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Managing transboundary water resources in the Aral Sea Basin: in search of a solution

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Abstract: This paper examines the complex problems facing the Central Asian republics in the Aral Sea Basin. Confronted with unsustainable economic practices, environmental degradation and serious social problems, the Aral Sea Basin states seek to develop an effective legal and institutional framework for the cooperative management of scarce water resources. Up to date information on the environmental, economic and human conditions in the Aral Sea Basin provides the context for an analysis of efforts to manage transboundary water resources in the Soviet period and among the independent republics. The most recent draft agreements and initiatives among the Aral Sea Basin states are reviewed from the perspective of legal and institutional effectiveness, with reference to the principles of international water law. Finally, recent attempts to meet the needs of all riparians through trade in natural resources are viewed as a promising development. This strategy could provide solutions based on a more holistic approach to natural resources, while recognizing the historical, geopolitical and natural characteristics of the region.

Keywords: Aral Sea; dispute resolution; institution building; regional cooperation; water law.

Reference to this paper should be made as follows: Vinogradov, S. and Langford, V.P.E. (2001) 'Managing transboundary water resources in the Aral Sea Basin: in search of a solution', *Int. J. Global Environmental Issues*, Vol. 1, Nos. 3/4, pp.345–362.

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1 Introduction

The legacy of Soviet planning for the Aral Sea Basin has been unsustainable economic practices, environmental degradation and serious social problems. Faced with these challenges, the Central Asian republics are seeking to develop a regime for the management of transboundary water resources [1]. This regime must not only address environmental issues, but it must also recognize the economic and human dimensions of the Aral Sea crisis. An overview of the complex environmental and economic problems in the Aral Sea Basin will provide the foundation for a consideration of regional and international attempts to cooperate on the use and development of transboundary water resources. The most recent draft agreements among the independent Central Asian republics are analysed and evaluated from both legal and institutional perspectives.

An effective regime must address the economic and social needs of all riparians through strategies based on a more holistic approach to the natural resource endowments of the region [2]. It must facilitate cooperative efforts to mitigate environmental degradation while providing for the allocation of water resources according to international legal standards, taking into consideration the historical, geopolitical and natural characteristics of the region. The framework for regional cooperation should be established in well-drafted agreements with unambiguous legal status. The institutional structure must be logical and well defined, with equal input from all stakeholders. Procedures for needs assessment, project planning, implementation and review must be clear, consistent and supported by effective dispute resolution and enforcement mechanisms. Also, the clarification of financial responsibilities and adherence to reporting procedures are fundamental to the credibility of the cooperative regional framework.

Regional cooperation must also demonstrate an awareness of geopolitical considerations. Since the demise of the Soviet Union, increasing tension among the Aral Basin states over water resource allocation have demonstrated the potential for conflict. Not only do the five Central Asian republics have major economic and human interests at stake, but Afghanistan, China, Iran and Russia also have direct interests in the regional environment and transboundary water resources. Serious disputes over water and other natural resources in the region emphasize the need for a framework in which all interested parties have confidence.

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2 Water resources and the environment

The lack of effective management in the use and development of transboundary water resources in the Aral Sea Basin has had severe consequences for the natural environment, the human population, and the economies of the Central Asian republics. The following section will focus on these conditions which provide the background for an analysis of the regional attempts to develop the framework and procedures for cooperation in the Aral Sea Basin.

2.1 Environmental conditions

The Aral Sea Basin is situated in the heart of the Eurasian continent, extending over the territories of the five Central Asian Republics: the southwestern part of Kazakhstan, most of Turkmenistan and Kyrgyzstan, and all of Tajikistan and Uzbekistan. Portions of the basin lie in Afghanistan, China and Iran. The two major rivers are: the Amu Darya, which originates in the mountains of Afghanistan and Tajikistan and flows through Uzbekistan and Turkmenistan to the Aral Sea; and the Syr Darya, which originates in Kyrgyzstan and flows through Tajikistan, Uzbekistan and Kazakhstan to the Aral Sea. The degradation of the natural environment in the Aral Sea Basin is well documented [3]. What was once a spectacular and highly diverse region, is now the scene of severe water shortages and chronic pollution.

2.1.1 The Aral Sea

Once the world's fourth largest lake, the Aral Sea has declined dramatically since 1960. Before its decline, the area of the Aral Sea was 68,320 km^2, including 66,090 k m^2 of water and 2,230 km^2 of islands. Its water volume was about 1,066 km^3 with a maximum depth of 69 metres, although most of the Aral Sea was less than 30 metres deep. Measured in five-year periods, the total water inflow into the Aral Sea has decreased from 280 km^3 in 1956–1960, to 235 km^3 in 1966-1970 and to only 10 km^3 in 1981–1985 [4]. By 1995, the Sea had lost nearly three-quarters of its water volume.

