 bcm today) if development plans are realized.²¹ In October 2002 the Ministry of Irrigation, Water Resources, and Environment issued a list of short-term priorities which include rehabilitating irrigation canals and existing systems. Longer-term priorities include the Khushtapa, or "Good Hill" Project, which would pump water from the Amu Darya River into a canal to be transported to Mazar-I-Sharif to irrigate a large area there.

Tajikistan

Tajikistan, a small, mountainous country covering 139,800 km², is made up of a number of distinct and relatively isolated regions, separated by high mountain ranges. The Vaksh and Pyanj Rivers, the main tributaries of the Amu Darya, rise in the mountains of Tajikistan and Afghanistan. The flow formation within Tajikistan's portion of the Aral Sea Basin is 60.9 bcm and the interstate allocation of water to Tajikistan is 11.5 bcm. In 2000, 718,000 ha were irrigated in the Tajik portion of the Aral Sea Basin, requiring the diversion of 12.5 bcm of water to irrigation systems. Irrigated agriculture, using about 85 percent of the water, is the largest water consumer in the country. Still, the great elevation differences and large volumes of flow in the rivers of Tajikistan give the country important hydropower potential. Even now, Tajikistan is one of the world's largest producers of hydroelectric power. Whether this potential is tapped will depend upon future water negotiations and the ability of the Central Asian countries to achieve a sound policy.

In the past decade, the economy of Tajikistan experienced a sharp decline as industrial and economic relations with Russia were broken and civil war inflicted much damage on the country's infrastructure and human resources. Approximately 70 percent of Tajikistan's six million people live in rural areas, with about 50 percent of the population working in the agricultural sector, making Tajikistan the most rural of the former Soviet Republics. Tajikistan's main agricultural production areas lie in the irrigated valleys of the Amu Darya and Syr Darya tributaries. Cotton is the major cash crop accounting for about two-thirds of the gross production value of the agriculture sector.

Tajik water law, typical of all the countries of Central Asia, claims water to be the property of the national government. Water management in Tajikistan is transforming from the old command administrative system to newer market based incentives. In November 2000, a new Water Code was adopted that allowed transfer of irrigation systems management to the private sector with collective farms as the base for development of privatization and support of irrigation system operation. In an effort to provide the population with a secure food supply, the Tajik government intends to increase irrigated lands by 350,000 ha by the year 2010. Most of the water required for this agricultural expansion is predicted to come from water saved through increased irrigation efficiency. Efforts are in place to improve irrigation efficiency through the introduction of water charges and the improvement of infrastructure with the proceeds, as well as the introduction and development of cooperative water user associations. The new water code also establishes principles for Tajik cooperation in international water relations based on international water law principles.

Tajikistan is experiencing rapid population growth, a major factor affecting its economic development and water management policy. Achieving food security is an objective for the country, which will require improved agricultural productivity through increased irrigation efficiency and expansion of irrigated lands. During the Soviet period, the development of irrigated lands in Tajikistan was limited. The Soviets favored developments in downstream areas of the Basin. Hence, Tajikistan has inherited the consequences of this legacy and the allocation of the Amu Darya and Syr Darya waters according to the old Soviet scheme which favors downstream cotton production at the expense of expanded hydropower and agricultural development upstream. Tajikistan supports the creation of a new system of water allocation among the countries of the Basins that recognizes conjunctive use of water for agriculture and hydropower generation, prevention of pollution of transboundary waters, and elimination of adverse effects, but does not view this as a pressing issue at this time. However, Tajikistan is a strong supporter of the concept that the institutional structure of Central Asian water management should be improved through integration of the water and energy sectors at the regional level.

Kyrgyzstan

The Kyrgyz Republic is a mountainous country with an average height above sea level of 2,750 meters and a maximum height of 7,439 meters. This wide range of elevations, complex relief, protracted geologic development, and other factors result in a variety of natural conditions

and a richness of natural resources. The Naryn River rises in the mountains of Kyrgyzstan, and, along with the Karadarya and Chirchik Rivers, is one of the main tributaries of the Syr Darya. The main watercourses of the Kyrgyz part of Aral Sea Basin are the Naryn, Karadarya, Sokh, and Chatkal rivers (Syr Darya Basin) and the Kyzyl Suu River (Amu Darya Basin). The flow formation within the Kyrgyzstan portion of the Aral Sea Basin is 29.2 bcm, and the interstate allocation of water to Kazakhstan from the Syr Darya is 4.27 bcm. The population of Kyrgyzstan in the Aral Sea Basin is about 2.2 million. Approximately 39 percent of Kyrgyzstan's GDP is derived from a severely disorganized and undercapitalized agricultural sector where about 55 percent of the total population works. In 2000, 415,000 ha were irrigated in the Kyrgyz portion of the Aral Sea Basin, requiring 3.3 bcm of water.

