

CASE STUDY 4: THE ARAL SEA BASIN*

The year 1992 marks two distinct but likewise related events in the history of transboundary water. For one, the collapse of the Soviet Union introduced a new era in international relations accompanied by several opportunities for cooperation over transboundary water. At the same time, one of the biggest environmental and natural resources catastrophes — the degradation of the Aral Sea and the associated environmental problems — became an international concern after years of being managed domestically. The five newly independent states (republics) of Kazakhstan, Kyrgyz Republic (Kyrgyzstan), Tajikistan, Turkmenistan, and Uzbekistan were left to address the shrinking sea. Given that the grave deterioration of the Aral Sea is relatively a recent issue, it has yet to be dealt with in a serious manner. While numerous statements have been issued by the riparian countries, the river basin lacks a robust and comprehensive treaty. This case study will focus, therefore, on the factors and processes militating against full cooperation in the basin.

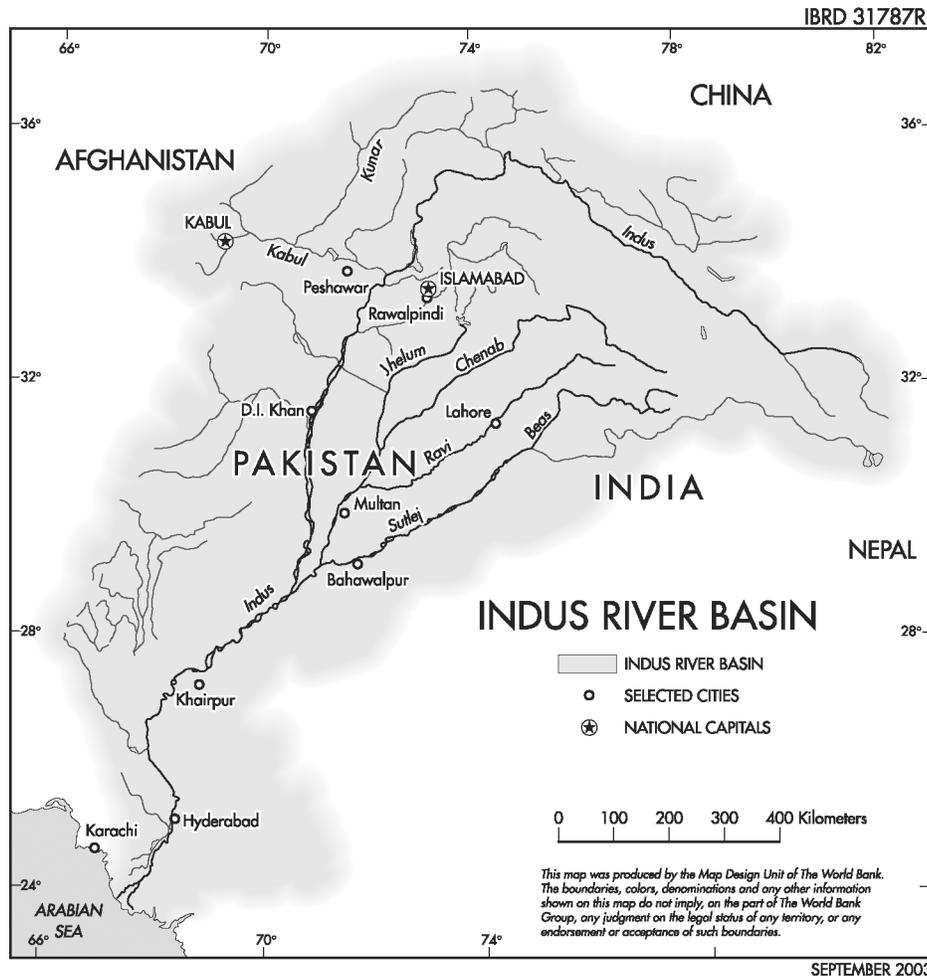
FEATURES OF THE BASIN

The Aral Sea extends over 690,000 km² (Kirmani and LeMoigne, 1997). The basin is formed by two of the largest rivers of Central Asia — The Amu Darya and the Syr Darya. The source of the Amu Darya is largely in Tajikistan, with a few water-courses originating in northeastern Afghanistan. The Syr Darya originates mainly in Kyrgyzstan. The Aral Sea Basin has three distinct ecological zones: the mountains, the deserts, and the Aral Sea with its deltas. The Tian Shan and Pamir mountains in the south and southwest are characterized by high altitudes with peaks over 7,000 m and by an average annual high precipitation ranging from 800 to 1,600 mm/year. The mountains host large forest reserves and some national parks. In the foothills and valleys, soil and temperature conditions are favorable for agriculture. The lowland deserts of Karakum and Kyzylkum cover most of the basin area, and are characterized by low precipitation (under 100 mm/year) and high evaporation rates (Kirmani and LeMoigne, 1997, p. 10).

The basin coincides with almost the entire area of Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan. It covers also the southern part of Kazakhstan, and the northern part of Afghanistan and Iran (Dukhovny *et al.*, 2006). The total mean

*This case study benefited from research by Tim Eestermans, Lola Gulomova, Benjamin Hengst, Pothik Chatterjee, Haik Gugarats, Elcin Caner, Max Du Jardin, Abigail Goss, Hamir K. Sahnai, Edward Anderson, Brigid Harris, Andrea Semaan Bissar, Marco Sampablo Lauro, Nicholas M. A. Smith, and Jeff Brez. It benefited greatly from comments by Masood Ahmad. The case study is not aimed at covering all aspects and details.

Map CS4.1: The Aral Sea Basin



Source: World Bank (Permission granted to reproduce the map)

annual flow of the two rivers is estimated at about 116 BCM (Central Asia Water Information, 2006). Groundwater resources utilized in the basin amount to 35 BCM (Water Resources Institute, 2003). While Afghanistan and Iran contribute 9% of the basin’s resources (Table CS4.1), they are not part of the Aral Sea Basin dispute.

The Aral Sea, which has no outlet, was the fourth largest inland (brackish) lake in the world prior to 1960. It is shared by Uzbekistan and Kazakhstan. As indicated, the Amu Darya and Syr Darya originate respectively in the Kyrgyz Republic and Tajikistan, yet cross Turkmenistan, Kazakhstan, and Uzbekistan, before discharging into the Aral Sea. In the 1950s the Aral Sea had a water volume exceeding 1,090 km³ (1 km³ = 1 billion m³ = BCM), and a surface area of more than 67,900 km². The water level in the Aral Sea ranged seasonally between 50 and 53 m above sea level (Glantz, 1999; Central Asia Water Information, 2006).