Its surface area shrank to less than 30,000 k m^2, dropping 19 metres in the process [5]. The Aral Sea is now divided into two independently supplied reservoirs, the Large Aral to the south, and the Small Aral to the north. In the middle of 1992, a connecting channel between the two seas was blocked by a dyke, which stands 42 metres above sea level, blocking any water flow from the Small Aral to the Large Aral [6].

The Amu Darya and Syr Darya rivers, which once replenished the Aral Sea with 50–60 km^3 of fresh water annually, no longer provide enough water to reach the sea's shoreline. The waters of the Amu Darya disappear in the former delta region while most of the Syr Darya dies in the parched plains outside Kazalinsk, over 120 km from where it used to enter the sea [7]. In addition, more than 200 km^3 of water evaporated from the surface of the Aral Sea in the 1980s. The loss of water inflow and evaporation have combined to decrease the water volume of the Aral Sea by 690 km^3 between 1960 and 1985 [8].

Over 33,000 square kilometres of exposed seabed have been left in the wake of the Aral Sea's recession, creating vast salt plains inundated with agricultural chemicals. Salt and residues from pesticides and fertilizers are scoured off and blown hundreds of

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kilometres by harsh winds, settling in deposits that contribute further to the desertification of the region. This phenomenon is illustrated by the joining of the Karakum and Kyzylkum deserts of the Aral Sea's former seabed. The salinity of the Aral Sea has steadily increased from 10 grams per litre in 1960 to 34.4. grams in 1992; and conservative projections are that it will reach 42 grams per litre by 2000 [9]. This projection is conservative compared to the UNEP Diagnostic Study which projects average salinity levels of 65-70 grams/litre in the Large Sea and 36 grams/litre in the Small Sea by 2000 [10]. This has virtually wiped out a flourishing marine ecosystem that once supported 24 species of fish of commercial significance [11].

Another consequence of the desiccation of the Aral Sea is the loss of its ability to moderate the local climate. The Aral Sea once acted as a buffer to the region's fierce Siberian winter winds and harsh summer temperatures that exceed 40 degrees Celsius. The climate around the Aral Sea has become more continental, with shorter, hotter, rainless summers and longer, colder, snowless winters. In some areas, the growing season has been reduced to an average of 170 days, falling short of the 200 frost-free days needed to grow cotton [12].

2.1.2 Water resources

The quality of ground and surface water in the Aral Sea Basin has deteriorated dramatically in recent years. Ground water in the entire region is contaminated with nitrates from fertilizers, mineral salts from irrigation systems and toxic chemicals from pesticide residues and industrial sources. Surface water pollution has reached unprecedented levels, particularly in the Amu Darya and Syr Darya rivers.

Both rivers have become saturated with agricultural drainage waters, industrial wastes and untreated municipal sewage. However, they continue to be used extensively for irrigation and food production. High levels of pesticides are found in the tissues of fish in both rivers. Also, as a result of industrial pollution, samples of cane, rice, millet and even wheat grown around the Syr Darya have been found to contain dangerous levels of benzpyrene, a carcinogen produced by automobile exhausts, oil and coal furnaces, and the manufacturing of asphalt [13].

2.2 Human conditions

The Aral Sea Basin has a population of approximately 35 million people, of which 3.5 million live in the disaster zone that encompasses most of Karakalpakstan and the Khorezm region of Uzbekistan, the region of Dashowuz in Turkmenistan and the south-central portion of Kazakhstan (the province of Kzyl Orda) [14]. Currently, the Aral Sea crisis affects – directly or indirectly – an estimated 60% of the basin's population, or about 21 million people.

The human costs of environmental degradation in the Aral Sea Basin are measured in mortality rates, disease and health disorders that have reached critical levels. Mortality rates have risen by nearly 18%; and infant mortality rates are comparable to those of Indonesia and Burma [15]. Mortality rates in the Aral Sea Basin have risen from 6.8 deaths per 1000 people in 1985, to 8 deaths per 1000 people in 1994. Infant mortality rates are the highest in the former Soviet Union. In Karakalpakstan they average 50–60 deaths per 1000 live births, and in the Dashowuz province of Turkmenistan they average 75 per 1000 live births.