Like Tajikistan, Kyrgyzstan finds its agricultural development constrained by the Soviet-era water allocation scheme for the Syr Darya, which the Central Asian countries have agreed to honor until a new scheme can be developed and approved. In the meantime, Kyrgyzstan would like to expand its agricultural sector and needs additional water to do so. No transboundary water enters Kyrgyzstan from any source and about 44 bcm of runoff are formed within the country each year. These are transboundary waters since they feed the Syr Darya and, ultimately, the Aral Sea.

The presidential decree "On foreign policy of the Kyrgyz Republic in the sphere of water resources generated in Kyrgyzstan and flowing into neighboring countries" (June 1997) mandates the solution of interstate water problems, water allocation, and the use of economic instruments for promoting water conservation and efficient use of water and energy resources. The law "On interstate use of water objects, water resources and water facilities of the Kyrgyz Republic" (July 2001) confirmed the principles of cooperation of Kyrgyzstan with other countries in the field of water resources. However, the law states that all the waters in the territory of the country belong to the State and demands that the downstream countries pay for water emanating from Kyrgyzstan. This has caused a certain amount of conflict with Kazakhstan and Uzbekistan, both of which demand that Kyrgyzstan continue providing water free of charge, which would be available without regulation by reservoirs.

Regional water use agreements may be of little help to Kyrgyzstan. The 1998 Syr Darya Water and Energy Use Agreement regulates water use in the Syr Darya Basin. This agreement is based on the concept of compensation to upstream countries for lost energy production following a release. Yet this regime favors irrigated agriculture in downstream

countries. Although Kyrgyzstan receives energy resources (electricity, coal, gas, and oil) in exchange for its water, these resources must be transported and transformed into electric power or heat at Kyrgyzstan's expense. As a result of this compensation arrangement, Kazakhstan and Uzbekistan receive water at very low cost.

The Kyrgyz energy sector depends on power generation from the Naryn cascade to satisfy a major portion of the domestic demand, which existing thermal generating facilities cannot handle. The continued use of the Toktogul reservoir in an energy generation mode, i.e. with increased water releases in the fall-winter period, seems inevitable without new generating facilities and capacity at thermal power stations. As recent experience has shown, providing the required energy generation and irrigation releases results in large fluctuations of accumulated storage in the Toktogul reservoir. Several proposals for the solution of this problem are being explored, such as energy conservation and demand management, and construction of new hydroelectric generating capacity. For now, Kyrgyzstan must continue to rely on the 1998 water-energy trade agreement with its downstream neighbors to obtain needed wintertime fuels.

Kazakhstan

Kazakhstan contains vast regions of steppe and most of the downstream portion of the Syr Darya Basin. The population of Kazakhstan in the Aral Sea Basin (South Kazakhstan and Kyzyl Orda oblasts) is about 2.6 million. Approximately 10 percent of Kazakhstan's GDP is derived from agriculture, with about 23 percent of the population working in that sector.

Water availability in the Kazakh portion of the Aral Sea Basin depends on the water policy of upstream states, Uzbekistan, Tajikistan, and Kyrgyzstan. The Syr Darya flows 1,650 km through Kazakhstan from the border with Uzbekistan at the Chardara reservoir to the Aral Sea. The river's flow formed within Kazakhstan is 2.4 bcm and the interstate allocation of water to Kazakhstan from the Syr Darya is 12.3 bcm. Since 1990, Kazakhstan has reduced its irrigated area in the Syr Darya Basin because many unproductive farms have been taken out of production. Kazakhstan irrigated about 786,000 ha in 2000, requiring about 8.2 bcm of water. In recent years, productivity has declined due to low irrigation efficiency, lack of technical inputs (fertilizer and machinery), and lack of funds for proper technical and operational measures.

The most recent agreement on management and operation of the Naryn-Syr Darya cascade of reservoirs (March 1998) places certain obliga-

tions on Kazakhstan in order to receive irrigation water under the agreement. In particular, surplus summer electricity is delivered to Kazakhstan and, in return, Kazakh coal must be supplied to Kyrgyzstan in the wintertime. For Kazakhstan to accept large amounts (1.1 billion kWh) of Kyrgyz electricity in the summertime when demand is low requires restructuring the Kazakh national power distribution system and shutting down some thermal power stations in South Kazakhstan.²² This has been very disruptive to the Kazakh power grid resulting in the need to sell expensive power to Kazakh customers reluctant to pay the combined price of power and water. If the Kazakh agricultural sector compensated the power sector for the increased price of the summertime electricity, the situation might improve.

