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International Perspectives on  
Managing Water Resources of  
the Aral Sea Basin  
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ENVIRONMENTAL POLICY AND TECHNOLOGY PROJECT  
Central Asian Republics Regional Office

ПРОЕКТ ПО ПРИРОДООХРАННОЙ ПОЛИТИКЕ И ТЕХНОЛОГИИ  
Региональный офис республик Средней Азии

ENVIRONMENTAL POLICY AND  
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Под руководством CH2M HILL

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June 12, 1997  
Date

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## Section 1

# Introduction

The Republics of Central Asia face a crisis in water sharing and usage as they seek to resolve issues related to the Aral Sea crisis during a time of transition to market economies. The use of economic incentives is viewed by the international community as showing promise for resolving the complex environmental and resource sharing problems facing the transitioning economies.

Water pricing is the centerpiece of the United States Agency for International Development's (USAID) assistance to Central Asia in resolving water sharing and water use problems. Although the republics have limited experience in the use of such economic instruments, they are receptive to their introduction. USAID's Environmental Policy and Technology Project (EPT) has been conducting an intensive effort over the last two years to assist the republics in adopting water pricing at the national level and in negotiating compensation arrangements in the context of international energy and water exchanges. The focus of this report is on December 1996 efforts to assist the republics in gaining a greater understanding of international water sharing treaties, international cost allocation for multi-purpose facilities serving more than one republic, and institutional arrangements for administration on international treaties.

Over the last two years, USAID has assisted the Central Asian Republics in gaining an understanding of the problems they face and how to solve those problems, using models based on international experience. Most recently, USAID presented overviews of international treaties dealing with water sharing and water quality to two groups: 1) the Sustainable Development Commission of the Interstate Council for the Problems of the Aral Sea (December 10-12, 1996); and, 2) the Energy and Water Uses Roundtable of the Syr Darya Basin (December 18-20, 1996). Both groups have expressed strong interest in obtaining information on world experience in the management of large and complex transboundary river systems. However, the primary focus of the effort undertaken in this consultancy was to assist the Energy and Water group with the development of a multi-year agreement on the Toktogul reservoir, the primary hydropower and irrigation storage facility of the region.

## Section 2

# Background

### 2.1 Overview of International River Management Schemes and Their Application to Central Asia

Under the former Soviet regime, water allocation schedules of the Amu and Syr Daryas were developed to promote intensification of cotton production. The last agreement concerning water use of these two rivers was completed prior to the collapse of the Soviet Union, in 1983. The basic premise behind this agreement was the development of an interbasin transfer from Siberian waterways, to cure the ills complicated by cotton production in the Aral Sea

Basin. In 1992, the heads of state agreed to continue this scheme until further agreements could be completed. The agreements continued under the assumption that irrigation was the primary use of the region's waters, and no consideration was given to other uses, especially hydropower. At present, although the allocation schemes for water deliveries to each country are continued, there has been no reason to consider the seasonal basis for water releases that take into account the need to generate wintertime hydropower in lieu of summertime crop production. It is clear from the ongoing debate of this issue that an agreement with respect to water allocations must be associated with some form of money or in-kind exchange to avert severe displacements to irrigation and, eventually, to hydropower production.

To assist the republics in gaining an understanding of world experience with such matters, presentations were made on several international treaties. The primary focus of the presentations and discussion was on the Columbia River treaty between the United States and Canada. The general context of this treaty is the development of upstream storage in Canada to assist the United States in avoiding flooding downstream. In this case, Canada receives compensation from the United States in the form of energy production and shares in the benefits of downstream power production. In calculating the downstream benefits to estimate the basis for water and energy exchanges, Canada is entitled to the expected value of reduced flooding as a result of Canadian storage. Canada is also entitled to one-half of the downstream power benefits resulting from the optimal production of power in the U.S. The basis for this treaty is of interest, particularly in developing rates of compensation for water storage, in the context of the Toktogul reservoir.

International agreements generally have several common elements. They usually form a commission of all member countries that have committees or entities in charge of management. The agreements often specifically allocate cost and uses of project services. They may or may not specify compensation or calculation of compensation. All normally specify a conflict resolution process. It is worthwhile to note that it is rare for a river commission to be established in advance of a treaty negotiation, as is currently the case in Central Asia.

The treaty between the United States and Mexico is of great interest to the Central Asian republics. The issues surrounding the treaty involve extensive upstream development with decreasing outflow and increasing salinity to downstream countries. This treaty appears to be more applicable in relation to resolving water allocations among republics and for providing solutions to salinization, a severe problem in downstream countries.