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In the Aral Sea disaster zone, incidents of disease are nearly double the rates elsewhere in the Central Asian republics [16]. Mortality from lung diseases occurs at rates 1.5 times higher than the average for all Central Asian republics. In the Kzyl Orda region of Kazakhstan, incidents of infectious and parasitic diseases – typhoid, paratyphoid, hepatitis A, and acute intestinal and stomach disorders – were twice as high as the average for the five republics by 1995. In Karaklpakstan, which lies at the southern end of the Aral Sea, 20% of young women are reported to have kidney diseases; 23% have suffered from thyroid dysfunction; and many women are affected from high levels of lead, zinc and strontium in their blood. In Karakalpakstan in the last decade and a half, kidney and liver diseases, especially cancers have increased 30 to 40 times, arthritic diseases 60 times, and chronic bronchitis 30 times. In total, approximately 70% of Karakalpakstan's 1.1 million people are ill or suffer from some sort of chronic condition. Similar threats to human health are pervasive in the Kazakhstan region of the Aral Sea Basin. The most common conditions include cancer of the oesophagus, which has increased by 14 times and bronchial asthma and heart disease which have increased by ten times. Some 80% of the residents of Aralsk suffer from illnesses including blood diseases (which affect five times more children than the national average), and chronic anaemia (which affects over 70% all mothers).

It is trite to say that such levels of disease and illness continue to have profound effects on the people living in the region, affecting their health, productivity and ability to address environmental and economic problems. As the Central Asian republics have the highest population growth rates in the former Soviet Union, the number of people suffering under these conditions will continue to grow at an average rate of roughly 2.5% per year; doubling every 28 years and exceeding 60 million by the year 2025 [17].

2.3 Economic conditions

2.3.1 Agriculture

Agricultural practices that had been sustained for over two thousand years were replaced by the Soviet diversion of massive amounts of water from river valleys to the surrounding steppes and deserts, primarily for cotton cultivation. Between 1940 and 1986, cotton production on irrigated land was increased by over 300% in Turkmenistan, by 196% in Tajikistan and by 122% in Uzbekistan [18]. By 1986, over three million hectares of land in Turkmenistan, Tajikistan and Uzbekistan were under cotton production, accounting from more than 50% of total Soviet agricultural production.

Quota-based mass production of cotton entailed excessive irrigation, failure to rotate crops and the application of pesticides and fertilizers at rates ten times the average for the former USSR. Such abuse of agricultural chemicals has resulted in the contamination of groundwater aquifers and return flows. Also, the design, construction and operation of irrigation systems caused the salination and saturation of thousands of hectares of once productive farmland. By 1988, more than 3.5 million hectares of agricultural land had been taken out of production. For example, in Uzbekistan, 1.6 million hectares or 44% of the entire area under irrigation suffers from varying degrees of salination [19].

2.3.2 Fisheries

Regional fisheries have basically collapsed with the desiccation of the Aral Sea. In 1959,

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the Aral Sea's fishing fleets hauled in nearly 50,000 metric tonnes of several species of fish. By 1994, a mere 5,000 metric tonnes of carp were landed from the few polluted lakes in the ruined deltas of the Amu and Syr Darya rivers. Virtually nothing of commercial value survives in the saline water of the sea itself. The collapse of the fishing industry affected some 60,000 people who were directly or indirectly dependent on fishing for employment and income. For example, the once thriving fishing village of Muynak – now marooned 80 kilometres from the sea on what used to be its southern shore – has had its population reduced from 45,000 in 1960 to about 13,000 in 1995 [20]. Many of the remaining villagers are unemployed or under employed most of the year. The town's fish cannery, which has a capacity of producing 27 million cans a year, produced only 4 million in 1993; it operated for only a few days in 1994; and fish have been brought in from the Pacific Ocean and the Baltic Sea in a desperate, costly effort to keep it in operation.

3 The framework for regional cooperation

3.1 Agreements in the Soviet period

Cooperation in the Soviet period involved international agreements and regional arrangements for water resources in the Amu Darya and Syr Darya basins. International agreements on the uses and quality of frontier waters were signed between the USSR and Afghanistan in 1946 [21] and 1958 [22]. These agreements established an international commission to deal with the use and quality of frontier water resources.

Since the collapse of the Soviet Union, the Amu Darya basin states have inherited the responsibilities of the commission, but appear to have made little progress in achieving further cooperation with Afghanistan [23]. Since Afghanistan is an upstream riparian, sharing with Tajikistan several tributaries of the Amu Darya it is essential that the Central Asian republics negotiate further agreements (once there is someone to negotiate with) on the equitable utilization of these water resources [24]. Otherwise, the unilateral diversion of water by Afghanistan for its own purposes (to the detriment of downstream states) would result in further economic hardship, environmental damage, and create a potential for conflict.