The Water Code of the Republic of Kazakhstan was approved in 1993 and constitutes the legal basis for water policy in the country. Water use in the country is still determined by centrally controlled economic interests, with little regard for social and environmental consequences. There are eight Basins in the republic, each with its own BVO. The Kazakh portion of the Aral Sea Basin water management is carried out by the BVO Aral-Syr Darya. The BVOs manage water resources in the Basins, including water distribution between users, development of water supply plans, water use limits, and reservoir operation modes. Water Users Associations have been created in some areas, but so far they are insufficient to support many activities, particularly drainage and water supply works.

Since it receives most of its water resources from external sources, Kazakhstan recognizes transboundary rivers as a security problem and is motivated to seek international agreements on shared waters. Kazakhstan has a large agricultural sector dependent on an adequate supply of irrigation water. At times, the delivery of this water is complicated by upstream water use tradeoffs between energy and irrigation. This results in water shortages during growing seasons and flooding of lowland areas in winter seasons. Being a downstream country, Kazakhstan experiences difficult water quality problems, resulting from agricultural return flows discharged by mid-stream irrigation water use. Poor water quality (high salinity, fertilizer, and pesticide levels) impacts the health of populations in the downstream areas that must use this water for drinking as well as for agricultural production.

Believing that common positions and mutual interests can provide regional stability, Kazakh officials have suggested that a new regional water strategy for Central Asian be developed. This new framework would be based on standards of international water law; utilize an ecosystem ap-

proach; minimize limitations on riparian countries; and be based on common interests in water resources development, use, and protection within each country.²³ Common principles of the water strategy would include considering water needs in the lower reaches of Central Asian rivers, balancing water use between irrigation and energy production, and recycling return flows from agriculture. The main international water law principles that the new strategy would be based on include the following:²⁴

- Transboundary water resources are the common property of Basin states;
- Basin interests take priority over those of individual states;
- Water supply is guaranteed to highest priority uses;
- States' obligation to observe the "equitable and reasonable use"²⁵ and to follow the "no harm"²⁶ principles;
- States' obligation to consult with other Basin states on development plans; and
- States' obligation to participate in joint monitoring of water quantity and quality.

Uzbekistan

Uzbekistan, with a population of over 24 million and 447,400 km² of territory in the Aral Sea Basin, is at the center of Central Asia. About 60 percent of Uzbekistan's land area is desert steppe broken by irrigated, fertile oases along the Amu Darya and Syr Darya. Approximately 25 percent of Uzbekistan's GDP is derived from agriculture with about 44 percent of the population working in that sector. In western Uzbekistan lie the ecologically damaged Amu Darya delta and the autonomous Republic of Karakalpakistan. Overuse of the Amu Darya has reduced the sea to two-thirds its former size and salinization of the area around the sea threatens the environmental and economic viability of a region in which more than one million people live.

Being dominated by desert and only partially mountainous, Uzbekistan contributes a modest amount of the flow to the Aral Sea Basin, 10.9 bcm, while the interstate allocation of water to Uzbekistan is 53.6 bcm. In 2000, 4.259 million ha were irrigated in the Uzbek portion of the Aral Sea Basin requiring 62.8 bcm of water. The large amounts of water needed by Uzbekistan to sustain the agricultural sector of its economy require that it negotiate with its upstream neighbors on an almost continual basis. By and large, the relations between Uzbekistan, Turkmenistan, and Tajikistan

in the Amu Darya Basin are good. However, the same is not true between Uzbekistan and its upstream neighbor, Kyrgyzstan, in the Syr Darya Basin. As previously discussed, there continue to be difficulties over the delivery of natural gas from Uzbekistan in return for delivered irrigation water. A major difficulty in efficient implementation of the 1998 water-energy agreement stems from Uzbekistan's need for, and Kyrgyzstan's lack of, hard currency. Monetizing the exchanges under the agreement would go a long way toward normalizing these trade relations.

Transboundary sources make up the bulk of the water resources available to Uzbekistan. Uzbekistan is therefore very concerned about transboundary water management. The main concerns of Uzbekistan regarding this issue include: further development of regional cooperation between Aral Sea Basin countries in management and use of transboundary water sources; availability and compliance with international agreements between the riparian countries of the Basins; the operating regime of transboundary reservoirs in the Basins, primarily, Toktogul, Kayrakum, and Nurek reservoirs; and the environment and effectiveness of the ICWC.²⁷ In addition, Uzbek officials call for improvement of information systems for water management and expansion of these systems to consider water quality, especially for transboundary sources.²⁸

Turkmenistan

Turkmenistan covers an area of 488,100 km², but 80 percent of this area is desert. The desert is bounded by a series of oases watered by the Amu Darya in the north and by rivers (the Murgap, Tejen, Atrek) descending from the Kopetdag, Gershi, and other mountains in the south. The central and western regions have no significant natural waterways, but the Kara Kum Canal (more than 1300 km in length) brings water from the Amu Darya west to the Mary Oasis and onward past Ashgabat. Approximately 25 percent of Turkmenistan's GDP is derived from agriculture with about 44 percent of the population working in that sector.