The treaty on the Senegal River between Mali, Mauritania and Senegal covers storage for irrigation, as well as for drought relief, hydropower, and navigation. It provides a good example of service uses by country and the cost allocation process that could be applied along the major rivers of Central Asia.

The Mekong Treaty between Laos, Vietnam, Thailand, and Kampuchea includes provisions for navigation, hydropower and irrigation. It is a novel approach to administration, embodying a river basin committee created with the power to plan. It owns and manages the structures under its auspices, a unique feature of the treaty.

## 2.2 International Agreements on Water Quality

The problems of water quality degradation in international river basins are becoming more critical. In the Aral Sea Basin, the reduction in streamflow to the sea and the increasing contamination of the waters in both the Syr Darya and Amu Darya have attracted world-wide attention. The international regulation of water quality has a relatively short history. Environmental regulation in developed nations has been addressed only in the last half century. International agreements are similarly "new." However, the experience in other international basins should provide both information and direction to the republics of the Syr Darya and Amu Darya.

Several international treaties dealing with the quality of transboundary waters were presented to two groups of Central Asian environment, water resources, and energy officials. The first case presented was that of the Great Lakes initiative. As a result of the increasing pollution of the five lakes situated between the United States and Canada, the Great Lakes Regional Commission was formed. This Commission was charged with data collection regarding pollution and with recommending actions to reduce or eliminate it. The Commission recommended that pollution from all point sources be reduced by 90 percent, and also suggested specific treatment technologies to be applied. Since the nations party to the agreement were committed to heeding the recommendations, pollution (organics, toxic substances, heavy metals, etc.) has been reduced and the lakes have begun to improve. However, the actual implementation of treatment standards and technology was left to the countries to impose individually.

The second case presented was that of the Colorado River between the United States and Mexico. Water regulation and administration between the two countries is governed by the International Boundary and Waters Commission (IBWC), created in 1884 and fully implemented in the treaty of 1945. In 1961, the Mexican government complained of increasing salinity, due in part to the Welton-Mohawk irrigation project in Arizona. This project was pumping highly saline ground water into the Colorado in order to reduce water-logging on its irrigated land. The two countries agreed to a specified ambient standard for the water flowing into Mexico, based on the salinity levels in the river above the border at the Imperial Dam. The United States has subsequently taken various actions to guarantee specified water quality, including building desalinization plants (which were very expensive and have been used only intermittently), reductions in irrigated land on the Welton-Mohawk project, and other salinity reduction practices in both the upper and lower Colorado River Basins in the U.S.

The third case covered the Tijuana River between Mexico and the U.S. In this case, municipal sewage was being released into the river in Mexico and polluting the beaches in Southern California. The solution was for the U.S. to provide funds for the construction of a municipal water treatment plant for the city of Tijuana.

The fourth case presented was that of the Rio Grande River, also between the U.S. and Mexico. In this case, new industries on the Mexican side of the Rio Grande (the border between the two countries) are releasing toxic wastes and heavy metals into the river's tributaries. The resolution of this problem is still being negotiated between the two countries, again under the auspices of the IBWC.

The fifth case examined was that of the Rhine River, involving Switzerland, France, Germany, Luxembourg, and the Netherlands. The International Commission for the Protection of the Rhine was created in 1950, in recognition of increasing water pollution problems from municipal, industrial, and agricultural sources along the river. After a devastating release of toxic materials in a 1986 fire in Switzerland, the Rhine Action Program was implemented under the auspices of the ICPR. The Commission established ambient water quality standards and recommended treatment practices to be adopted by each riparian state. However, it was left to each individual state to implement these recommendations. Because the states were committed by treaty, implementation of the standards and treatments was undertaken. The river has been substantially cleaned, and the ecology is gradually recovering. However, some of the standards and treatment practices recommended by the Commission have yet to be fully implemented in some countries.

There were several other specific examples presented in which downstream entities (most often cities) paid for water treatment, or purchased water, in order to assure good water quality. The only compensation among countries was found in cases of catastrophic spills, such as the Swiss case.

These international agreements all have certain characteristics in common: the use of a commission or an international organization to collect the necessary data (either itself or from participating countries); to oversee pollution control and recommend both ambient standards and treatment practices to the signatory countries. However, in virtually every case, the implementation of practices (economic or technical) is left to the sovereign states to impose. Only in cases of catastrophic events has compensation been paid between countries, in which cases instruments could not be used. International commissions do not regulate activities in specific countries, which suggests that good-faith agreements and treaties of compliance left to each state involved is the more frequent institutional response to transboundary water quality pollution and control.