Regional schemes in the Soviet period – under the central management of the Ministry of Water Management – provided the construction of the hydraulic works needed to satisfy irrigation and other water demands in the Syr Darya and Amu Darya river basins. These central plans also apportioned water from each tributary, reservoir, canal or water intake, calculated according to crop needs, and was subject to modification by the Republics to address more specific and seasonal water requirements [25]. However, none of these arrangements regulated the quality of drainage water which was disposed into the rivers.

3.2 Agreements among the Independent Republics

Having recognized the need to cooperate on water issues and within a year of the dissolution of the Soviet Union in 1991, the five Central Asian Republics reached an agreement concerning transboundary water resources [26]. This early attempt at cooperative utilization and protection of 'common and integral' water resources led to the

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establishment of the Interstate Commission for Water Management Coordination (ICWC), with a mandate to control and ensure rational utilization and protection of the interstate water resources [27]. Until recent changes, the ICWC was responsible for the development of regional water management policies to ensure rational utilization of water resources and to provide incentives for adherence to the regional water allocation regime. The ICWC also governed the activities of the two regional Basin Water Management Bodies (Bassejnovoe Vodnoje Ob'edinenie – BVO): BVO 'Amu Darya' and BVO 'Syr Darya', both of which were created in 1986. Since 1992, the ICWC and the two regional BVOs were responsible for short and long-term water development and allocation planning, water quality control, conservation and environmental protection.

The momentum for regional cooperation was maintained by the establishment of four other intergovernmental institutions between 1993 and 1995. These institutions were:

1 the Interstate Council on the Aral Sea Basin (ICAS), intended to set policy, provide intersectoral coordination and review the projects and activities conducted in the Basin;

2 the Executive Committee of ICAS (EC-ICAS), intended to implement the Aral Sea Program;

3 the International Fund for the Aral Sea (IFAS), entrusted with the coordination of financial resources provided by member states, donors and international organizations [28]; and

4 the Sustainable Development Commission (SDC), designed to ensure that economic, social and environmental factors are given equal weight in planning decisions [29].

While this institutional framework has been criticized for its lack of clarity with respect to the functions of different organs of the same institution (i.e. ICAS and EC-ICAS); for confusion between decision making organs and executive organs; and for duplication of functions between different institutions, it may be considered as a stage in the development of the framework for joint decision making and management of transboundary water resources among the Republics [30]. Subsequent efforts to clarify and rationalize the responsibilities and functions of these institutions may be observed through a series of draft agreements, focusing on three main issues related to water resources in the Aral Sea Basin.

4 Recent agreements and draft agreements

Efforts since 1995 to achieve progress on issues of use and management of transboundary water resources among the Aral Sea Basin states have focused on institutional issues (the clarification of mandates for the various international organizations concerned with the Aral Sea), the current use of scarce water resources, and the joint planning (cooperative management) and protection of water resources among the parties. The European Union (TACIS Program) launched a program in 1995 to support the drafting of water sharing agreements through the organization of training activities, the establishment of working groups and the provision of advice by experts on international water law [31].

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4.1 Institutional issues

The evolution of the institutional framework for the management of transboundary water resources in the Aral Sea Basin may be observed in a series of agreements and draft agreements entitled 'development of cooperation and improvements of protection, management and development of the water resources in the Aral Sea Basin'. The objective of these agreements has been to streamline the interstate bodies and organizations involved. In September 1995, representatives of the Republics met in Nukus and Uzbekistan to sign a Declaration on the sustainable development of the Aral Sea Basin. The parties affirmed their financial obligations to the International Council for the Aral Sea (ICAS) and the International Fund for the Aral Sea (IFAS), and their commitments to strengthening the Interstate Commission for Socio-economic Development and Scientific, Technical and Ecological Cooperation (then called the 'Sustainable Development Commission') [32].

A subsequent draft agreement prepared in 1996 set out the composition and functions of the ICAS in highly general terms, including the improvement to the ecological situation of transboundary waters, and the development of water management policies and perspectives. The draft agreement also emphasized the importance of capacity building for interstate water management organizations and attempts to clarify the activities of the Scientific Centre (SC-ICWC) and the functions and status of the respective Basin Water Management Bodies (BVO Syr Darya and BVO Amu Darya). After several drafts, the parties eventually agreed that the institutional framework would fall under the auspices of the International Fund for Saving the Aral Sea (IFAS) and its Executive Committee (EC IFAS); and the Interstate Commission on Water Management Coordination (ICWC) and its executive bodies: the Secretariat, the Scientific Centre (SC-ICWC), the Basin Water Management Body Syr Darya (BVO Syr Darya) and the Basin Water Management Body Amu Darya (BVO Amu Darya) [33].

