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Basin-Scale Integrated Water Resources Management in Central Asia

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Integrative Nature of River Basins

River basins tend to integrate the effects of the various systems that operate within them (e.g., physical, economic, political, environmental, and social systems). Sometimes these systems develop in concert with the basin's geographic limits and other times in spite of them. Environment and hydrology/climate do not follow administrative boundaries or laws; they operate on different principles and serve to integrate many of the socio-physical factors across a basin. Conversely, national and local administrative boundaries may not comply with basin boundaries thus conflicting with the integrative nature of the basin. A basin divided into separate administrative or legal regions may produce lower benefits from the use of the basin's natural resources than would be the case if the administrative boundaries were absent. The result is that physical and political factors are often at odds with each other in a basin; and to achieve the benefits of the integrative nature of the basin it is necessary for basin countries to cooperate with one another on a regional level.

When several countries share a river basin, they must address the question of benefits from regional cooperation. This is true in Central Asia where five separate countries now exist in an area that was once part of a single country. Since independence, each country has sought to define itself in the world community of nations relative to sovereignty, trade, defense, territorial integrity, resource endowment, etc. These goals for one country can often be at odds with the goals for neighboring countries, especially when the nations share a river basin or two. For example, infrastructure once shared by all the basin nations may have ended up the property of one of the nations, leading to modifications in previous operating regimes that cause various problems in the basin, e.g., in the Syr Darya basin. The riparian nations must decide if the benefits of cooperative solutions to management outweigh the costs of participation in the solutions.

Sustainable development in a basin can be achieved by making decisions on regional and national water management policy, basin/sub-basin water allocation, and field level water management that take account of the integrative nature of the basin. When water users in the basin are in separate countries, they must solve the problem of allocating water among themselves in order to achieve the goals of cooperative management. Excluding a riparian country from using a fair share of the water of the basin is not in accord with international water law principles. However, defining the fair shares of the basin countries is often a difficult question.

The environment and stakeholder participation are important aspects of both sustainable development and integrative water management. This results from the historic supply-sided approach to water resources development, especially as issues of nonpoint source pollution and devolution of water management authority have come to the forefront in recent years. The need to integrate the planning and management of water resources over greater spatial areas, natural systems and economic sectors has meant that a broader set of issues, players and linkages must be included and considered.

Integrative behavior is not typical of national or foreign policy development. People have worked for centuries to strengthen national social and economic systems only to discover that these systems often operate in opposition to the integrative effects of nature. This situation is nowhere more apparent than in the areas of water and environmental management. Trying to construct new and sustainable management systems requires understanding the various social and governmental policies affected by the integrative nature of basins and the scales over which the policies and the integration are affected.

Policies Affected by Integration

Regional, national, and local scale environmental, social, and economic policies have major impacts on basin-scale water management. The integrative nature of river basins spreads the effects of these policies across the various scales of a basin. This creates a need for cooperative, multi-national solutions to these problems in the case of international river basins.

Environmental Policy – Policies for the protection of human health and the environment and restoration of damaged ecosystems place restrictions on the use of water resources for various activities. A main result of this is to limit the transmission of negative effects from activities in one part of a basin to other locations or the accumulation of the effects over time. Very often, protection of human health or ecosystems in downstream areas means imposing restrictions on discharges or withdrawals upstream. Sustainable development—development that meets the needs of the present without compromising the ability of future generations to meet their own needs—requires that water resources management simultaneously achieve two objectives: sustaining development for security and preserving the associated natural environment. A stable relationship should be maintained between these two objectives now and in the future, while potential conflicts between these objectives should be mitigated through appropriate water management practices.

Social Policy – Many social programs and policies have a direct impact on the use of water in river basins. These programs involve the health, stability, or growth of populations in the basin. The United Nations has said, “The human right to water is indispensable for leading a healthy life in human dignity.” Access to reliable and safe drinking water and sanitation is a key element in programs to ensure sustainable development, especially in rural, agrarian areas. This brings with it increased livelihoods and living standards, and provision of the basic human right to clean water. Two other aspects of social policy that concern water resources and environment are access to information and democratic governance. Civil society needs to have information about the state of the environment and the management of natural resources in order to ensure that government agencies maintain the resource endowment in a sustainable manner. In addition, citizens need to have access to and participation in the process of managing water resources in order that the objectives of management meet the needs of the populations served.