Case Study 4: The Aral Sea Basin

287

Table CS4.1: Aral Sea-mean annual runoff surface water contributions (BCM/year).

Country	Contribution to river		Total water contributions		Total water use (BCM)	Total water use for irrigation in 1994, BCM (% of total) ^b
	Syr Darya (BCM)	Amu Darya (BCM)	BCM	% of total		
Kazakhstan	2.516 [38.1] ^a	0 [0.0]	2.516	2.2	11.0	9.7 (88)
Kyrgyzstan	27.542 [5.0]	1.654 [2.0]	29.196	25.2	5.1	4.6 (90)
Tajikistan	1.005 [6.2]	58.732 [12.0]	59.737	51.5	12.0	10.3 (86)
Turkmenistan	0 [0.0]	1.405 [43.0]	1.405	1.2	23.1	22.4 (97)
Uzbekistan	5.562 [51.7]	6.791 [43.0]	12.353	10.6	58.0	53.0 (91)
Afghanistan and Iran	0	10.814	10.814	9.3	0	0
Flows to the Aral Sea					7.9	
Total Aral Sea basin	36.625	79.396	116.021	100	116	100.0 (86)

Source: Central Asia Water Information (2006).

^aAllocation during the Soviet regime Polat (2002).

^bWorld Bank (1998).

The region is largely arid and semi-arid and sparsely populated. It has a rich history of water resources development. For example, by 1900, 7–8 million people lived in Central Asia with about 3.5 million hectares of irrigated land and networks of channels forming the basis of the society's economy. At present the population of the region has increased seven times, exceeding 50 million people. Irrigated lands have reached 7.5–7.9 million hectares (IFAS-UNEP, 2001).

In its more glorious past, the Aral Sea played an important economic role as a north–south shipping route and as the source of an annual fishing catch of 45,000–50,000 tons of fish. The reed growth along the Sea's shores provided the raw material for cellulose and carton production. Sustained pastures and more than 250,000 hectares of tugay forests in the Amu delta, where migrant birds nested and rare animals lived, were a natural barrier against soil erosion.

The Aral Sea had an extremely complex ecological system. It had a dominant moderating effect on the local climate. The mass evaporation from the lake created a screen that kept the micro climate behind it moderate and stable. It protected Central Asia from the cold north winds. Upon meeting the immense column of evaporation, the cold air was lifted to great heights, traveled to far distances in the south and came down to replenish snow deposits and glaciers in the mountains of the Kyrgyz Republic and Tajikistan. Melting snows in these locations were the source for the Syr Darya and Amu Darya flowing back to the lake.

Basin development of irrigated agriculture during the 1950s did not reduce the rivers' runoff into the lake, because the areas developed were primarily in valleys and river deltas, areas with abundant water. Sufficient drainage provided appropriate conditions for irrigated agriculture with water consumption of the respective crops

constituting less than the evapotranspiration of the preceding plants which grew in the area. Consequently, the water balance in the Aral Sea Basin was not affected (Dinar *et al.*, 1995).

The Problems

In the 1960s, the Soviet government initiated regional irrigation development projects aimed at improving economic conditions in the region and addressing food and fiber (cotton) security, which were a major priority for Moscow. A system of canals and pumps was constructed to withdraw water from the Amu Darya and Syr Darya before their discharge into the Aral Sea, and to convey the water to remote desert areas of Kazakhstan, Turkmenistan (the Karakum Canal, described in government publications as the “Eighth Wonder of the World” — Turkmenistan Ministry of Irrigation and Water Economy, 1995) and Uzbekistan. The Karakum Canal is the largest canal in Central Asia. It diverts 500 m³/s from the middle of the Amu Darya to Turkmenistan. About 33% of the water used for irrigation in Turkmenistan percolates through the sandy soils of the canal. Furthermore, seepage losses are so significant that they have created an 800 km² lake alongside the Karakum Canal.

The long-term impact of these water diversions has been devastating to the Aral Sea, as can be seen from Table CS4.2. While the shrinking of the lake and the deterioration of its water quality were apparent prior to 1991, the associated environmental consequences became international, and gained serious attention, only after the collapse of the Soviet Union. The environmental damages caused by the diminishing lake have had direct and indirect health and economic consequences, such as loss of employment opportunities and elevated cancer occurrences.

Water management under the Soviets was centralized and coordinated by the Ministry of Water Management, which oversaw construction projects necessary for regional hydropower and agricultural needs (Langford and Vinogradov, 2001, p. 350), operation of the infrastructure and allocation of water quotas for different uses in the five Soviet republics. Of the total 116 BCM/year diverted from the Amu Darya and Syr Darya at the end of the Soviet legacy, nearly 90% was used for irrigation (Dukhovny *et al.*, 2006; Table CS4.1). The water was used mainly for growing cotton, wheat, and rice, using very inefficient irrigation technologies. Irrigation’s share in riparian water use is estimated at 81, 94, 92, 98, and 94%, respectively for Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan, in 1990 (World Resource Institute, 2003; see also Table CS4.1).

Once the Soviet Union was dissolved, the downstream riparians, still utilizing generous water allocations, immediately became dependent on their upstream neighbors for water, dramatically increasing both the possibility for conflict in the region as well as the need for cooperation. Today the downstream nations, whose economies depend heavily on irrigated agriculture for hard currency income, view water management not only as an economic issue, but also as integral to their national security (ICG, 2006, p. 2).

With the subsequent independence of the five Central Asian republics, financial help from Moscow was likewise dashed. In the absence of major aid for solving the

Case Study 4: The Aral Sea Basin

289

Table CS4.2: Aral Sea — forty years of mining the Aral Sea and their consequences.

Year	Annual inflow into the Aral Sea (BCM) ^b	Water level (m)	Salinity (g/l)
1960	56.0	53.3	10
1970	38.5	51.6	11
1976 ^a	10.3	48.3	14
1980	8.3	46.2	16
1985	0	44.0	20
1989	5.4	39.0	28
1994 ^a	30.6	36.8	> 35
2000 ^a	3.5	33.4	> 60

Source: IFAS-UNEP (2001); for 1989–2000: Sanigmii (2000).

^aSource for 1976, 1994, and 2000: Glantz (1999). Values in 1994 and 2000 are for the Large Sea. The small, Northern Sea, has higher water levels and lower salinization levels.

^bSource: Weinthal (2002); for 1989–2000: Sanigmii (2000).