4.1.1 International fund for the Aral Sea (IFAS)

Established in 1997, the new International Fund for the Aral Sea (IFAS) – as a successor to the former ICAS as well as to the former structure of the IFAS – has a Board composed of Deputy Prime Ministers of the five states, with portfolios involving agriculture, water and the environment [34]. The Board meets at least three times a year to discuss the views of member states and to decide on the policies, programs, and institutional proposals recommended by the Executive Committee (renamed the Executive Committee of IFAS), which is the permanent working body of the fund. The IFAS also retains its former responsibilities for managing contributions and financing program activities, pursuant to a set of regulations on the IFAS and its Auditing Committee [35].

4.1.2 The International Commission on Water Management Coordination (ICWC)

The relationship between the new IFAS and the International Commission for Water Coordination (ICWC or 'Commission') remains somewhat unclear. For example, the 1997 Draft institutional agreement designated the commission as the umbrella organization with the requisite international legal status to coordinate water management

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programs in the Aral Sea Basin [36]. The Commission was to be composed of ministers or delegates entrusted by their governments to represent state interests at quarterly meetings. Delegates to the Commission were simultaneously to consider all sectors of their national economies, as well as the regional interests of the basin and of the Aral Sea itself [37]. However, these functions now seem to come under the mandate and procedures of the new IFAS.

Nonetheless, the functions of the Commission are not entirely displaced. Surviving functions include supervision over the management of transboundary water resources in accordance with interstate agreements; distribution of annual water limits to the parties and to the Aral Sea, and development of measures to maintain the regimes of water supply and distribution [38]. These functions are consistent with the concept of the Commission and its organs as an implementing agency, whereas the IFAS would be responsible for policy and financial decisions.

The 1997 Draft institutional agreement also provides that the Commission would draft legislation to clarify the management regime for transboundary water resources in the Aral Sea Basin [39]. While the importance of the legal framework for cooperation in the Aral Sea Basin cannot be overemphasized, the effectiveness of any model legislation or agreements will depend on the clarity of the instruments, their consistency with prior agreements and with international standards. It is apparent that the requisite legal expertise has not been sufficiently involved in the drafting of agreements to date.

4.1.3 Dispute resolution

The lack of legal precision is also apparent in the absence of adequate provisions for dispute resolution in the post-independence agreements. The 1992 Agreement refers water disputes to the Ministers of Water Resources for the five republics [40]. However, it does not provide for situations in which the Ministers are unable to resolve the dispute. A subsequent draft international convention provides that any intentional violation within a basin state of water withdrawal limits, regimes and schedules, determined by the ICWC and its executive bodies, causing damage or affecting the interest of other basin states, leads to a penalty and to liability for compensation. Such cases are to be heard by an arbitral court composed of three nationals of third states [41].

Although the 1997 Draft institutional agreement deals with such important matters as the distribution of annual water limits and the determination of reservoir releases, it makes no reference to dispute resolution. Another 1997 draft Agreement on the use of water resources in the present conditions has an arbitration clause providing that the ICWC will create an Arbitration court to ‘consider claims and make relevant decisions’ [42]. However, the clause lacks reference to applicable law or procedure. It is further weakened by a subsection which provides that the Party in fault is exempt from ‘indemnities and penalties if its actions were not prejudiced, not systematic or caused by emergency situations (flood, natural calamity, military actions)’ [43].

There is a need for a dispute settlement mechanism that clarifies the type of tribunal, the applicable law and procedure, and the authority of the dispute settlement body. Beyond interstate negotiation, one option for dispute resolution could be the creation of a body within the Aral Sea Basin states, independent of the Commission or successive executive bodies. This body could seek the advice of international water law experts while remaining sensitive to the political context of the dispute. In the event that such an internal mechanism was unable to resolve a dispute, recourse to international arbitration

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may be advisable. This system could provide a flexible dispute resolution mechanism that is appropriate for the Aral Sea Basin states. Thus, the relevant provisions should be included in future agreements to avoid the present system of leverage, negotiation and recurrent conflict.

4.1.4 The ICWC Secretariat

The Secretariat, based in Khodjent (Tijikistan), acts as a standing executive organ of the ICWC, reporting on the implementation of ICWC decisions. The Secretariat organized the meetings, prepares the budget and programs of the ICWC. The budget for the Secretariat is paid by the Republic of Tajikistan, presumably as part of its share of the overall ICWC budget [44].