The amount of river flow generated within Turkmenistan is extremely small, 1.5 bcm, whereas the interstate allocation of water to Turkmenistan is 22 bcm. In 2000, 1.86 million ha were irrigated in the Turkmen portion of the Aral Sea Basin requiring 18.1 bcm of water. The government expects irrigated lands to reach 2.2 million ha by 2010. The source of water to implement this expansion is somewhat of a mystery; however, it may come from reclaimed agricultural drainage water. The Kara Kum Canal is perhaps the most important water facility in Turkmenistan, supplying water to irrigate more than one million ha of farmlands. An average of 11.5

bcm is diverted into the canal each year from the Amu Darya. More than half of Turkmenistan's total agricultural products are grown in the Canal Zone. Today, the Canal is in a precarious condition with most of its control structures inoperative. Water flows according to hydraulic conditions, not management decisions. This situation may prove to be unsustainable in the future as the system continues to deteriorate.

Agricultural runoff is a major transboundary problem for Turkmenistan, causing downstream pollution affecting population health and reducing agricultural productivity in the Basin. Turkmenistan receives transboundary flows at several locations, including source water from the Amu Darya and agricultural drainage water from the Khorezm region of Uzbekistan. There is great concern about the quality of these waters, especially the return water, since it is a large volume and heavily polluted. Currently, Turkmenistan assumes responsibility for the disposal of this drainage water to the Sary-Kamush Lake, which has become polluted with salts and chemicals. In addition, the passage of this water through unlined canals creates drinking water pollution problems by contaminating groundwater sources. At present, no agreements exist on transboundary water quality in Central Asia. In order to prevent increased environmental damage from transboundary irrigation drainage water, Turkmenistan has proposed to the Uzbeks the development of a Transboundary Water Quality Agreement for the Amu Darya Basin, but there is no progress on this yet.

Regional Water Management Issues

The following are issues that must be addressed by the Central Asian republics if true progress is to be made on water issues at the regional level.

Financial Obligations of Regional Institution Members

The current provisions for financing the Executive Committee of the Intestate Fund for Saving the Aral Sea (EC IFAS) require that the host member country must cover the costs (salary and living expenses) of two representatives from each member country. The host country rotates between the members every two years. This has created an undue burden on the poorer countries of Central Asia, like Tajikistan, the current host country, which do not have the resources to cover many of these expenses. In the case of some host countries, this may be feasible, but in the case of others, it is impossible. This has resulted in an inability of EC IFAS to function properly.

The March 18, 1992 ICWC agreement does not reflect current conditions characterized by a severe lack of financing for water infrastructure and the varying rate at which the countries are making the transition to market economies. The member countries have not shared equitably in the financial obligations of joint water management and development under ICWC. Although the ICWC budget is confirmed each year, only Turkmenistan and Uzbekistan have met their obligations for operation and maintenance works. Only Uzbekistan has met the obligation for research, with a small contribution from the other states. The result is that the BVOs, as the operational arms of the ICWC, are desperately short on resources with which to carry out their work.

BVO Functions

According to the foundation documents of the BVOs, all main structures for controlling transboundary waters on the Syr Darya and Amu Darya rivers should be transferred to the temporary (but long-term) control of the BVOs. However, the only structures currently under BVO control are the main interstate canal structures in Uzbekistan. This situation creates uncertainty as to the role of the BVOs in managing regional water resources because the BVOs presently are not operational organizations controlling the critical structures in the Basins. If the ICWC member countries truly intend for the BVOs to be operational management organizations, then the main structures outside of Uzbekistan should be transferred to BVO control. On the other hand, if BVOs are intended as planning organizations to monitor system functioning and prepare operational plans, then the structures currently under BVO control in Uzbekistan should be transferred to Uzbek Ministry of Agriculture and Water Management (MAWR) control.

Water Quality Monitoring and Control

Water quality problems in Central Asia have yet to be addressed in any comprehensive way. One major problem is the disposal of agricultural return flows. The agricultural return flows with transboundary impacts are not strictly controlled. Adequate and up-to-date equipment for acquisition and processing of water data (both quantity and quality) in the main river Basins is still lacking. Agreement on appropriate interstate water quality standards have yet to be established and alternative mechanisms to achieve different water quality standards have yet to be explored. If these issues continue to be ignored there will be a continual degradation of drinking water quality in the lower reaches of the rivers.