Note: Flow measurements are made in the last weir station, about 150 km from the Aral Sea. Thus, the flow amounts do not necessarily mean that the quantity entered the Aral Sea, although it is a very good approximation. The year 1994 was an exceptionally wet year, where precipitation was sufficient to eliminate pumping of water from the rivers.

environmental consequences of the Sea's deterioration, the five republics needed to manage the problem in unison. Interestingly, their point of departure was the same water allocations which was in place during the Soviet era, and the uneven level of impact each republic faces due to the lake degradation. The following sections will focus on the regional dispute that ensued and the various agreements negotiated among the basin states.

HISTORY OF WATER AND OTHER DISPUTES IN THE BASIN

Increasing demand for water in each of the post-independence republics, inadequate monitoring and measurement provisions, and lack of enforcement made the original allocations unsustainable. Tension over water allocations increased with the lack of a central coordinating authority. While outright resource wars have been avoided, the five nations have been at odds with each other (Table CS4.3) adopting a “zero-sum” attitude — each country acts to maximize its water allocation without reference to regional needs or planning. In addition, most of the states in the region have announced plans to build their own dams and reservoirs to increase internal water capacity. Verbal threats have been enunciated (Table CS4.3; see also Time Table Annex).

Two main reservoirs provide water for irrigated crops in the three downstream states, Kazakhstan, Turkmenistan, and Uzbekistan — the Karakum in

Table CS4.3: Water-related and other disputes among the Aral Sea Basin riparian states.

	Kazakhstan	Tajikistan	Uzbekistan
Kazakhstan			<p>In 1997 Kazakhstan repeatedly blames Uzbekistan for cutting the water flow by 70%.</p> <p>Border disputes. Uzbekistan attempts to shift the border twice during this year.</p> <p>Disagreements over the terms of an energy swap agreement.</p> <p>Uzbekistan introduces visa regime for citizens of other member countries in the Commonwealth of Independent States (CIS), which makes trade between the countries difficult due to border shifts.</p>
Kyrgyzstan	<p>Kazakhstan fails to deliver energy under an energy swap agreement.</p> <p>Kyrgyzstan closes Toktogul reservoir.</p>		<p>Kyrgyzstan cuts water flow from its reservoir when Uzbekistan does not agree to pay for water.</p> <p>In 1999 Uzbekistan deploys 130,000 troops on the Kyrgyz border to guard the reservoirs rid the area of 4000–10,000 Islamic Movement of Uzbekistan (IMU) and Taliban fighters who had infiltrated the area.</p> <p>Ownership dispute over the reservoir on the border of Kyrgyzstan and Uzbekistan.</p> <p>Border disputes.</p> <p>Dispute over energy swap agreement.</p> <p>Uzbekistan places mines along the border with Kyrgyzstan to prevent the illegal movement of IMU fighters from the territory of Kyrgyzstan.</p> <p>Uzbekistan introduces visa regime for citizens of other member countries in the CIS, which makes trade between the countries difficult due to border shifts.</p>

(Continued)

Case Study 4: The Aral Sea Basin

291

Table CS4.3 (*Continued*)

	Kazakhstan	Tajikistan	Uzbekistan
Tajikistan	At the request of Kazakhstan, Tajikistan releases water every time Kazakhstan faced difficulties with irrigation of fields even though it suffered great losses.		Ethnic tensions rise in the north of Tajikistan where Uzbeks reside. Political tensions escalate due to civil war in Tajikistan. Uzbekistan imposes trade restrictions and repeatedly closes the border, blaming Tajikistan for aiding the IMU. Uzbekistan places mines along the border with Tajikistan to prevent the illegal movement of IMU fighters from the territory of Tajikistan. Uzbekistan introduces visa regime for citizens of other member countries in the CIS, which makes trade between the countries difficult due to border shifts.
Uzbekistan		Uzbekistan asks Tajikistan to release water downstream in exchange for electricity and gas in winter. Disputes erupt between Tajikistan and Uzbekistan due to Uzbekistan's failure to comply with agreed terms.	

northern Tajikistan and Toktogul on the Kyrgyz border with Uzbekistan. Unlike their downstream neighbors Kyrgyzstan and Tajikistan have no natural gas and oil reserves and consider the water originating on their territory to be their resource.¹

¹The Kyrgyz President signed an edict in October 1997 codifying the right of Kyrgyzstan to profit from water resources within its territories. Kyrgyzstan demonstrated a clear intent to follow through on its plans. It has also demanded compensation for lost revenues — rather than generating hydropower Kyrgyzstan releases water downstream to Uzbek farmers (Heltzer, 2003).

In 1998, Kazakhstan and Uzbekistan signed barter agreements (United Nations, 2006) with Kyrgyzstan, exchanging coal and electricity for water. The swap agreements do not specify the volume of water to be released in exchange for a given tonnage of coal nor do they indicate how water stored during wet years should be released in dry years. When the states fail to meet the targets, each country's experts disagree as to the volume of water to be received downstream. These disputes occur about the volume of energy swaps and not about the time of water release or other issues. As a result of these disputes, the agricultural fields of Kazakhstan and Uzbekistan suffered dramatically due to the shortage of irrigation water. This in turn results in decrease of the water flow of the Syr Darya into the Aral Sea.

Regional Politics and Power

The disputes summarized above show how complicated the relationships between the Basin states are. The few indicators in Table CS4.4 suggest that there is an imbalance of regional power that could explain some of the behavior of the basin states.

It is extremely difficult to predict which state will play the regional leadership role. Kazakhstan, Kyrgyzstan, and Tajikistan have demonstrated their will to deal with regional issues, such as the problem of the Aral Sea, on a multilateral basis. However, Kyrgyzstan, with relatively little power to boast, acts primarily in its own interest. Tajikistan, another relatively weak riparian, strives to keep friendly relationships with all the basin states. It is an isolated country. Its infrastructure is completely linked with Uzbekistan and Kyrgyzstan and any disagreements with these states tend to exacerbate the economic situation in Tajikistan. Therefore, Tajikistan often responds favorably to requests of additional water from other states. Surprisingly, it is Tajikistan that is in desperate need of additional water resources.

Turkmenistan refuses to deal with regional issues due to its isolationist policy. Given its neutrality, and despite its water shortage and needs, Turkmenistan relies primarily on bilateral deals with the basin states and does not play an integral part in the overall water dispute (Table CS4.5). This policy may change with the

Table CS4.4: Demographic and economic indicators of the Basin states, 1990(92)–2000.

Indicators	Kazakhstan	Kyrgyzstan	Tajikistan	Turkmenistan	Uzbekistan
Population ^a	16.7	4.4	5.3	3.7	20.5
(million)	16.7	4.6	6.0	4.6	23.1
	16.1	4.9	6.1	4.7	24.9
GDP per capita	1690	520	740	2088	517
(1995 US\$) ^a	1263	331	407	940	446
	1515	399	386	1377	485

Source: World Bank (2003).