Economic policy – Economic incentives and cost allocation have a major impact on the development and use of water resources in a river basin, both at the national and regional levels. The development of water infrastructure often proceeds from a primarily supply-side approach that projects needs and demands and then develops supply in the least costly way to meet those demands with little consideration given to the efficient use of the water or the recovery of costs

or compensation for damages. Government policies related to food security and agricultural production may have the greatest impact on water resources of all. Government subsidies can distort water use efficiency, especially in the agricultural sector. Often the economic policies of neighboring riparian nations in a basin may be inconsistent and lead to the inability of the countries to assess the costs and benefits of their resource use decisions on other nations. The increasing scarcity of water resources is demanding that we use water in the most efficient and sustainable ways possible.

A framework for achieving sustainable, integrated management of water resources in a basin must recognize the integrative nature of the basin¹. It must include an enabling environment of policies, legislation regulations, and information for water management, well defined institutional roles for all administrative bodies and stakeholders, and management instruments for regulation, monitoring, and enforcement that enable decision-making based on environmental, social, and economic policies.

Scales Affected by Integration

Because of the integrative nature of river basins, water resources management often crosses several scales and may reach from the local to the international level. Ignoring this at one level can lead to externalities and diminished productivity or environmental damage at other scales. This can happen from the basin scale down to the local scale, as in the case of Karakalpakstan in the Aral Sea basin, or from the local scale up to the basin scale, as in the case of Toktogul reservoir management in Kyrgyzstan.

Local Level (rarely the basin scale) – Due to the integrative nature of river basins, actions at the smallest scale in a basin often have affects that are felt throughout the basin. Water management administrative bodies at the local level tend to be local government bodies, water user associations (WUAs), farms, industry, and citizens. Several issues are of critical importance relative to the management of water at the local scale and their effects at larger scales in the basin, including; water use efficiency, agricultural runoff, citizen participation, and access to information.

- **Water Use Efficiency** – The efficiency of water use is a function of the management practices and technology used and the condition of the systems. Assurance of proper financing for operation, maintenance, and replacement prevents wasteful use of water. Capacity-building programs can ensure that water users have adequate knowledge of agricultural and water management practices to use water in an effective manner.

One of the major ways of improving agricultural productivity and providing needed flows to the Aral Sea and other endangered ecological systems in Central Asia is through improved efficiency of water use and conveyance systems. To achieve sustainable water management at the local level, farmers must be empowered to fully operate and maintain local irrigation networks through the establishment of water user associations (WUAs). WUAs regulate the

¹ Global Water partnership, “Integrated Water Resources Management,” TAC Background Paper No. 4, Stockholm, 2000.

relationships of the parties in the process of water delivery and consumption, define the legal rights of members, and provide conditions for administration and use of the water source. A law that can serve as a model for other Central Asian republics as they move to establish improved water management at the on-farm level is the newly approved Kazakh law on “Agricultural Water User's Cooperatives,” which provides the legal framework for the delegation of the local water distribution network and its management to the farmers of Kazakhstan.

- **Agricultural Runoff** – The local or farm level generates drainage water and other agricultural return flows and this is where their management and treatment must begin. Agricultural return flows from both surface runoff and subsurface drainage present a difficult waste management problem at the local level with accompanying effects at larger scales. The generation of the flows is difficult to control and their measurement is extremely complex and expensive; treatment options are problematic due to the magnitude of the generated flows; disposal of the flows also presents difficulties unless evaporative sinks are available. One of the ubiquitous aspects of this problem is its inherent externality; that is, transporting generated flows downstream to areas no longer affecting the generator. However, due to the integrative nature of river basins, downstream areas may become greatly affected and suffer huge losses in terms of agricultural production or health effects.
- **Citizen Participation** – Often, the rights of citizens to enjoy good environmental quality lack definition. These rights can include access to clean drinking water and sanitation, access to information about water and environmental management, and access to the governance process for the management of these resources. Giving citizens the right to bring lawsuits for damage to human health and property from environmental causes has become a hallmark of environmental protection in many parts of the world. This is very important since it gives citizens a powerful lever in forming national and local water and environmental policy, given a competent legal system. Informing citizens of their opportunities to participate in the system of governance is an important role of non-governmental organizations (NGOs). NGOs take on various roles in this regard, including education campaigns, assistance to government ministries in forming policy, legislation, and regulations, independent assessment of environmental and water resources conditions, and preparing legal actions in the event of a threat to human health or the environment and no government action has been taken to correct the situation. In Central Asia, the first of these activities is well developed, but the others are less apparent. However, the recent establishment of the Central Asia Regional Environmental Center (CAREC) has helped to bring about realization of the other activities on the local, national, and regional levels.
- **Access to Information** – The participation of citizens in the formation of environmental policy requires access to good (accurate and timely) information about the state of the environment. Citizens should have the right to know what water quality standards exist for, say, potable, industrial and irrigation water and the concentration of certain elements at particular times. They should also have access to the results of government sampling campaigns carried out on a regular basis. When the information is available to citizens about the real state of the environment, then they can express public opinion regarding various environmental protection measures. In Central Asia, there tend to be barriers to this type of

participatory process. Again, the establishment of the CAREC has helped to initiate the development of and access to data about the Central Asian environment at all levels.