Citizen Participation

Citizens are essential participants in forming national and local water and environmental policy. Informing citizens of opportunities to participate in such a system is often an important role of non-governmental organizations (NGOs). NGOs take on various roles in this regard, including education campaigns, assistance to government ministries in forming policy, legislation and regulations, independent assessment of conditions, and preparing legal actions when there is evidence of a threat to human health or to the environment. The participation of NGOs in the formation of policy requires access to accurate and timely information. The public should have the right to know what the standards are for potable, industrial, and irrigation water and for the concentration of certain elements at particular times. When the information is available to citizens about the real state of the environment, then citizens can formulate educated opinions about and demand environmental protection.

Syr Darya Agreement

The 1998 Syr Darya Agreement has achieved modest success in relieving tensions over water and energy use in the Basin. The signing of this Agreement by the four Prime Ministers demonstrated a show of support for cooperative management of the Basin's resources. This has provided an impetus for the parties to conduct difficult and serious negotiations each year since 1998.

Nevertheless, implementation of the agreement is difficult. A mechanism by which dry and wet year hydrologic conditions can be reflected in compensation needs to be established. In addition, Kyrgyzstan in particular suffers from a lack of longer-term assurance that compensation will, in fact, be made by downstream countries. The 1998 agreement specifies that surplus electricity from growing season releases is to be transferred to Kazakhstan and Uzbekistan, and compensation for irrigation storage in the reservoirs is to be made in amounts of fuel equivalent to this surplus energy. In recent wet years, the downstream countries have called for below average releases during the growing season. This has resulted in reduced surplus electricity deliveries to downstream countries, accompanied by reduced deliveries of fuel to Kyrgyzstan the following winter season. On the other hand, in dry years, downstream countries have called for above average releases in the growing season, resulting in additional surplus electricity delivered to downstream countries accompanied, in theory, by increased deliveries of fuels to Kyrgyzstan in the winter season. If the system is to be run fairly, Kyrgyzstan should receive credit for additional dry year

electricity deliveries and be able to make “withdrawals” in fuels on dry year credit during wet years when there is a fuel deficit. Currently, this is not the case. Further negotiation and compromise will be needed to ensure an equitable method of compensation for water storage services during wet periods with attendant water releases during drought periods.

Amu Darya Agreements

The Amu Darya Basin is shared by Afghanistan, Tajikistan, Turkmenistan, and Uzbekistan. Afghanistan has not been an active partner in managing the water in the Basin. During the 1940s to 1970s, several agreements were reached between the Soviet Union and Afghanistan regarding the waters of the Amu Darya, including an allocation of nine bcm to Afghanistan. Despite these agreements, no more than two bcm per year has been diverted to Afghan use.

In the accounting and allocation of the Amu Darya waters to Basin states by the ICWC, neither 9 nor 2 bcm of water is considered. Turkmenistan and Uzbekistan signed a bilateral agreement in 1996 agreeing to split the waters of the Amu Darya below the river gauge at Kerki. Uzbekistan and Turkmenistan also have an informal, technical level agreement in operation and maintenance of the transboundary drainage water collectors which originate in Uzbekistan (Khorezm region) and terminate in Turkmenistan. These agreements should, but currently do not, take into account Afghanistan’s water needs. Further amendments likely will be required to meet the increasing demands of all parties in the Amu Darya basin.

Conclusions

While not as effective as it could be, the capacity for shared water management exists in Central Asia. High level political will is needed to achieve such cooperative management of water resources, and that will seem to be lacking in Central Asia. Government officials from Turkmenistan and Uzbekistan often exhibit a desire to handle water management and other regional issues through the development of strictly bilateral arrangements and agreements. Yet consensus is needed among high level advisors to the Central Asian presidents that regional cooperation can lead to increased benefits, stability, and security for each individual country. Regional development assistance could demonstrate the mutual economic benefits to be derived from a multi-sectoral approach to regional cooperation in water resources management.

Multi-sectoral Paradigm for Regional Water Cooperation

Energy and agriculture sector policies have a large impact on water management in Central Asia. Currently, no mechanism is in place to coordinate or manage this inter-sectoral problem within most of the countries, let alone at the regional level. A new paradigm for regional water cooperation in Central Asia is needed. Water sector managers cannot solve the problems of regional cooperation alone. The Central Asian Heads of State need to motivate this approach or the various concerned sectors will not participate.

No new agreements on water or energy have reached the Heads of State for signature since 1998, and none are presently under development. Since it is a uni-sectoral, technical body, the ICWC is not the right forum to achieve this sort of government-to-government interaction. Interaction must occur at a higher level and it must be multi-sectoral. International donor agencies should try to promote consensus at the Prime Ministerial or Presidential level on principles of regional cooperation. In the Syr Darya Basin, Kazakhstan, Kyrgyzstan, and Tajikistan already understand this, only Uzbekistan remains to be convinced. In the Amu Darya Basin, increased downstream water stress in Turkmenistan and Uzbekistan, due to upstream Afghan water diversions, may convince the countries to contend with this serious problem.