4.1.5 The Scientific Information Centre (SIC-ICWC)

The SIC-ICWC is based in Tashkent (Uzbekistan), with branches to be established in Kazakhstan, Kyrgyzstan, Tajikistan and Turkmenistan. It includes [45]:

- the regional Scientific Research Institute, SPA SANIRI;
- the regional planning Scientific Research institute, Vodavtomatika and Metrologia;
- five head national scientific information centres; and
- six national organizations.

The functions of the SIC-ICWC are mostly of a technical nature. They include the creation and management of a unified database for water resources in the Aral Sea Basin, the development of automated systems to be used in the management of the BVO Amu Darya and BVO Syr Darya, and the organization of regional training courses for water management personnel. Again, further clarification is necessary with respect to the role of the Scientific Information Centre in policy development and international project coordination [46].

4.1.6 The BVO Amu Darya and BVO Syr Darya

The BVO Amu Darya, which is based in Urgench, was established as an interstate organization in April 1992. It is directly responsible for water allocation, quality control and operation of structures in the Amu Darya river basin. Similarly established and based in Tashkent, the BVO Syr Darya has the same set of responsibilities for the Syr Darya river basin. In order to guarantee the water supply to the Aral Sea, Kazakhstan transferred control of all structures on the Syr Darya to the BVO [47].

4.2 Current use of water resources

The issue of current water utilization in the region is particularly sensitive, as evident in ongoing negotiations and disputes among the governments of the Central Asian republics over water allocation. Some recent decisions by upstream riparian governments – to reduce the water made available to downstream states and to charge for water in excess of previously agreed allocations – have resulted in disputes over allocation, pricing and payment. For example, representatives met in the Tadjik city of Khujand in July 1997 to

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discuss Kazak and Uzbek requests to increase the volume of water flowing from the Kairakum Reservoir in Tajikistan into the Syr Darya. The issue remained unresolved, as the Tajik representative reportedly stated that only the central government of Tajikistan could make such a decision. At the same time, Kyrgyzstan reportedly announced plans to charge its neighbours for water from the Naryn River [48]. Also, public reaction to water shortages in Kazakhstan (perceived to be the result of Uzbek cutbacks) has taken the form of open demonstrations [49].

Whereas long term planning is of obvious importance, current utilization and allocation of water resources is an indicator of not only demand patterns among the Republics, but also the state of negotiations and compromise that engender the overarching issues of regional cooperation and sharing of scarce water resources. This is also the forum where radically new approaches and concept can be tested. The concept of trading energy resources among the Republics (hydrocarbon resources to be used in power generation, for water critical to agricultural sectors) is gaining momentum at present. Before such innovations are fully considered, let us consider the most recent draft agreements on the 'use of water resources in present conditions'.

Two draft agreements prepared in 1997 proceed from the interest in joint use of water resources in the Aral Sea Basin and the acknowledgement of international legal principles relevant to the use of transboundary water resources [50]. These 1997 draft agreements on utilization seek to provide common definitions and to clarify the applicability of the agreements to all transboundary water resources. However, they do not apply to water resources that are local in nature (i.e. not connected to transboundary waters) be they river, ground or return waters.

The main provisions of the 1997 draft agreements on utilization include joint management clauses, which refer to the 'basin principle' [51], providing for the equality of the parties' rights to use, and responsibility to ensure rational utilization and protection of the water resources of the region, which are defined as 'common and integral'. The basin principle appears to have been elaborated to include the 'rational' use of water resources and the prevention of 'considerable harm' to all users and natural ecosystems. The parties also agree not to use more water than allocated to them [52].

While these provisions are certainly an improvement over earlier arrangements based on the concepts of 'water apportionment' and 'maximum utilization', efforts must go further to recognize the principle of 'equitable and reasonable utilization and participation', in accordance with Article 5 of the UN Convention on the Law of the non-navigational uses of international watercourses [53]. The principle of 'equitable and reasonable utilization' takes into consideration (but it is not limited to) such factors as:

- geography, hydrographic, hydrological, climatic, ecological and other factors of a natural character
- social and economic needs of the watercourse States concerned
- the population dependent on the water resources; the effects of usage on other States; existing and potential uses
- conservation, protection, development and economy of use of water resources, and
- the availability of alternatives to a planned or existing use [54]

Additional principles of the 1997 UN Convention on International Watercourses which are of particular relevance to the Aral sea basin States include:

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- the obligation not to cause significant harm to other watercourse States [55]
- the general obligation to cooperate (through joint mechanisms or commissions) [56]
- to exchange information on a regular basis, [57] and
- to provide timely notification of planned measures and emergency situations which may have a significant adverse effect upon other watercourse states [58].