National Level (often not the basin scale) – Water management policies and actions enacted at the national level affect the allocation of resources within countries and a nation's interactions with its neighbors in transboundary river basins. The distribution of water to users, the economic incentives for efficient resources use, and protection of human health and the environment stem from the governing laws of each basin country. These policies act to integrate water management effects over the national area within a river basin.

- **Legal Basis** - A sound system of water rights is necessary for the efficient utilization of water resources. Whether vested with individual citizens or with the government, water rights are essentially a bundle of entitlements defining the rights, privileges, and limitations for the use of water. These rights must be well defined and exclusive to the owner; they should specify the quantity of water that may be diverted and consumed, and the place and timing of the water delivery. Changes in any of these characteristics will likely affect other water users in the basin or system.

Many countries do not have well-developed systems of water rights (or even permitting), resulting in inefficient use of water and uncertainty in continued access to the resource. In Central Asia, existing legislation is only beginning to take into account the emergence of private water users in the transition economies of these countries. The transition process and the establishment of different types of ownership changes public attitudes toward natural resources in general and toward water resources in particular. Market relationships can provide a favorable basis for the rational use of water resources. The state's role in this regard, typically as the owner of water resources, is to implement economic incentives to encourage water users to protect and consume water rationally. As a result, each water user has an interest in observing the requirements determined by legislation.

Most Central Asian water law provides for agricultural water use on a contract basis, often free of cost or at extremely modest fees. Often, water management authorities set annual water delivery amounts according to their own purposes and programs and do not coordinate this with water users. This practice leads to inefficient and wasteful delivery and use of water. If not done on an economic basis, at a very minimum, water rights should be given and deliveries made for a certain amount of water depending on the area to be irrigated, considering the biological requirements of crops, and the highest effectiveness achievable by water users.

- **Economic Policy** – The economic policy of a country regarding water management relates to the access of producers to real prices for inputs and outputs in the market. Often producers do not face the real price of outputs; sometimes their prices are too high because of government subsidies; or, as in the case of many Central Asian countries, the price may be artificially low because of a government quota and marketing program. Inputs are also subject to subsidies in many cases. These distorted prices affect production decisions and they induce an excessive use of water. State orders (quotas) and central planning systems in Uzbekistan and Turkmenistan severely constrain individual production and can be damaging

to the environment. Farms are required to produce specific quantities of crops at prices much below the international market level. This taxes away a large portion of the income needed for investment in farming operations. At the same time, governments are not making adequate investments in operation and maintenance of the irrigation and drainage infrastructure.

In the absence of economic mechanisms and the presence of failing physical infrastructure, water tends to flow according to hydraulic rather than economic principles. Proper measurement and control of irrigation water deliveries, minimization of canal leakage through lining and proper operation and maintenance (O&M) are primary means of preventing continued wastage of water and degradation of drinking water supplies in agricultural areas. Adequate O&M funding is unavailable in all of the Central Asian countries, with typically about 20% of the funds available to implement plans. National level investments are necessary for many facilities, as well as local level control over the financing investments in inter-farm and on-farm infrastructure.

- **Environmental Policy** – National level environmental policy is the backbone of protecting human health and ecosystems. National government usually has the authority and resources to develop, implement, monitor, and enforce environmental laws and regulations; the local level often assists in this, but is unable to take the leading role, and regional bodies often lack authority to undertake enforcement actions. National level legislation provides the enabling environment for citizen and NGO participation in environmental protection.

Regional Level (often the basin scale) – The regional level is where decisions regarding the allocation of shared resources between countries, joint protection of the common environment, and sustainable development of the region are made. In transboundary river basins, water management is a large factor in these issues and it acts to integrate their effects over the entire river basin. National level laws and regulations are not directly applicable at this level; the cooperation of nations and the management of water depend on negotiated agreements.