The countries of the Aral Sea Basin must agree to water quality management practices for all users (municipal, industrial, and agricultural) as well as instream flow maintenance. There is limited documentation of economic approaches to environmental issues in international settings. This does not mean that the countries should ignore such tools at the international level. Initially, a commission which recommends treatment standards or practices, coupled with ambient standards, may be the most effective short term approach.

### **2.3 Cost Sharing in the Syr Darya Basin**

Cost-sharing for operating river basin water/hydropower systems in the Syr Darya Basin is certain to be an important element of any long-term agreement that may be negotiated. Under the current arrangement for the two major Aral Sea river systems, the Basin Management Organizations (BVO's) carry out planning for annual operating regimes of the regions dams and reservoirs. However, the facilities themselves are owned, operated and funded by the republic on which territory they are located. Cost-sharing among republics for multi-purpose dams and reservoirs serving more than one republic has been successfully negotiated in several international river treaties.

The primary issues related to cost sharing in the successful management of such projects include:

- whether the project benefits exceed project costs;
- how the efficient use of project services is determined;
- who owns the property rights to the water and the services it provides;
- how efficient use of project services is assured; and
- how project costs are reimbursed.

The types of costs generally considered for cost-sharing options include:

- investment costs;
- operation costs;
- maintenance and replacement/rehabilitation costs;
- environmental costs;
- administrative costs; and
- insurance fund costs.

In determining cost shares, it is important to determine whether the costs are separable or joint. Separable costs are those that are attributable to only one entity and are generally borne by that entity. Joint costs are those incurred for the mutual benefit of more than one party.

There are several methods for cost recovery and allocation of joint costs. Cross subsidies are where one group of users pays a portion of another's repayment responsibility. Tariffs on hydropower can be levied to cover the entire cost of a multi-purpose project. Subsidy-free allocation is where the user pays no less than the cost associated with his being included in the project, no more than the cost associated with the least costly alternative way of obtaining service, and no more than the benefits which are derived from participation in the project.

It is clear from the information presented in meetings during 1996 that the cost of operation, maintenance, and rehabilitation of the various facilities in the Syr Darya basin are not necessarily equitably shared. The upstream nations are responsible for these costs, while the major beneficiary under the Soviet system was irrigation in the lower basin republics. There has been no formal recognition of the cost burden on upstream countries, and the 1992 accords do not recognize the rights of upstream countries to the water. A clear understanding of the functions of cost allocation relative to the rights and duties of water users in upstream and downstream countries would be forthcoming with a detailed effort at cost allocation (both intra- and international).

There is also consideration of developing more upstream facilities on the Syr Darya, which would be used to offset the Toktogul releases for hydropower in the winter. There seems to be a general agreement that all three countries should participate in the development of these facilities, although it is unclear as to whether resources are available for such participation.

Should more development occur upstream, there needs to be a firm agreement on cost sharing, both for investment as well as operation and maintenance.

## **2.4 Valuation and Costing of Water**

It is quite clear that the value of water in energy production, especially for agriculture, is not well defined. Optimal allocations of water and/or storage and optimal operations of facilities on these river systems cannot be achieved without (1) a functioning market for the products the system generates, or in the absence of privatization and markets, (2) estimations of the values which water generates.

## **2.5 Institutions and Organizations for Long-term Management of the Syr Darya**

There is a plethora of organizations involved in studying and managing the Syr Darya Basin. Each of these organizations view at least a part of the management of the region as its domain. Clearly, this competition cannot lead to a coordinated operation of the system. Moreover, there is no organization specifically charged with either short- or long-term development of the river basin as a cooperative effort. There is a clear need for the establishment of institutions and organizations with specific lines of responsibility and authority. In addition, it is unclear whether any of these organizations has a "balanced" representation of all the republics of the basin.

### **Section 3 Issues for Central Asia**

- The economic situation in the republics makes compensation and/or alteration of the river management systems extremely painful. For example, the inability of Kazakstan to deliver the agreed-upon coal resources to replace hydropower production in the winter resulted from a lack of funds necessary to purchase those resources. Further, monetary compensation is not a consideration, as the in-kind transfer agreements seem to confirm. Moreover, the ownership and control of resources within the boundary of a given country is a matter of strategic importance, not just in the CAR, but around the world. Thus, there will have to be compromises made by all CAR nations in order to assure an optimal allocation of resources. Further, the lack of markets in these countries, let alone infrastructure, makes trades more difficult and the evaluation of the effects of those trades problematic.
- The economic conditions in each country suggest that operation and maintenance costs alone, not to mention new investments, are likewise problematic, particularly when one country must bear the entire burden for a given facility with no compensation. Further, since true water pricing has not been implemented, users of water and power are not producing revenues sufficient to offset costs. The absence of markets is a notable factor in these problems of water and power pricing. It should also be noted that simply implementing water pricing with no other changes (that is,

no privatization or markets for the products for which the water and power are inputs) is likely to achieve neither water conservation nor sufficient revenues.