^aPopulation and GDP values in each cell are respectively for 1990–1992, 1995, and 2000. GDP values are constant 1995 US\$.

Table CS4.5: Regional power relations and behavioral pattern.

State	Political power within the region and behavioral pattern
Kazakhstan	Strong, often acts as mediator in basin disputes
Kyrgyzstan	Medium, but acts in its own benefit. Plagued by ethnic and political unrest since 1990
Tajikistan	Weak, adopts a friendship framework. Fell into civil war immediately upon gaining independence (among liberals, pro-Communists and Islamists)
Turkmenistan	Adopts an isolationist policy on regional issues
Uzbekistan	Strong, considers itself a regional leader yet often acts unilaterally on different regional matters

passing away of Turkmenistan's life-long ruler, Saparmurat Niyazov or as he used to be called — Turkmenbashi (father of the Turkmens).

ATTEMPTS AT CONFLICT MANAGEMENT — THE NEGOTIATION PROCESS AND REGIONAL AGREEMENTS

Since some of the states' land and population shares in the basin range between 50% and 99% (Heltzer, 2003), it is clear why the riparians are eager to covet as much of the Basin's resources as possible. The desire of the upstream states to utilize river flows for hydropower during winter has been incompatible with the desire of the downstream states to store upstream water for irrigation during the dry season. During the Soviet era, the timing for releasing the water downstream was dictated and enforced by Moscow. After independence, however, the need for negotiations became much more critical. In fact, between 1991 and 1994, more than 300 informal agreements concerning the Aral Sea Basin were concluded as compared with only three formal agreements signed prior to the collapse of the Soviet Regime (Peachey, 2004).

Basin-Level Agreements and Plans

In 1986, the Soviet Union created the Syr Darya and Amu Darya Basin Management Organizations (BVO) mainly for internal coordination purposes. They were not forums for negotiation but rather management authorities to oversee plans approved by the Soviet Ministry of Water Management (Dukhovny *et al.*, 2006). Three international agreements were likewise concluded between the Soviet Union and Afghanistan.

The first Agreement — *The Frontier Agreement between Afghanistan and the USSR* — was signed in 1946. It established a joint commission aimed to discuss water issues related to the Amu Darya, which forms a border between the two

countries. It also codified a water allocation regime, allotting 9 BCM of the Pyandj River to Afghanistan and the remainder to the USSR (Ahmad and Wasiq, 2004; Votrin, 2006).

The second Agreement between the two states — *Treaty Concerning the Regime to the Soviet-Afghan Frontier* — was signed in January 1958. It established water-related environmental and ecological standards. The two states agreed to refrain from actions that alter the course of frontier waters, and to restore the waterways if they do begin to diverge from their previous route. They also agreed to prevent water pollution and to exchange data and information regarding water levels and volume. In addition, they also agreed to establish a flood warning system.

In June 1958, the two countries concluded their third, and final water Agreement — *The Protocol between the USSR and Afghanistan Concerning the Joint Execution of Works for the Integrated Utilization of the Water Resources in the Frontier Section of the Amu Darya*. The treaty promoted the shared utilization of the waters of the Amu Darya between the two countries (Ahmad and Wasiq, 2004; Votrin, 2006).

The need for a dispute resolution framework became apparent when the Soviet Union was dissolved in December 1991. The path to such a framework has been anything but direct, however, and has required numerous agreements and institutional changes to arrive at the present structure (de Chazournes, 2006). The following section will trace the process leading to this structure and the agreements reached.²

The Almaty Agreement (1992) and the Interstate Commission for Water Cooperation

The creation of five new states necessitated the formation of a regional institution for dispute resolution. In February 1992, a mere three months after the official dissolution of the USSR, the Ministers of Water Resources for the five states signed the *Agreement on Cooperation in the Management, Utilization and Protection of Water Resources in Interstate Sources* in Almaty. This agreement established a framework to resolve water disputes, but also set water allocation levels at Soviet era quantities until the states could reach a solution amenable to all parties. This essentially favored downstream (agriculture intensive) states, and provided no allocation for Afghanistan (O'HARA, 2004).

Another result of the Almaty Agreement was the creation of the Interstate Commission for Water Cooperation (ICWC), comprised of the basin's Ministers of Water Resources. ICWC's objective has been to develop a single water policy that meets the interests of each state while sustaining the basin resources. ICWC is also responsible for managing and monitoring water allocations and serves as the

²Provisions to include Afghanistan in this framework once that country formulates a stable government and is better able to predict and insist its water needs, will have to be made.

reporting authority for the re-established Amu Darya and Syr Darya Basin Management Organizations (BVOs). The BVOs make recommendations to the ICWC for short-term and long-term water development for their respective basin, taking into account allocation, water quality, conservation, and environmental protection issues (Vinogradov, 2001).

The Agreement on Joint Activities in the Aral Sea (1993)

This new agreement, which was signed between all five heads of state on 26 March 1993, addresses the environmental, social, and economic issues of the Aral Sea Basin. While the treaty was non-binding and provided no dispute resolution mechanisms, it established regional institutions for water management in the basin. These organizations are discussed in detail in the next section. As stated by Article III of the agreement, Russia participated as an observer in addressing the Aral Sea crisis, and provided financial and technical assistance (IWL, 2006; Roll *et al.*, 2006).

The ICAS, the IFAS, and the SDC (1993–1995)

Additional organizations were created between 1993 and 1995 to support the management of the Aral Sea Basin. These included the *Interstate Council on the Aral Sea Basin* (ICAS) that was formed to develop policies and proposals for the management of the Aral Sea Basin (Peachey, 2004); the *International Fund for the Aral Sea* (IFAS), designed to manage contributions and to finance program activities (Mukhammadiev, 2001); the *Sustainable Development Commission* (SDC) formed to ensure that socio-economic issues were considered by ICAS when determining new policy, and the *Executive Committee of the ICAS* (EC-ICAS), which was given the responsibility of implementing programs set forth by the *Aral Sea Basin Program* (ASBP).

The (ASBP)-International Involvement (1994)

The ASBP, initiated in 1994, is a consortium of international organizations such as UNDP, UNEP, the World Bank, and the EU. It is aimed at identifying long-term solutions for the basin's wide-ranging problems (environment, water management, rehabilitation of the disaster zone around the lake). It is also charged with improving the capacity of the riparian states to implement these programs (World Bank, 1998).