- **Legal Basis** – Water management in a basin that encompasses several countries is very different from a basin wholly contained within one country. There are no governing regulations or any administrative body for regulating the behavior of riparian nations in a basin. As such, transboundary water management has evolved from a combination of traditions, common practice, and international guidelines. International framework agreements between riparian countries can facilitate the management water in transboundary river basins. These agreements serve to limit the sovereignty of each country in various ways in order to increase the benefits that the countries receive from use of the waters or through linkages to other economic sectors, social programs, or environmental protection. The framework conventions of the UN Economic Commission for Europe (UNECE) “Convention on the Protection and Use of Transboundary Water Courses and International Lakes” (Helsinki, 1992) and the UN “Convention on the Law of Non-navigational Uses of International Watercourses” (1997) contain the main tenets of contemporary international water law. The primary, and well-known, principles guiding these documents are:

- **Precautionary principle** – prevent, control, and reduce pollution of waters causing or likely to cause transboundary impact. This principle affects economic and environmental policies of the region and each nation in the basin;
- **Polluter-pays principle** – costs of pollution prevention, control and reduction measures are borne by the polluter. This principle affects economic and environmental policies of the region and each nation in the basin;
- **Joint monitoring and information exchange** – implement joint monitoring programs concerning water quality and quantity. Exchange of information on the condition of the watercourse, in particular that of a hydrological, meteorological, hydrogeological and ecological nature and related to water quality. This principle assists the democratic governance process in the region and within each country of the basin;
- **Consultation** – exchange information and consult each other and, if necessary, negotiate on the possible effects of planned measures. This principle affects economic policy and environmental protection of the region and each basin country; and
- **Equitable and Reasonable Utilization and Participation** – utilize the watercourse in an equitable and reasonable manner and cooperate in its protection and development. This principle affects economic policy of each basin country.

These principles point out the essential, integrative nature of a river basin when it is shared by two or more countries. Collectively, these principles call for the joint management and protection of the shared resources. They point out the nature of problems in dealing with transboundary water resources, namely, that natural factors play a large role, social and economic development are significant factors, historical (and potential future) use of the resource is important, and users can have significant impacts on other users in the basin, both in terms of quantity of water available and environmental quality. One thing to note is that they do not necessarily dictate what any one country should do within its own borders (outside of the equitable and reasonable nature of the use), but that it should be concerned about the impact of those activities beyond its borders.

- **Environmental Policy** – Protection of the environment at the regional (multi-country) level is similar to water management, it requires the negotiated agreement of the nations involved. Countries must have clear national environmental quality goals and objectives and understand how activities in neighboring countries affect those goals. In Central Asia, the recent development of a Regional Environmental Action Plan is a major step in this direction. One of the most severe regional environmental problems in the Aral Sea basin is water quality, a major water management problem.
- **Sustainable Development** – Regional economic development and the protection of natural resources depends on agreed goals and effective regional management institutions. These institutions should enjoy political support from the highest level of the countries involved. The economic policies enacted by individual nations should be reconciled with those of

neighboring countries in order to avoid externalities leading to conflict and to gain the advantages of cooperative efforts.

International Level – To achieve agreed regional goals it is often necessary for countries to receive technical and financial assistance from the international community’s donor agencies and other bilateral agencies. Donors have a major role here and their coordinated action is of utmost importance in achieving the goals that have been set by the countries. Donor involvement in support of integrated water management in the Aral Sea basin has been ongoing for the past decade. Several important milestones in achieving regional cooperation and attracting international support for solving Central Asian water problems include: (i) creating the Interstate Coordinating Water Commission (ICWC) in 1992 and the Interstate Fund for the Aral Sea (IFAS) in 1993; (ii) presenting the Aral Sea Basin Program (ASBP) to the donor community in 1994 at Paris as an integrated water and environmental management program; and (iii) signing the Syr Darya water and energy resources framework agreement in 1998.

A decade of work on the Aral Sea basin problems has resulted in some tangible, on-the-ground infrastructure and capacity, and a large body of technical information related to the problems of water management in the basin. After the initial phase of the ASBP, up to about 1996, there was a gradual diminishment of the formal coordination of donor activities. Following that, and up to the present time, donor coordination has diminished even further. The result has been a lack of dissemination of results of activities, lack of beneficiary understanding of the scope and nature of donor involvement, duplication of efforts in some cases, and poor leveraging of donor resources. Given all of the prior work and the number of donors interested in providing assistance in the Aral Sea basin, recently, there has been a renewed interest in stronger donor interaction and coordination. The need to have some sort of agreed “roadmap” of donor involvement in the Aral Sea basin problems has become evident.

Basin-Scale Integrated Water Management in Central Asia

Improving integrated water resource management at the basin scale in Central Asia depends on the resolution of regional level as well as national level issues.