Upstream-Downstream Priorities

Previous water management rules, based on the priority of irrigated agriculture, do not conform to current power generation needs of the upstream countries, Kyrgyzstan and Tajikistan. Attempts to resolve this issue on the basis of interstate energy barter have been moderately successful, but implementation of annual barter agreements has been complicated by difficulties in negotiating timely annual agreements. Renewed efforts are needed to: prepare annual agreements in a timely manner; develop multiyear schedules for compensation; include compensation for storage services as well as flow regulation; and move away from the barter system to a monetized exchange between the countries.

The present method of water allocation, based on Soviet era rules, does not take into account the emerging priorities of the now independent republics. Kyrgyzstan and Tajikistan often claim that the old water allocation rules limit the development of irrigation on their lands, and that they need to reassess their future water allocation. Downstream countries complain that poor water quality in the middle and lower reaches of the Basins is reducing agricultural production and damaging public health,

and that remediation of this problem must be undertaken. In addition, growing water demands of Afghanistan may cause new stress on the system of water allocation.

Kambarata I and II Dams

Kyrgyz domestic energy demand has increased above the equivalent of the surplus summer electricity resulting from Toktogul irrigation releases. Negotiating higher winter fuel deliveries in exchange for the irrigation releases seems out of the question, and new energy generation capacity may be needed that can supply energy to Kyrgyz customers in the winter. Several organizations, such as the World Bank and U.S. Agency for International Development (USAID), are considering the economic feasibility of two dams designed in Soviet times, Kambarata I and II, which would be located upstream of Toktogul reservoir in Kyrgyzstan. Given the expected cost of the projects (about one billion U.S. dollars), Kyrgyzstan, Kazakhstan, and Uzbekistan are considering the formation of a consortium to jointly develop the projects. The projects would result in cheap summertime electricity which the consortium partners would try to market to third parties.

Non-governmental Stakeholder Participation

Non-governmental stakeholders are not active participants in Central Asian water management at the present time. The way that NGOs might participate is through public awareness and information exchange activities. In addition, NGOs can link local community opinion to the national debate on water policy.

The Central Asian water management officials have, for the most part, a negative reaction to the participation of NGOs in this sphere. Officials recognize that many NGOs take a very proactive approach and promote ideas of rapid change that are threatening to the water management structures of Central Asia. It will take time and patience on the part of both the NGOs and the water management officials to develop a complimentary, rather than antagonistic, relationship. There are now some NGOs not engaged in highly controversial activities who are accepted by the water management officials as participants in some activities. NGOs could function more effectively if they identified key water management stakeholders both geographically (upstream versus downstream) and topically. Such stakeholders would include water user associations or at least key collectives along the entire system of rivers; those involved with fisheries like Arnasai, reservoirs, and deltas; those providing river-based

transport; those living in the areas subject to flooding based on alternative management regimes including new dam construction; industrial water users; municipal water users; and environmental groups working on aquatic ecosystems conservation, river pollution, and other issues.

Promotion of Regional Cooperation

Regional cooperation is unlikely to be achieved solely through technical activities and projects. On the national level, plenty of these are ongoing, and more are in the design stages. Regional cooperation will come by illustrating the benefits of participation in the development of joint, coordinated projects and the adoption of policies that bring benefits or reduce damages to multiple participants. These activities are not going to arise in a single sector, but they will span two or three sectors. Sustainable regional cooperation will most likely be achieved by creating a basis for assessing the national and regional benefits from technical investments, but these must be complemented by supportive national policy and institutional reforms, coupled with empowerment and capacity building for regional institutions.

Improved or appropriate technology is important in achieving increased water use efficiency and agricultural production. However, this does not address or promote regional cooperation. By and large, a drop saved by an Aral Sea Basin nation is viewed as another drop for expanding the nation's agricultural production, not for the Aral Sea. Improvements in irrigation efficiency in upstream areas will not necessarily result in more water flowing to the Aral Sea, rather the saved water will be diverted to new irrigated areas. In many cases, improvements in efficiency can significantly improve the economic benefits from national participation through regional approaches to water resources management.

The Central Asian states of Kazakhstan, Kyrgyzstan, and Tajikistan have expressed a strong desire to develop new agreements that satisfy these international concepts. However, there is still reluctance on the part of the major water using countries, in particular, Turkmenistan and Uzbekistan, to enter into discussions on this issue. One of the major hurdles in achieving regional cooperation in shared water resources in Central Asia is the focusing of the Republics' attention on international water law. Another issue is the lack of coordination in national water policies and legislation across the region. While the principle of national sovereignty must be upheld, there is no reason why the benefits from synchronization cannot be achieved.