A review of the Aral Sea management framework structure, following the initiation of the ASBP, found that there was a lack of clarity in the roles and functions between the newly formed ICAS and the ICWC, as well as between the ICAS and the EC-ICAS (Vinogradov, 2001). In response, the five riparian states agreed in 1997 to restructure the institutional framework, leading to a new IFAS that combines the ICAS and the previous IFAS. The EC-ICAS was transformed into the EC-IFAS which, along with the SDC and the ICWC, were to answer directly to the new IFAS board members. The revised institutional framework of the Aral Sea

Basin along with the ASBP are considered a major factor in improved cooperation in the basin (see also section on the North Sea restoration).

Main Declarations, Bilateral and Multilateral Agreements, and Unilateral Legal Initiatives (1995–2003)

Below we provide a very short review of major negotiated outcomes and unilateral initiatives. The details can be found in (IFAS, 2006) and (Roll *et al.*, 2006). They are also summarized in the Annex.

Between 1995 and 2003, four declarations were made by the riparian states pertaining to the improvement of the basin (IFAS, 2006). Following the formation of the ASBP, the Nukus Declaration (September 1995) discusses the sustainable development of the Aral Sea Basin and affirms the financial obligations of the states to the ICAS, IFAS, and the SDC. The Almaty Declaration (1997) proclaims 1998 as the *Year of Protection of the Environment* in the region. The declaration recognizes that an eco-system approach should be used in the region's water resource management. The Ashgabat Declaration (1999) emphasized the support for joint actions to address common environmental problems in the basin (Roll *et al.*, 2006) and announced the implementation of the *Water Resources and Environment Control Project* (improved use of water and other natural resources). The 2002 Dushanbe Declaration establishes major directions for solving the problems related to the Aral Sea, and for improving monitoring and information exchange on water and other natural resources.

Bilateral and Multilateral Water Agreements

As alluded to earlier, a complex water storage system had been built during the Soviet era on the Amu Darya and Syr Darya to store water in winter for use in the subsequent summer for irrigation and electricity generation. Since independence one of the lingering problems continues to be the operation and maintenance of infrastructure and hydraulic facilities. The issue was partly addressed by the Framework Agreement. The Agreement stated that the infrastructure would be owned by the state where it was located, though the liability for the management activities would be shared among them (de Chazournes, 2006).

To cope with the remaining problems, states reverted to short-term bilateral and trilateral agreements. Most of these agreements pertained to the Syr Darya as it suffers from greater water scarcity and requires additional attention. Furthermore, the upstream riparian on the Amu Darya, Tajikistan, had been engaged in a civil war in the mid-1990s, which hindered its ability to negotiate.

In truth, these informal arrangements have not been successful over time. The main issue of dispute has been the lack of long-term compensation mechanisms from the downstream states to the upper riparians. This has resulted in a more formalized and predictable framework, to avoid such disputes from arising, instead of the series of *ad hoc* agreements to establish energy and water trade-offs. An illustration of the result of such arrangements can be seen at the Toktogul hydropower station and

reservoir, on the Syr Darya in Kyrgyzstan, which controls the release of water to the downstream riparian states.

The Syr Darya Framework Agreement. This agreement, also referred to as the Bishkek Agreement, was signed by the Prime Ministers of Kyrgyzstan, Uzbekistan, and Kazakhstan in 1998 (de Chazournes, 2006). Tajikistan became a signatory to the agreement only later, in 1999, as its civil war was coming to an end. The agreement demonstrated support for cooperative management of the basin's resources and was an attempt to resolve the issue of exchanging fuel for water, a point of contention among the upper and lower riparians.

The agreement specified that Kyrgyzstan should be compensated by the downstream riparians (Uzbekistan and Kazakhstan) for the costs of maintaining the infrastructure related to water storage, and subsequently the potential hydropower production it foregoes in the winter (McKinney, 2004). The agreement is based on the proposed management and maintenance of the five reservoirs: Toktogul, Kairakum, Charvak, Chardarya, and Andijan, in the Syr Darya Basin. The treaty also pertained to the timing of water storage releases from the Toktogul reservoir and the related compensation schemes among the riparians. In addition, the agreement takes into account the issue of the value of the water released.

Article IV of the agreement declares that energy losses, as a result of reduced water releases during the nonvegetative period (winter months), shall be compensated with coal, gas, and electricity, or their monetary equivalent. A tariff will be included in these exchanges based on costs of operation, maintenance, and reconstruction of hydrotechnical facilities.

The treaty also declares that the four nations will seek agreement on construction of new hydropower facilities, and promote the use of monetary exchange as a replacement for current energy exchanges. The riparians likewise agreed to reduce the amount of pollutants released into the river, and to develop water saving technologies.

Box CS4.1: The Syr Darya Water-Energy Swap Agreement in Numbers.

Kyrgyzstan receives 1.1 million of kWh of power in electricity or coal, valued at \$22 million, and 400 million kWh of power plus 500 million m³ of gas, valued at \$48.5 million, from Kazakhstan and Uzbekistan respectively. In return Kyrgyzstan delivers 3.25 BCM of water from the Toktogul Reservoir in monthly flows and 1.1 billion kWh of summer hydroelectric power to both Kazakhstan and Uzbekistan.

Source: United Nations Treaty Collection (2006).

Overall, the 1998 Barter Agreement seems reasonable. Since Kazakhstan and Uzbekistan benefit from timely water releases from Kyrgyz dams, it is only fair that they pay for part of the maintenance and operation of the dams. However, the fact that Uzbekistan pays more than Kazakhstan for the same amount of water and power could be challenged. Furthermore, is it fair that Uzbekistan and Kazakhstan pay for the maintenance and operation of the dam plus pay for the water releases?

The Amu Darya River Basin Agreements. Barter agreements, codifying energy for water swaps, are also instituted among the Amu Darya riparian states. Tajikistan exports 3.4 billion kWh (\$170 million) of hydroelectric power to Uzbekistan from the Amu Darya dams. In exchange, Tajikistan imports 3 billion kWh (\$130 million) of electricity per year from Uzbekistan in the form of natural gas. Furthermore, while the Amu Darya does not flow within the borders of Kyrgyzstan, the ICWC allocates 0.15 BCM/year of Amu Darya water to Kyrgyzstan for additional energy production. By allocating Amu Darya water to Kyrgyzstan, the ICWC is able to alleviate some of the demands on the Syr Darya (Heltzer, 2003).