National Level Issues

Due to the integrative nature of transboundary basins, many national level issues in Central Asia affect integrated water management at the basin level.

- **Kazakhstan** – Receiving most of its water resources from outside the country, Kazakhstan recognizes transboundary rivers as a security problem, thus motivating the country to seek international agreements on shared waters. Kazakhstan has a large agricultural sector dependent on an adequate supply of irrigation water. Upstream water use tradeoffs between energy and irrigation often complicate the delivery of this water resulting in water shortages during growing seasons and flooding of lowland areas in winter seasons. Being a downstream country, Kazakhstan, like Turkmenistan, also experiences difficult water quality problems resulting from agricultural return flows discharged by mid-stream irrigation water use.

Believing that common positions and mutual interests can provide regional stability, Kazakh officials have suggested the development of a new regional water strategy for Central Asian. This new framework would embody standards of international water law, use an ecosystem approach, minimize limitations on riparian countries, and account for common interests in water resources development, use, and protection of each country. The water strategy would address water needs in the lower reaches of Central Asian rivers, balancing water use between irrigation and energy production, and recycling return flows from agriculture.

The 1998 Syr Darya agreement places certain obligations on Kazakhstan in order for it to receive irrigation water under the agreement. In particular, Kazakhstan must accept surplus summer electricity and, in return, Kazakh coal must be supplied to Kyrgyzstan in the wintertime. Accepting Kyrgyz electricity in the summertime, when demand is low, requires restructuring the Kazakh national power distribution system and shutting down some thermal power stations in South Kazakhstan. Kazakhstan pays more for the summer electricity than its own generating cost, indicating an imputed value for the irrigation water deliveries. Coordination between the agriculture and energy sectors has caused difficulty in securing coal deliveries in many years.

- **Kyrgyzstan** – No transboundary water enters Kyrgyzstan from any source and a major portion of the Aral Sea basin runoff is formed within the country. The Central Asian countries have agreed to honor the Soviet-era water allocation scheme for the Syr Darya until a new one is developed and approved. Kyrgyzstan would like to expand its agricultural sector and needs additional water to do so and thus may be constrained by the current water allocation.

The Kyrgyz energy sector depends on power generation from the Naryn cascade to satisfy a major portion of the domestic demand. The continued use of Toktogul reservoir in an energy generation mode seems inevitable without new generating facilities or capacity at thermal power stations. As recent experience has shown, providing energy and irrigation releases results in large fluctuations of accumulated storage in Toktogul reservoir. Continuing this practice in the face of hydrologic fluctuations may destabilize both the energy and the irrigation sectors of Uzbekistan and Kazakhstan. Several proposals for the solution of this problem are being explored, including electricity loss reduction in country, construction of new hydropower generation facilities (Kambarata dams), and the expansion of thermal power capacity.

- **Tajikistan** – Tajikistan is experiencing rapid population growth which is a major factor affecting its economic development and water management policy. Achieving food security is a policy objective for the country, which will require increased agricultural productivity through increased irrigation efficiency and expansion of irrigated lands. Tajikistan, like Kyrgyzstan, may find current water allocations in the Aral Sea basin to be a constraint to future development.
- **Turkmenistan** – Collection and disposal of agricultural runoff is a major water quality problem for Turkmenistan affecting health and reducing agricultural productivity in both

Uzbekistan and Turkmenistan. Turkmenistan receives transboundary flows at several locations, including source water from the Amu Darya and drainage water from the Khorezm region of Uzbekistan. There is great concern about the quality of these waters, especially the drainage since it is a large volume and heavily polluted. Currently, Turkmenistan assumes responsibility for the disposal of the drainage waters originating in Uzbekistan and it exacerbates drinking water pollution problems in the Dashoguz region. In order to prevent increased environmental damage from transboundary drainage flows, Turkmenistan has proposed the development of a Transboundary Water Quality Agreement for the Amu Darya basin. There are no existing agreements on transboundary water quality in Central Asia.

- **Uzbekistan** – Transboundary sources make up the bulk of the water resources available to Uzbekistan, making integrated water management at the basin-scale an important national issue. Major concerns include development and compliance with international agreements between the riparian countries of the basins, transboundary reservoir operating regimes, improved effectiveness of the ICWC, and improved and expanded information systems for water management, especially for water quality of transboundary sources.