Financing Regional Water Management Projects

A few projects have been proposed that might be considered for joint financing by the governments of Central Asia in the area of regional water management. Most prominent of these are the development of the Kambarata I and II dams in Kyrgyzstan. However, Kyrgyzstan is not in a position to finance this project alone and the proposal has been made for an international consortium of Central Asian countries for the joint financing of the project. Kazakhstan has expressed interest in participating in this consortium—if the conditions are favorable. By joining the consortium, Kazakhstan would change its water management position from being the most downstream country in the Basin to assuming a position in the uppermost part of the Basin and being able to exert some control over the water management decisions in that part of the Basin. Kyrgyzstan and Kazakhstan are both interested in attracting Uzbekistan into the Kambarata consortium. However, the direct benefit to Uzbekistan of joining the consortium is not as clear as that of Kazakhstan and, to date, Uzbekistan has not expressed much interest in joining such a consortium. However, Uzbekistan would be very concerned to see its neighbors working with each other and gaining additional control over the Basin's waters without a place reserved for its own interests in these matters.

Any decisions regarding major water management investments affecting the overall regional water management regime should be made with the full participation of all countries affected; otherwise this will undermine trust and the basis for regional cooperation in this sphere. The future management regime adopted for both the Syr Darya and the Amu Darya should be based on a comprehensive evaluation of options including new physical infrastructure, upgrading of existing physical infrastructure, and improved water management by user groups throughout the Basin. Such analysis, which must include Afghanistan for the Amu Darya, should amply demonstrate the benefits to be derived from regional cooperation as compared to unilateral or even bilateral decision-making and actions.

Coordination of Donors' Activities.

Coordination among donors is desperately needed in Central Asian regional water management activities. Lack of coordination in the past has been noted as a cause of duplication of efforts, reduced effectiveness of programs, inefficient use of funds, and lack of recognition of achieved results. Most of the major donor agencies active in the region are in a transition period at the moment. The Asian Development Bank (ADB)

is entering the area; the World Bank is considering options for new initiatives; USAID is receiving expanded resources; the Swiss Development Commission is developing a new long-term assistance plan; and the Canadian International Development Agency (CIDA) is also considering new initiatives.

A uniform set of principles and objectives for the donors would serve to focus the efforts more effectively to achieve results. Although donor coordination cannot occur in the absence of government representatives, there is a need for a donor-led mechanism for information exchange and coordination. In the past, the World Bank and the United Nations Development Programme (UNDP) helped to organize periodic meetings.

Areas Not Yet Addressed

The technical issues of water use and management in Central Asia are well developed and sufficient studies have been carried out that provide a sound technical base for future work on water saving, efficiency increases, information and decision system support, and capacity building for regional institutions. Other areas not related to water use and management currently demand attention. These areas include the following:

- Water quality, including pollution from point and nonpoint sources and especially transboundary effects. This issue requires a mandate from a high government level before efforts can be undertaken to mitigate the effects of water pollution.
- Information and data exchange.
- Past experience in Central Asia has made the governments and donor agencies wary of the creation of regional water management databases, due to efforts to limit access to or use of these databases. What is needed is a new concept, where the raw data stays in the initiating country and reports are sent periodically to the other countries. The five national hydrometeorological services have been working on the development of regional cooperation and data sharing in their area for the past year or so, and the lessons learned from their efforts could be applied on a broader scale.
- Agricultural policy and its effect on national economies, water use, and environmental effects. Some of the food security measures implemented by some of the Central Asian states have had large economic impacts that have not been studied. Food security is primarily a national issue, but it does have regional environmental impacts.

■ Water allocation.

Water allocation has been identified by several of the Central Asian countries as an important issue, but Uzbekistan and Turkmenistan are reluctant to discuss this issue for fear of disrupting existing patterns of water use in their agricultural sectors. High-level governmental cooperation is required to tackle this issue.

As has been seen in this chapter, water management in Central Asia is a complex and critical issue affecting the security of all the nations of the region. Cooperative management of this vital resource could lead to great benefits in the future, while ignoring the opportunities for cooperation will lead to roadblocks in the development pathways of the countries. Many issues must be addressed to achieve regional management, but a firm foundation exists from which progress can be made.

Notes

¹ Y. Khudaiberganov, "About BWO Role in Amudarya Basin Water Resources Management Issues," ADB Regional Consultation Workshop, Cooperation in Shared Water Resources in Central Asia: Past Experience and Future Challenges, Almaty, September 26-28 2002.

² M. Khamidov, "Syr Darya River Water Resources Management and Environmental Effects Caused by Changing Natural River Flow Regime," ADB Regional Consultation Workshop, Cooperation in Shared Water Resources in Central Asia: Past Experience and Future Challenges, Almaty, September 26-28 2002.