- The main constraints in developing international management organizations are (1) the existence of competitive organizations formed either before or since the Soviet collapse, and (2) the problems inherent in relinquishing local control of facilities and finances.

## Section 4 Outlook

- The outlook for negotiated agreements is positive at the moment. Current on-going efforts to develop a long-term agreement on the Syr Darya are evidence of the possibility for negotiated settlements that will leave all parties satisfied.
- The need for cost sharing seems to be understood among the countries, as are the conceptual bases of the cost allocation criteria. However, the constraints mentioned above, plus the self-interest of each country in the short run, are mitigating factors against a cost sharing agreement. Certainly, the development of new facilities will require cost sharing and there is considerable interest in those long-term developments. There is also some uncertainty about the level of cost sharing in the republics. Moreover, the application of cost sharing procedures to in-country developments as a basis for water or power pricing are of considerable interest to all the republics.
- The outlook for creating, or identifying an existing organization, as an overall management institution appears reasonably plausible. However, in order to accomplish such a program, it is likely that all the competing organizations must be either brought into agreement or undergo a required realignment of jurisdictions.

## Section 5 Possible Resolutions

- Clearly, aiding negotiations among the countries is of critical importance. This aid can be comprised of further consultation with outside sources of information; the development of a detailed and clear data base for agricultural production, and for the costs of operating, maintaining and rehabilitating the facilities in the system; and the trade-offs involved in negotiations. In addition, continued support of local and international exchange of ideas and information is essential.
- The need for an analysis of the actual allocations which might be achieved by various kinds of cost sharing approaches is clear. Until the republics understand the actual application of the allocation process *among countries* and the amounts which might be expected, it is not clear that any definitive resolution will be forthcoming. **Thus, a demonstration of cost allocation and sharing among countries may provide both**

**significant information and the impetus for the establishment of cost allocation procedures for both existing facilities (operation and maintenance costs) and for new or planned facilities.**

- During the process of creating an agreement of principles underlying a new comprehensive agreement and of the creation of the agreement itself, consideration of the type and form of an international organization for river management should be emphasized. It is unclear as to whether existing agencies could easily be given this responsibility. It may be more appropriate to incorporate each of these organizations into a general scheme in which some "Oversight Commission" is created.

## **Section 6 Recommendations**

- The organizational structure of a river basin management institution should be made an integral part of the process of developing an international agreement on the basin. This can be done with the aid of outside consultants, who should be used as both resources and as expert advisors in the process.
- Develop a program for cost allocation using alternative approaches suggested in other agreements. Data on the value of water in various crops and crop rotations needs to be collected from secondary sources, and, where unavailable, from primary data collection. The on-farm costs of water use must also be determined. Also, a full estimation of the costs of operation, maintenance, and rehabilitation of all the elements in the system should be either obtained or made. In fact, this must be accomplished in order to achieve a benefit-based (economically efficient and equitable) cost allocation. In this way, further agreement can be reached regarding the maintenance and operation of joint facilities.
- Support data collection and analysis efforts in order to establish clear information on the relative costs and benefits of differing operating regimes. Further, international and CAR exchanges of information, both data and conceptual approaches, should be supported. USAID should consider supporting the current negotiations in terms of both logistic and technical support.

## **Section 7 Findings and Conclusions**

In conclusion, members of both groups of the USAID-sponsored meetings in December 1996 acquired a clear understanding of the methodologies for cost allocation (among countries) and in obtaining detailed knowledge about international treaties and institutions for water management. Given sufficient support, technical aid, and direction sensitive to local economic and political conditions, an agreement will be forthcoming which will provide a foundation for the management of the Syr Darya and Amu Darya Basins, including the Aral Sea.

Next Steps:

- As soon as the general principles of an agreement among the countries can be reached, an aggressive program of data collection, analysis, and information exchange should be undertaken. Requests for further visits to international river basins and for detailed discussion with experts familiar with international agreements and the implementation of management and compensation schemes should be encouraged.
- A program for the realization of a cost allocation program for specific multi-purpose facilities in each of the republics should be developed. After completion of these initial studies, a final examination of cost allocation and sharing for the entire basin, based on the data collected, would be accomplished.
- The process of developing an agreement should be explicitly supported, including both logistics for local meetings, visits to other international agencies by those charged with treaty development, and information exchange with consultants who are familiar with the organizational structures and implementation of international management of river basins.

*Jek1; 6/17/97*