Regional Issues

- **Financing and functions of Regional Institutions** – The 1992 ICWC agreement may not reflect current conditions characterized by a severe lack of financing for water infrastructure, and varying rates at which the countries are making the transition to market economies. The main regional water and energy institutions, ICWC (and associated BVOs) and the Unified Energy Dispatch Center (UDC Energyia), have limited capacity and function according to principles which are sometimes contradictory. These organizations have, in principle, the status of interstate organizations, yet they do not rotate management staff or hire specialists from other republics. According to the foundation documents of the basin management organizations (BVOs), all main structures for controlling transboundary waters should be transferred to the temporary (but long-term) control of the BVOs. However, the only structures currently under BVO control are the main structures in Uzbekistan. This creates uncertainty as to the role of the BVOs in managing the region's water resources. At present, they are not operational organizations controlling the critical structures in the basins. If the ICWC member countries truly intend for the BVOs to be operational management organizations, then the main structures outside of Uzbekistan should be transferred under their control. On the other hand, if they are planning organizations monitoring system functioning and preparing operational plans, then the structures currently under BVO control in Uzbekistan should be transferred back to Uzbek control.
- **Water Allocation** – The present method of water allocation to Aral Sea basin countries, based on Soviet era rules, may not take into account the emerging priorities of the now independent republics. Kyrgyzstan and Tajikistan often claim that the old water allocation rules limit the development of irrigation on their lands. Downstream countries note that poor water quality in the middle and lower reaches of the basins reduces agricultural production and damages public health. In addition, growing water demands of Afghanistan may cause new stress on the system of water allocation.

- **Water Quality Monitoring and Control** – A comprehensive assessment of water quality problems in Central Asia is needed. One of the major problems in this area is the disposal of agricultural return flows. The quality and disposal of return flows having transboundary impacts are not strictly controlled or under the jurisdiction of appropriate government agencies. Adequate and up-to-date equipment for acquisition and processing of water quantity and quality data in the main river basins are still lacking. Agreement on what water quality standards may be appropriate at interstate borders given the various uses of water have yet to be established. Alternative mechanisms to achieve different water quality standards have yet to be explored.
- **Syr Darya Framework Agreement** – The 1998 Syr Darya agreement has achieved a modest success in relieving the tensions over water and energy use in the basin. Probably the most important thing that has resulted from the signing of this agreement by the four Prime Ministers was the show of support for cooperative management of the basin's resources. This has provided impetus for the parties to conduct difficult and serious negotiations each year since 1998. However, there are issues which make the implementation of the agreement difficult.

There needs to be a mechanism to reflect dry and wet year hydrologic conditions in the compensation between countries. Kyrgyzstan suffers from a lack of longer-term assurance of compensation by downstream countries. The 1998 agreement specifies the transfer to Kazakhstan and Uzbekistan of surplus electricity generated by growing season releases, and compensation for storage in the reservoirs in amounts of fuel equivalent to this surplus energy. In recent wet years, the downstream countries have called for below average releases during the growing season resulting in reduced surplus electricity transfers and deliveries of fuel to Kyrgyzstan the following winter season. On the other hand, in dry years, downstream countries called for above average growing season releases, resulting in additional surplus electricity transfers accompanied, one might hope, by increased deliveries of fuels in the winter. Additional dry year electricity transfers should result in credit for fuels during wet years. Conceptually, this would be equivalent to placing a value on the service of storing water accumulated in the reservoirs during wet years. This would provide a longer-term horizon over which the compensation mechanism would function.

- **Kambarata Dams** – Kyrgyz winter energy demand exceeds the fuel equivalent of the surplus summer electricity resulting from Toktogul irrigation releases. Negotiating higher winter fuel deliveries in exchange for the irrigation releases seems out of the question. New energy generation capacity could supply this energy to Kyrgyz customers in the winter. Several organizations are considering the economic feasibility of two Soviet-designed dams, Kambarata I and II, which would be located upstream of Toktogul reservoir in Kyrgyzstan. These new dams would generate about 5,200 GWh with about 1,500 GWh of that in the wintertime to cover the Kyrgyz energy deficit. Given the expected cost of the projects (about one billion USD), Kyrgyzstan and Kazakhstan are considering the formation of a consortium to jointly develop the projects. The projects would result in cheap summertime electricity which the consortium partners would try to market to third parties. In addition, there would be other benefits, i.e., electricity generated by wintertime Kambarata releases would replace

the current Toktogul winter generation and the water would be captured and stored in Toktogul for summer release.

- **Monitoring and Information Exchange** – The collection and processing of hydrometeorological information and forecasts in Central Asia has been very limited in recent years. Addressing the problem of regional exchange of this information between national services is critical to the integrated management of water and energy resources in the Aral Sea basin. In recent years, the upper catchment hydrometeorological observation network has fallen into almost complete disrepair. Water quantity and quality measurements are performed infrequently, resulting in a low degree of reliability. Some work on this issue has been completed, including rehabilitation and installation of gauging stations and means of radio communication to the national and regional agencies. However, additional attention should be given to operating methods, communications systems, and data base creation and management for these purposes.