Nevertheless, where significant harm is caused to another state, the party responsible for causing such harm in consultation with the affected state, is obliged to take appropriate steps to eliminate or mitigate such harm, and where appropriate, to discuss the question of compensation [59].

4.3 Joint planning of transboundary water resources

Two additional draft agreements address issues related to the 'joint planning of transboundary water resources' among the Central Asian republics [60]. The primary outcome of the preparation of these draft agreements has been the elaboration of a Regional Water Strategy with short (one-year), medium (five-year) and long-term (15 to 25 year) objectives. The overall objectives of the Regional Water Strategy are to assess regional water resources and the potential for changes in their quality and quantity; to assess national and regional water requirements and the possibility of curtailing these demands through effective management; to promote the conditions necessary for a sustainable ecosystem in the Aral Sea zone [61].

The Strategy also recognizes the importance of considering alternative uses for water resources and irrigated lands as part of a more rational development plan for the region. The Strategy notes that regional development depends upon the elaboration of legal, economic, technical and institutional mechanisms to promote compliance and to reduce conflicts over water resources. However, it fails to elaborate on the legal and economic mechanisms appropriate for this particular region. Articles 4–7 of the Strategy provide details for the physical management of water resources through 'perspective', 'medium-term' and 'current' planning regimes under the auspices of the ICWC. The Strategy urges the parties to pursue technical standardization of all rules, instructions, methods of measurement and other normative documents among institutional bodies. Also, articles 8 and 11 provide basic procedures for the implementation of initiative projects, with regard for the impact of these projects on other parties. Articles 4–7 of the Strategy provide details for the physical management of water resources through 'perspective', 'medium-term' and 'current' planning regimes under the auspices of the ICWC. The Strategy urges the parties to pursue technical standardization of all rules, instructions, methods of measurement and other normative documents among institutional bodies. Also, articles 8 and 11 provide basic procedures for the implementation of initiative projects, with regard for the impact of these projects on other parties.

Provisions relevant to joint planning under the 1997 UN International Watercourses Convention include the obligation:

1 to cooperate to attain optimal utilization and adequate protection of the international watercourse (i.e. through joint mechanisms or commissions) [62]

2 to protect its ecosystem through the prevention, reduction and control of pollution [63], and

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3 to enter into consultations concerning the management (i.e. sustainable development, rational and optimal utilization, protection and control) of the international watercourse [64].

Future agreements should make direct reference to these principles and reflect the experience gained through cooperation in existing joint mechanisms and commissions in various regions throughout the world.

5 Prospects for regional solutions

5.1 Energy resources in the Aral Sea region

The Central Asian republics have recognized that cooperation over the planning, development and utilization of scarce water resources is essential. Efforts to establish an institutional framework to coordinate environmental cooperation have made progress. One of the problems is that attempts to resolve ecological problems and water scarcity have until very recently focused almost exclusively on water resources. However, there are indications that other natural resources are increasingly considered as part of a holistic approach to the water supply and demand in the region.

5.1.1 Hydrocarbon resources

Central Asia is known to be rich in hydrocarbon resources, including oil, natural gas and coal. Estimated potential coal resources (concentrated mostly in Kyrgyzstan and Uzbekistan) are 30.5 million tons [65]. Potential oil reserves (1.4 billion tons) and potential gas resources (17.3 trillion m^3) had been located in Turkmenistan and Uzbekistan. Explored reserves represented 40% of the initial potential oil resources, and 34.6% of the natural gas resources. At the end of 1996, Kazakhstan alone had proved oil reserves of 8.0 thousand million tonnes, enough at annual production rates to last 48 years [66]. Proved natural gas reserves total 1.84 trillion cubic feet in Kazakhstan, 2.89 trillion cubic feet in Turkmenistan and 1.89 trillion cubic feet in Uzbekistan [67]. Developed and ready-for-extraction deposits accounted for approximately 53% of the explored coal reserves, 82% of the oil reserves, and 93% of the natural gas reserves [68].

In addition, the first discoveries in the Aral Sea region are estimated to contain 2 billion tons of recoverable oil reserves [69]. Discussions are now underway about the creation of an Aral Petroleum Consortium. While greater certainty exists over the borders between Kazakhstan and Uzbekistan on the Aral Sea, it remains to be seen whether an Aral Consortium could proceed without legal and territorial disputes similar to those in the Caspian Sea. However, the possibility remains that the development of petroleum resources could promote the solution of ecological problems in the Aral Sea Basin through cooperative exploitation and support for regional institutions that manage the Aral Sea Basin.