Kyrgyzstan's New Law and Its Impact

In 2001, the Kyrgyz Parliament passed a new law that allows Kyrgyzstan to demand monetary compensation from the downstream riparians for water storage and infrastructure maintenance undertaken by Kyrgyzstan. This law is considered by Kyrgyzstan a clarification of the 1998 Framework Agreement (Heltzer, 2003). Furthermore, the law reflects Kyrgyzstan's belief that while the downstream states are entitled to a percentage of the water, the amount they have historically used has been excessive. Specifically, the law introduces payments for storage infrastructure related services (to account for operation and maintenance of the storage and conveyance facilities) and for quantities of water released beyond what the downstream states actually need for irrigation (according to Kyrgyzstan's opinion). The law also accounts for the hydropower benefits Kyrgyzstan foregoes due to the storage of water in favor of downstream states.

Kyrgyzstan's law has expectedly impacted other riparians in the region. For example, Tajikistan, the second upstream riparian, has been contemplating a similar law. In November 2002, Tajikistan and Uzbekistan negotiated and adopted a Power-Trade Relations Agreement (de Chazournes, 2006). It established a framework for bilateral power-trade relations, and also instituted policy conditions for an integrated water and energy system. Other riparian states in the basin are expected to join this framework.

It is quite clear that Kyrgyzstan's law intends to bring the lower riparians back to the bargaining table, renegotiating the terms of the region's water allocation regime. Uzbekistan, which is a significant user of water, may realize that it is cheaper to reach an agreement on water allocation levels so that it only has to pay for the excess water it uses. This may aid the region in determining equitable and efficient water allocations.

International Agreements Involving the Basin States

The basin states are involved in various other international agreements that can contribute directly, or indirectly, to cooperation on the Aral Sea.

Central Asian Economic Community (CAEC)

Central Asia Cooperation Organization was established in 1994 by Kazakhstan, Uzbekistan, and Kyrgyzstan. Tajikistan joined in 1998 and Russia in 2004.

Commonwealth of Independent States (CIS) Collective Security Treaty

Established on 15 May 1992 with Armenia, Kazakhstan, Kyrgyzstan, Russia, Tajikistan, and Uzbekistan as signatories. Azerbaijan, Georgia, and Belarus joined in 1993. The regime entered into force on 20 April 1994. The treaty reaffirmed the desire of all participating states to abstain from the use or threat of force. Signatories are not allowed to join other military alliances with other groups of states. Similarly, aggression against one signatory would be perceived as an aggression against all.

Shanghai Cooperation Organization (SCO)

Began in 1996 with a treaty on *Deepening Military Trust in Border Regions* and signed, in Shanghai, by Kazakhstan, China, Kyrgyzstan, Russia, and Tajikistan. In 1997 the same countries signed the Treaty on *Reduction of Military Forces in Border Regions* in a meeting in Moscow. On 14 June 2001, the above treaties evolved into an intergovernmental organization which included Kazakhstan, Kyrgyzstan, Russia, China, Tajikistan, and Uzbekistan.

Observation on Conflict and Cooperation in the Aral Sea Basin

The agreements and declarations enumerated above have established an approach for limiting water consumption in the Amu Darya and Syr Darya basins, and on a common strategy for transboundary water resources management. The treaties have likewise set the basis for potential cooperation. Unfortunately, this collective corpus of agreements has only marginally ameliorated tension in the area.

The emergence of cooperation in the Aral Sea basin so soon after independence was especially striking, since most other attempts at rapid regional institutionalization and cross-border exchange have been useless. As explained by Weinthal (2002), the rapid cooperation in the region, in the form of new institutions, may be just as much about 'state making' as it is promoting regional cooperation.

On the other hand, the large number of regional agreements pertaining to the Aral Sea may be scrutinized, since they are devoid of meaningful content. Similarly, the riparian states have likewise shown little willingness to establish and participate in multilateral, multi-issue frameworks, which is required to prevent conflict and safeguard natural resources. Thus far, basin states have preferred bilateral, case-by-case solutions. Specifically, the lower riparians (economically and militarily more powerful than the upper riparians) have chosen to adopt these bilateral

case-by-case solutions to mitigate the recurrent disputes over water. Such a strategy may have reduced the impact of regional cooperation initiatives that take advantage of economies of scale and respond appropriately the extrenalities present in the basin. On the other hand, case-by-case panaceas have also prevented interstate crises from escalating into open violent conflict (Just and Netanyahu, 1998).

Finally, the active and generous role of the international community in the form of international organizations and NGOs impel institution building at both the regional and domestic levels that induce cooperation and reinforce capacity.

EPILOGUE: RECENT DEVELOPMENTS

Two recent developments may affect the status and direction of regional affairs. First, the successful revival of the Northern Sea, and the second, the death of Turkmenistan's life-long ruler, Saparmurat Niyazov — Turkmenbashi.

The Northern Aral Sea Resurrection

The Southern Aral Sea continues to shrink as outflows from the sea surpass inflows. The level of the Northern Aral Sea, however, has been rising due to recent rehabilitation efforts (World Bank, 2001). During the period from 1991 to 1997 the Southern Aral Sea received an average of 13.2 BCM of water inflows from the Northern Aral Sea and the Amu Darya River, and 3.6 BCM from precipitation. It lost an average of 29.6 BCM due to evaporation. The Northern Sea is in a much better state. The average inflow from the Syr Darya River to the Northern Aral Sea was 5.8 BCM and the average inflow from precipitation was 0.4 BCM. Outflow from the Northern Sea averaged 3.4 BCM while losses due to evaporation were constant at 2.8 BCM (World Bank, 2001).

It is currently widely recognized that the goal of restoring the entire Aral Sea to previous levels is not achievable in the foreseeable future. It is estimated that to restore the sea in 25 years would require 75 BCM of water annually, which would be an unrealistic expectation as it would require, either billions of US dollars in investments to improve the efficiency of the existing irrigation systems upstream, or closing most of the irrigation systems. Funds for such large investments are not available and closing the irrigation systems would create even bigger economic and social hardships than the Aral Sea crisis ever did (World Bank, 2001).

However, the Northern Aral Sea, which is fed by the Syr Darya can be rehabilitated by building a dike in the Berg Strait. Simultaneously, the delta area, wetlands and lakes near the Sea could then be rehabilitated. Current projects aimed to rehabilitate the Aral Sea include the World Bank's Syr Darya Control and Northern Aral Sea Phase-I Project (World Bank, 2001) and the Aral Sea Basin Program (World Bank, 1998). The World Bank's project in Kazakhstan aims to rehabilitate the Northern Sea and rejuvenate fish yields; increase water levels and decrease salinity; improve air, soil, and water quality; improve irrigation and crop production; improve

the water supply; and improve the health of the local population. Implementation of the project includes the construction of a dam between the Northern Sea and the Southern Sea with the goal of increasing the water level in the Northern Sea, and repairing old infrastructure such as the Chardara Dam on the border of Uzbekistan and Kazakhstan (World Bank, 2001).