Policy Recommendations

Some comments, questions, and suggestions on achieving improvements in integrative water management at the basin scale in Central Asia are made below.

- **NGO Participation** – Nongovernmental stakeholders are not active participants in Central Asian water management at the present time. The way that they might participate is through the public awareness and information exchange activities. In addition they bring a lot of local community opinion to the national debate on water policy.

The Central Asian water management officials have, for the most part, a negative reaction to the participation of NGOs in this sphere. Part of this comes from recognition that many NGOs take a very proactive approach and promote many ideas for rapid change that are very threatening to the water management structures of Central Asia. It will take time and patience on the part of both the NGOs and the water management officials to develop a complimentary, rather than antagonistic, relationship with one another. There are now some identified NGOs that do not “rock the boat” that are accepted by the water management officials as participants in some activities. In the future it will be necessary to determine how these NGOs really operate and how to make this a more participatory effort.

In addition to the rather passive “public awareness” approach, it would be useful to consider key water management stakeholders both geographically (mountains to the Sea) and topically. This would certainly include: water user associations (or at least key collectives) along the entire system of rivers; those involved with fisheries (e.g., Arnasai, reservoirs, and deltas); those providing river-based transport; those living in the areas subject to flooding due to alternative management regimes (including new dam construction); industrial water users; municipal water users; and environmental groups working on aquatic ecosystems conservation, river pollution, and other issues. The Central Asian Regional Environmental Center (CAREC) exists in part to help bring such interests into the dialogue on regional natural resources and environmental management matters, so they are a possible institutional partner.

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

Improved or appropriate technology is important in achieving increased water use efficiency and agricultural production. However, it may not address or promote regional cooperation, i.e., by and large, a drop saved is another drop for expanding a nation's agricultural production, not for the Aral Sea. In some cases, however, opportunities for efficiency improvements can significantly and positively improve the economic benefits from national participation in regional approaches to water resources management.

- **Gaps in Policy and Legislation** – Regional water policy in Central Asia may not satisfy many commonly held principles of international water law. Some of the Central Asian states (Kazakhstan, Kyrgyzstan and Tajikistan) have expressed a strong desire to develop new agreements that satisfy these international concepts. These countries have even drafted a concept paper defining a strategy to serve as the basis of a new water and energy convention. However, there is still reluctance on the part of the major water using countries, Turkmenistan and Uzbekistan, to enter into discussions on this issue. One of the major hurdles in achieving regional cooperation in shared water resources in Central Asia is attracting the attention of these countries to the ideas of international water law. Another issue is lack of coordination in national water policies and legislation across the region. While the principal of sovereignty over national law must be upheld, there is no reason why the benefits from synchronization and the costs of inconsistencies cannot be reaped.
- **Financing Water Management Projects** – Some projects have been proposed that might be considered for joint financing by the governments of Central Asia in the area of regional water management. Most prominent of these projects is the development of the Kambarata dams. However, Kyrgyzstan is not in a position to finance this project alone and an international consortium of Central Asian countries is being considered for the joint financing of the project. Kazakhstan has expressed interest in participating if the conditions are favorable. By joining the consortium, Kazakhstan would change its water management position from being the most downstream country in the basin to a position in the uppermost part of the basin and be able to exert some control over the water management decisions in that part of the basin.

Kyrgyzstan and Kazakhstan are both interested in attracting Uzbekistan into the Kambarata consortium. However, the direct benefit to Uzbekistan of joining the consortium is not as clear as that of Kazakhstan. Uzbekistan has not expressed much interest in joining such a

consortium. However, Uzbekistan would be very concerned to see its neighbors consorting with each other and gaining additional control over the basin's waters without Uzbekistan reserving a place for its own interests in these matters.

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

- **Afghan Reconstruction and the Amu Darya Basin** – Uzbekistan and Turkmenistan need to consider the effect of the reconstruction and recovery of Afghanistan on the Amu Darya water sector. This should be done soon, before the stress of additional Afghan diversions of Amu Darya water becomes felt in the downstream regions of Uzbekistan and Turkmenistan. There should be a study of the Afghanistan situation that gets delivered to the Presidents of Uzbekistan and Turkmenistan. This might convince the Presidents that this problem is serious and should be dealt with before pressure from Afghanistan increases. Alternatively some mechanism could be devised to bring all four riparians together from the start.