5.1.2 Hydroelectric resources

The Syr Darya and Amu Darya river basins house a complex system of dams and reservoirs, primarily used for water storage in winter and release for irrigation and power

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production in summer. The World Bank counts more than 80 water reservoirs, 45 hydropower plants and 57 large dams in the Aral Sea Basin [70]. Hydroelectric resources are concentrated in Tajikistan (with the third largest in the former Soviet Union) and Kyrgyzstan. The potential hydroelectric resources of the Amu Darya and Syr Darya total 306 and 162 billion kilowatt hours, respectively. The economic potential of the hydroelectric resources for the entire region is 127 billion kilowatt hours, including 80 billion kilowatt hours in Tajikistan, 37 billion kilowatt hours in Kyrgyzstan, and 10 billion kilowatt hours in Uzbekistan [71].

5.2 Trade in natural resources

Trade in natural resources may provide solutions to water scarcities affecting the entire Aral Sea region. First, it is important to recognize the difference between upstream power generation and downstream irrigation in terms of seasonal demands for water. The peak demand of the upstream riparians in the Aral Sea Basin for power generation is in the cold winter months. However, Tajikistan and Kyrgyzstan generally store runoff from the Pamir mountain glaciers in reservoirs during the summer months to ensure adequate supplies for power generation in the winter. The dry summer months are precisely when downstream riparians have peak demand for agricultural irrigation. This is the crux of conflicting demand patterns that affect the Aral Sea Basin on an annual basis, and the origins of current conflicts over upstream decisions to charge for releases from its reservoirs.

The substantial petroleum and coal reserves in Kazakhstan, Uzbekistan and Turkmenistan could be used to fuel power stations in Kyrgyzstan and Tajikistan. Reduced demand for water to generate hydroelectric power in Tajikistan and Kyrgyzstan could make additional water resources available for agricultural and industrial uses in the other Republics, and for the Aral Sea itself. While this option is now being discussed and tested in a series of annual agreements to trade hydrocarbons and water between Uzbekistan, Kazakhstan and Kyrgyzstan, the parties will undoubtedly encounter further obstacles, including issues related to valuation, compliance and monitoring. Effective dispute resolution mechanisms will be essential to these trade arrangements, as is the case in most regional trade agreements. With these considerations granted, there is definite potential for regional solutions through trade in natural resources.

With the objective of achieving a system for trade in natural resources, the prime ministers of Kazakhstan, Uzbekistan and Kyrgyzstan (with observers from Russia and Tajikistan) met in March 1998 at Bishkek, the capital of Tajikistan. Six documents were signed, including an Agreement to form a consortium on hydro-energy resources. Also, Kazakhstan reaffirmed its intention to barter coal for water supplies from Kyrgyz reservoirs; and Uzbekistan again promised deliveries of natural gas for Kyrgyz water deliveries [72].

6 Conclusion

Legal and institutional mechanisms play an increasingly important role in cooperative efforts to manage transboundary water resources in the Aral Sea Basin. Confidence will grow as further progress is made with the institutional framework and as the parties begin to recognize and adhere to the international legal principles most relevant to

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transboundary water resources including: equitable and reasonable utilization, the obligation not to cause significant harm, sustainable development and joint management through appropriate institutional mechanisms. Future conflicts over natural resource allocation in the region may be avoided through improved communication among national governments and the willingness to seek consultation with other riparians before taking actions that cause harm to others. Other geopolitical considerations, particularly with respect to Afghanistan require further attention.

Trade in natural resources may provide additional options by reducing the competition for limited water resources while addressing the energy needs of all riparians. While the development of hydrocarbon resources in the Aral Sea Basin holds the potential to stimulate local economies, it could also enhance the ability of the Central Asian republics to find regional solutions to the Aral Sea crisis. These solutions have already been conceived, but further progress in the legal and institutional arenas is essential to future success.

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37 1997 draft institutional agreement, ref. 33, arts 2.1, 2.2. Article 2.3 provides that the parties will also consider holding an annual meeting before the beginning of the 'water management year'. This meeting would be attended by the vice-premiers responsible for the agriculture and water sectors, other key ministries and main water users as necessary to facilitate the planning of annual regimes for water allocation, finance and infrastructure development. Article 2.5 provided for other organs such as the Secretariat to participate in the annual meeting without voting rights, and for the Secretariat to invite independent experts and organizations to attend for consultation where appropriate.

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