When these rehabilitation schemes began, project managers assumed that it would take up to 10 years for the water to rise 3m and cover 800 km² of dry seabed. However, just 7 months after the dike's completion, the Northern Aral Sea has reached the target level, 42 m above the level of the Baltic Sea. Spare water is already flowing through the spillway — evidence of what may become one of the biggest reversals of an environmental catastrophe in history (Pala, 2006, p. 163).

The Death of Turkmeni leader, Saparmurat Niyazov Turkmenbasi on December 21, 2006

The passing away of the Turkmeni leader, Saparmurat Niyazov Turkmenbasi on December 21, 2006 shocked his nation, the region and many others that have interest in regional water and gas issues. How would that even affect the waves in the Aral Sea?

In this context, many, if not all, possible outcomes are unknown. The domestic power balance would probably dictate many of the answers to the following questions. What kind of a future is waiting for Turkmenistan? How will the opposition act? What kind of attitudes will Turkmenistan maintain towards regional issues? What would be the faith of the “isolationist” policy? While it is still too early to predict, it is clear that new power balances, domestic, regional and international, have now renewed stake and will affect Turkmenistan's role in the regional economy and politics (Erol, 2006). The Aral Sea and the gas reserves and plans are certainly part of this possible stake.

ANNEX

Time Table of Major Events Associated with the Aral Sea.

Year	Agreement/Declaration/Event	Accomplishment
1953	Treaty signed between Soviet Union and Afghanistan	Establishes precedent for transboundary cooperation
1986	Basin Water-Management Associations (BWAs) established: BWA Amu Darya and BWA Syr Darya	Regional boards to coordinate water management in respective river drainage basins; formed initial infrastructure
1991	All five nations agree to abide by Soviet era water allocations	First step in water management following Soviet breakup
1992	Almaty Agreement signed by all Central Asian nations	Interstate Coordinating Water Commission (ICWC) created to ensure quota implementation and protect resources, govern the two BWAs. Scientific Information center (SIC) created to monitor and measure water in region
1993	ICKKU/ICKKTU	Interstate Council of Kazakhstan, Kyrgyzstan, and Uzbekistan, and later, Tajikistan
1993	International Fund to Save the Aral Sea (IFAS) created by all five nations	Created to coordinate financial resources provided by member states and donors
1993	Interstate Council on the Aral Sea Basin (ICAS) set up by all five nations	Created to coordinate projects and set policy on Aral Basin efforts
1995	ICSDETC (SCSD)	Sustainable Development Commission
1995	Nukus Declaration signed by all five nations	Nukus Declaration acknowledged the formulation of the Aral Sea Basin Sustainable Development Convention. All nations pledge commitment to Basin protection and fund-raising
1997	New IFAS created, merged with ICAS	Streamlined institutional structure New draft institutional agreement resulted, with improvements in legal content
09/1997		The four states of Kazakhstan, Kyrgyzstan, Tajikistan, and Uzbekistan signed an agreement on the use of the Syr Darya waters
1996–present	Various multi- and bilateral agreements (less than five nations)	Topics of these agreements include energy swaps, water flow and allocation, and water measurement
1998–present	Various multi-lateral conferences, including those sponsored by UN or other NGOs	Repeated commitments to environmental and regional planning; establishment of scientific monitoring regimes
03/1998		Agreement for Cooperation in the field of Environment and Rational Use of Nature.
04/1998	Central Asian Environment Ministerial Conference	The Ministers reaffirmed their commitment to environmental cooperation in accordance with previous agreements

REFERENCES

- Ahmad, M. and M. Wasiq (2004). *Water Resource Development in Northern Afghanistan and its Implications for Amu Darya Basin*. Washington, DC: World Bank.
- Central Asia Water Information (2006). http://www.cawater-info.net/aral/water_e.htm (Visited on October 26, 2006).
- de Chazournes, L. B. (2006). The Aral Sea Basin: Legal and institutional aspects of governance. In: Finger, M., T. Ludivine and J. Allouche (eds.), *The Multigovernance of Water*. New York: State University of New York Press.
- Dinar, A., P. Seidel, H. Olem, V. Jordan, A. Duda and R. Johnson (1995). Restoring and protecting the world's lakes and reservoirs. World Bank Technical Paper Number 289. Washington, DC: World Bank.
- Dukhovny, V., V. Sokolov and B. Mukhamadiev (2006). Integrated water resources management in the Aral Area Basin: Science policy and practice. In: John, W. and P. Wouters (eds.), *Hydrology and Water Law—Bridging the Gap*. London: IWA Publishing, pp. 198–217.
- Erol, M. S. (2006). Turkmenistan after Turkmenbashi. The Journal of Turkish Weekly Opinion. <http://www.turkinshweekly.net/comments.php?id=2393> (Visited on April 22, 2006).
- Glantz, M. H. (1999). Sustainable development and creeping environmental problems in the Aral Sea Region. In: Glantz, M. H. (ed.), *Creeping Environmental Problems and Sustainable Development in the Aral Sea Basin*. Cambridge: Cambridge University Press, pp. 1–25.
- Heltzer, G. (2003). Stalemate in the Aral Sea Basin: Will Kyrgyzstan's new water law bring the downstream nations back to the multilateral bargaining table?, *Georgetown Environmental Law Review*, Winter, 15(2), 291–321.
- IFAS (2006). Declarations. http://www.ec-ifas.org/English_version/About_IFAS_eng/declaration_eng.htm (Visited on November 4, 2006).
- IFAS–UNEP (2001). International Fund for the Aral Sea and the UN Environment Programme. Environment State of the Aral Sea Basin — Regional Report of the Central Asian States 2000. <http://enrin.grida.no/aral/aralsea/english/obr/obr.htm> (Visited on October 27, 2006).
- International Crisis Group (ICG) (2006). Central Asia: Water and Conflict. <http://www.intl-crisis-group.org/projects/showreport.cfm?reportid=668> (Visited on November 2, 2006).
- International Water Law (IWL) (2006). Agreement of the Republic of Kazakhstan, Republic of Kyrgyzstan, Republic of Tajikistan, Turkmenistan, and Republic of Uzbekistan on joint activities in addressing the Aral Sea. <http://www.internationalwaterlaw.org/RegionalDocs/Aral-Sea.htm> (Visited on November 3, 2006).
- Just, R. E. and S. Netanyahu (1998). International water resource conflicts: Experience and potential. In: Just, R. E. and S. Netanyahu (eds.), *Conflict and Cooperation on Trans-Boundary Water Resources*. Boston: Kluwer Academic Publishers, pp. 1–26.
- Kirman, S. and G. L. Moigne (1997). Fostering riparian cooperation in international river basins: The World Bank at its best in development diplomacy. World Bank Technical Paper 349, Washington, DC: World Bank.
- Langford, V. P. E. and S. Vinogradov (2001). Managing transboundary water resources in the Aral Sea Basin: In search of a solution. *International Journal of Global Environmental Issues*, 1(3/4), 345–362.