Conclusions

Basin-scale, integrated water resources management in Central Asia is evolving. Many important issues have been tackled. However, others remain to be dealt with in the future in order to reap the benefits of regional cooperation in managing the shared water resources of this region.

High Level Political Commitment

The capacity for shared water management exists in Central Asia, however, at this time it is not as effective as it could be. High level political will is needed to achieve this, and that will seem to be lacking in Central Asia now. Government officials from Turkmenistan and Uzbekistan often cite a desire to handle water management and other regional issues through the development of strictly bilateral arrangements and agreements. There is a need for a consensus at the highest level in Central Asia that regional cooperation can lead to increased benefits, stability and security for the countries.

Integrated Water Management is Multisectoral

Energy and agriculture sector policies have a large impact on water management in Central Asia. Currently, there is no mechanism to coordinate or manage this inter-sectoral problem within most of the countries, let alone at the regional level. A new paradigm for integrated water management at the basin scale in Central Asia is needed. Water sector managers can not solve the problems of regional cooperation alone and there needs to be a multisectoral approach. The Prime Ministers or the Presidents need to motivate this approach or the various concerned sectors will not participate. Regional development assistance could demonstrate the mutual economic benefits to be derived from a multi-sectoral approach to regional cooperation in water resources management.

No new agreements on water or energy have reached the Prime Ministers for signature since 1998 and none are under development now. Since it is a uni-sectoral, technical body, the ICWC is not the right forum to achieve this sort of government-to-government interaction, it must be on a higher level and it must be multi-sectoral. International donor agencies could try to promote consensus at the Prime Ministerial or Presidential level on principles of regional cooperation. In the Syr Darya basin, Kazakhstan, Kyrgyzstan and Tajikistan already understand this, only Uzbekistan remains to be convinced. In the Amu Darya basin, the Afghanistan situation may convince Turkmenistan and Uzbekistan that this is a serious problem that must be dealt with soon.

In the Aral Sea basin, multisectoral aspects of water management play a major role that is often overlooked. The tradeoffs between water use for energy production and irrigation have been prominent issues in the past few years. However, the effect of agricultural policy on water use and management has a major influence on the environment and the health of ecosystems in the basins. These multisectoral effects may be more difficult to isolate and identify than those of the water – energy problems. Past attempts to develop solutions to these problems by involving only the water management sector in Central Asia have not been fruitful. Only those efforts which took a multisectoral approach to the problems have had any measure of success. However, it should be pointed out that these efforts were often controversial and met with stubborn resistance by officials of the water sector. The strategy of discussing agreements only among the water sector management are unlikely to succeed since these managers do not have responsibility for the other sectors nor do they have any mandate to elevate developed agreements to a proper level for approval and signature.

Upstream – Downstream Priorities

Previous water management rules, based on the priority of irrigated agriculture, do not conform to current power generation needs of the upstream countries, Kyrgyzstan and Tajikistan. Attempts to resolve this issue on the basis of interstate energy barter have been moderately successful, but negotiating timely agreements and accounting for varying hydrologic conditions has caused difficulties. Efforts are needed to: (i) prepare annual agreements in a timely manner; (ii) develop multiyear schedules of compensation with minor adjustments for hydrologic fluctuations; (iii) include compensation for storage services as well as flow regulation; and (iv) monetize exchanges between the countries.

Missing Areas in the Dialog

The technical issues of water use and management in Central Asia are well developed and sufficient studies have been carried out that provide a sound technical base for future work on (i) water saving, (ii) efficiency increases, (iii) development of IWRM, (iv) information and decision support systems, and (v) capacity building for regional institutions. Some areas that have not been addressed or fully discussed include:

- **Water quality** – including pollution from point and nonpoint sources and especially transboundary effects. This issue requires a mandate from a high government level before it can be undertaken.
- **Information and data exchange** – Past experience in Central Asia has made the governments and donor agencies wary of the creation of regional data bases. What is needed is a new concept of a distributed data basin, where the raw data stays in the initiating country and reports are sent periodically to the other countries.
- **Agricultural policy** – and its effect on national economies, water use, and environmental effects. Food security measures implemented by some of the Central Asian states have had large economic impacts that have not been studied. This is primarily a national issue, but it does have regional impacts.
- **Water allocation** – has been identified by several of the Central Asian countries as an important issue, but Uzbekistan and Turkmenistan are reluctant to discuss this issue for fear of disrupting existing patterns of water use in their agricultural sectors. This issue requires a mandate from a high government level before it can be undertaken.