³ O. Atanyazova, "Health and Ecological Consequences of the Aral Sea Crisis," paper presented at the Third World Water Forum, Kyoto, March 18, 2003.

⁴ United Nations Environment Programme (UNEP), "State of Environment of the Aral Sea Basin Regional Report of the Central Asian States 2000," <<http://www.grida.no/aral/aralsea/english/fish/fish.html>>.

⁵ Almaty, February 18, 1992.

⁶ Kyzyl Orda, March 26, 1993.

⁷ Nukus, September 20, 1995.

⁸ Tashkent, January 4, 1993.

⁹ ICAS had as executive bodies: an Executive Committee (EC ICAS); the International Sustainable Development Commission (ISDC), and the ICWC (including the BVOs and SIC ICWC).

¹⁰ Kyzyl Orda, 23 March 1993.

¹¹ Nukus, January 11, 1994.

¹² Almaty, February 27, 1997; Tashkent March 20, 1997; and Tashkent May 30, 1997.

¹³ Agreement on the Use of Water and Energy Resources of the Syr Darya Basin, Bishkek, March 17, 1998.

¹⁴ Under the framework agreement, during 1998-2001, Kyrgyzstan met, on average, 86.5 percent of the planned irrigation water releases and 77.8 percent of the planned surplus electricity transmission. During the same period, Uzbekistan and Kazakhstan supplied to the Kyrgyz energy system 87.8 percent of the planned natural gas and 60.5 percent of the planned coal (A.K. Kenshimov, "Interstate Water Allocation in the Aral Sea Basin," Royal Haskoning, Tashkent, Uzbekistan, 2002).

¹⁵ G. Gleason, "Inter-State Cooperation in Central Asia from the CIS to the Shanghai Forum," *Europe - Asia Studies*, Vol. 53, no. 7, 1077-1095, 2001.

¹⁶ *Ibid.*, 1084.

¹⁷ RFEL, "Four Central Asian Presidents Meet in Dushanbe," <www.rferl.org/news-line/2002/10/2>.

¹⁸ D. McCauley, "Establishing a Framework for Transboundary Water Management in the Syr Darya Basin of Central Asia," Issue Paper, U.S. Agency for International Development, Washington D.C., 2002; E. Weinthal, "State Making and Environmental Cooperation: Linking Domestic and International Politics in Central Asia," (Cambridge: MIT Press, 2002).

¹⁹ The data and statistics used to characterize the countries of the region come mostly from the reports of the Global Environmental Facility, Water and Environmental Management Project, Component A.1 Joint Report 2 and Regional Report 2, 2002.

²⁰ I.S. Zonn, "Water Resources of Northern Afghanistan and Their Future Use," presented at Informal Planning Meeting: Water, Climate, and Development Issues in the Amudarya Basin, Philadelphia, June 18-19, 2002.

²¹ *Ibid.*, 9.

²² In 2000, the Kyrgyz hydroelectricity production cost was 0.006 USD per kWh, and the export price was 0.01 USD per kWh. This price for the Kyrgyz electricity exceeds the cost of generation at the Kazakh thermal plants (about 0.006 USD per kWh). At these prices and without consideration of the value of the delivered water (0.004 USD per kWh or 0.0034 USD per cubic m), the Kyrgyz electricity is not competitive in the Kazakhstan power market.

²³ A.D. Ryabtsev, "Country Perspectives on Regional Cooperation in Shared Water Resources: Water Resources of Kazakhstan," in *Cooperation in Shared Water Resources in Central Asia: Past Experience and Future Challenges*; D. C. McKinney, ed., Proceedings of the Regional Consultation Workshop on Cooperation in Shared Water Resources in Central Asia: Past Experience and Future Challenges, Asian Development Bank, Manila, 2003, 168.

²⁴ UN Economic Commission for Europe (UNECE), "Convention on the Protection and Use of Transboundary Water Courses and International Lakes", Helsinki, 1992, and the UN "Convention on the Law of Non-navigational Uses of International Watercourses", 1997.

²⁵ The obligation of a country to utilize a watercourse in an equitable and reasonable manner and to cooperate in its protection and development. This principle affects economic policy of each Basin country.

²⁶ The obligation of a country to prevent, control, and reduce pollution of waters causing or likely to cause transboundary impact. This principle affects economic and environmental policies of the region and each nation in the basin.

²⁷ A.A. Jalalov, "Water Resources Management in Uzbekistan: Legal aspects and Directions of Improvement," in *Cooperation in Shared Water Resources in Central Asia: Past Experience and Future Challenges*; D. C. McKinney, ed., Proceedings of the Regional Consultation Workshop on Cooperation in Shared Water Resources in Central Asia: Past Experience and Future Challenges, Asian Development Bank, Manila, 2003, 168.

²⁸ *Ibid.*, 47.