- McKinney, D. C. (2004). Cooperative management of transboundary water resources in Central Asia. In: Burghart, D. and T. Sabonis-Helf (eds.), *In the Tracks of Tamerlane—Central Asia's Path into the 21st Century*. National Defense University Press (Available online 2003: <http://www.ce.utexas.edu/prof/mckinney/papers/aryl/CentralAsiaWater-McKinney.pdf>).
- Mukhammadiev, B. (2001). Legal aspects of interstate cooperation for transboundary water resources management in the Aral Sea Basin. AWRA/IWLRI-University of Dundee International Specialty Conference, August 6–8, 2001.
- O'Hara, S. L. (2004). *Central Asians Divided Over Use of Dwindling Water Supply*. Local Governance Brief, Summer, 2004.
- Peachey, E. (2004). The Aral Sea Basin crisis and sustainable water resource management in central Asia. *Journal of Public and International Affairs* (Vol. 15), Spring, 2004.
- Pala, C. (2006). Once a terminal case, the North Aral Sea shows new signs of life. *Science*, 312, 183, April 14.
- Polat, N. (2002). *Boundary Issues in Central Asia*. Ardsley, NY: Translational Publishers, p. 137.
- Roll, Gulnara, *et al.* (2006). Aral Sea: Experience and Lessons Learned Brief. http://www.ilec.or.jp/lbmi2/reports/01_Aral_Sea_27February2006.pdf (Visited on November 4, 2006).
- Sanigmii (2000). Uzbekistan Scientific Institute of Hydrometeorology, Tashkent. Data made available to the authors.
- Turkmenistan Ministry of Irrigation and Water Economy (Called also Ministry of Land Reclamation and Water Management), Irrigation in Turkmenistan, Ashgabat, March 1995 (in Turkmen, Russian, and English).
- United Nations, United Nations Treaty Collection (2006). Protocol of the Bishkek Agreement. <http://untreaty.un.org/> (Visited on November 6, 2006).
- Vinogradov, S. (2001). Managing Transboundary Water Resources in the Aral Sea Basin: in search of a solution. *International Journal of Global Environmental Issues*, 1(3/4), 345–362.
- Votrin, V. (2006). Transboundary water disputes in Central Asia: Using indicators of water conflict in identifying water conflict potential, Vrije Universiteit Brussel. http://www.transboundarywaters.orst.edu/publications/related_research/votrin/votrin_thesis.html (Visited on November 3, 2006).
- Weinthal E. (2002). *State Making and Environmental Cooperation: Linking Domestic and International Politics in Central Asia*. Cambridge, MA: The MIT Press.
- World Bank (1998). Aral Sea Basin Program (Kazakhstan, Kyrgyz Republic, Tajikistan, Turkmenistan and Uzbekistan) Water and Environmental Management Project. Project Document Volume I — Main Report, May 1998. Rural Development and Environment Sector Unit Europe and Central Asia Region. Washington, DC: GEF.
- World Bank (2001). Project Appraisal Document on a Proposed Loan in The Amount of US\$64.5 Million to The Republic of Kazakhstan for the Syr Darya Control and Northern Aral Sea Phase-I Project May 11, 2001. Rural Development and Environment Sector Unit Europe and Central Asia Region. Washington, DC: World Bank Report No. 22190-KZ.
- World Bank (2003). Water Resources in the Europe and Central Asia Region, Volume II: Country Water Notes and Selected Transboundary Basins. Washington, DC: World Bank.

World Resources Institute (2003). *World Resources, Decisions for the Earth*. Washington, DC: World Resources Institute.

ADDITIONAL READING

- Beach, H. L., J. Hamner, J. Hewitt, E. Kaufman, A. Kurki, J. Oppenheimer and A. Wolf (2000). *Transboundary Freshwater Dispute Resolution: Theory, Practice and Annotated References*. Tokyo and New York: United Nations University Press.
- Bedford, D.P. (1996). International water management in the Aral Sea Basin, *Water International*, 21, 63–69.
- De Chazournes, L. B. (2006). The Aral Sea Basin: Legal and institutional aspects of governance. In: Finger, M., T. Ludivine and J. Allouche (eds.), *The Multigovernance of Water*. New York: State University of New York Press, pp. 147–171.
- Dinar, S. (2003). Treaty principles and patterns: Selected international water agreements as lessons for the resolution of the Syr Darya and Amu Darya water disputes. In: Hartmunt, V. and N. Dobretsov (eds.), *Transboundary Water Resources: Strategy for Regional Security and Ecological Stability*. NATO Science Series. Dordrecht: Springer, pp. 147–168.
- Glantz, M. H. (ed.) (1999). *Creeping Environmental Problems and Sustainable Development in the Aral Sea Basin*. Cambridge: Cambridge University Press.
- Gleason, G. (2001). Interstate cooperation in Central Asia from the CIS to the Shanghai forum. *Europe-Asia Studies*, 53(7), 1077–1095.
- Heltzer, G. (2003). Stalemate in the Aral Sea Basin: Will Kyrgyzstan's new water law bring the downstream nations back to the multilateral bargaining table?, *Georgetown Environmental Law Review*, Winter, 15(2), 291–321.
- Levintanus, A. (1992). Saving the Aral Sea, *Water Resources Development*, 8(1), 60–64.
- Micklin, P. (1992). The Aral Sea crisis: Introduction to the special issue, *Post Soviet Geography*, 3(5), 269–270.
- Micklin, P. (1998). Regional and international responses to the Aral crisis: An overview of efforts and accomplishments, *Post-Soviet Geography and Economics*, 39(7), 399–417.
- O'Hara, S. L. (2000). Lessons from the Past: Water management in Central Asia, *Water Policy*, 2, 365–384.
- O'Hara, S. L. (2000). Central Asia's water resources: Contemporary and future management issues, *Water Resources Development*, 16(3), 423–441.
- Precoda, N. (1991). Requiem to the Aral Sea, *Ambio*, 20(3–4), 109–114.
- Sergai, V. (1996). Transboundary water resources in the former Soviet Union: Between conflict and cooperation, *Natural Resources Journal*, 36, 393–414.
- World Bank (2004). *Water energy nexus, improving regional cooperation in the Syr-Darya Basin*. Washington.