

Lake Basin Management Initiative Experience and Lessons Learned Brief

Aral Sea

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Introduction

This report is prepared as a background document within the ILEC/LakeNet Lake Basin Management Initiative (see more at www.worldlakes.org) supported by the Global Environment Facility, the Government of Japan, U.S. Agency for International Development, Shiga Prefecture Government of Japan, the Netherlands Water Partnership and World Bank Institute. It gives an overview of major environmental and socio-economic challenges that the region is facing, threats to the sustainable management of the Lake Basin, major measures supported by the governments and international donor organizations aimed to address the critical environmental problems in

the Aral Sea Basin, and lessons learned from the environmental cooperation in the Aral Sea area. Given the great territory of the sea basin, a large number and scale of interconnected political, economic, environmental issues and agendas of multiple players and stakeholders in the region, this background report cannot offer a complete picture of the situation in the region and it cannot formulate global recommendations for future actions to be taken. Instead, the focus of the report is on the over-

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all lessons learned and the priority direction for work to promote the regional cooperation and long term environmental improvements in the Aral Sea Basin.

1. General Description of the Region

The Aral Sea is one of the largest inland saltwater bodies in the world. In 1960, with a surface area of more than 67,000 km², the Aral Sea was the world's fourth largest inland water body. The brackish lake with a salinity averaging near 10 g/l (less than a third of salinity of the ocean) was inhabited by mostly freshwater species. The sea supported a major fishery and functioned as a key regional transportation route. The extensive deltas of the Syr Darya and Amu Darya sustained diverse of flora and fauna. They also supported irrigated agriculture, animal husbandry, hunting and trapping, fishing, and harvesting of reeds, which served as fodder for livestock as well as building materials.

The Aral Sea's drainage basin encompasses a total area of 1,549,000 sq. km, of which nearly 590,000 sq. km are arable land (see Appendix 1). The Aral Sea is situated in the center of the Central Asian great deserts (Kara-Kum, Kyzyl-Kum, and Betpakdala) at an altitude of 53 meters above the sea level and functions as a gigantic evaporator. About 60 km³ of water evaporates per year from the sea and its rivers. The Aral Sea size and water balance are fundamentally determined by river inflow and evaporation from its surface. Over the past four decades, this water body has rapidly and steadily shrunk and salinized (see Figure 2 and Table 1 in Appendix 1) as countries in the Aral Sea Basin have increasingly taken inflow from its two influents, the Syr Darya and Amu Darya, for expansion of irrigation.

Amu Darya is the largest river in the region. The river's main catchment area is in Tajikistan, from where it flows along the border between Afghanistan and Uzbekistan, crosses Turkmenistan, flows back into Uzbekistan and finally in the territory of Uzbekistan the river flows into the Aral Sea. In terms of silt content, the Amu Darya clearly ranks first in Central Asia and one of the first in the world. The Syr Darya River ranks second in terms of water flow, even though it is actually the longest river in Central Asia. Its sources are in the Central Tian Shan Mountains. The river is at its fullest in spring and summer, starting in April and reaching its peak in June. Its main catchment area is in Kyrgyzstan, from where the river crosses Uzbekistan and Tajikistan and flows into the Aral Sea in Kazakhstan.

Seven countries share the Aral Sea Basin: Afghanistan, Kazakhstan, Kyrgyz Republic, Tajikistan, Turkmenistan, Uzbekistan and Iran. Up to 25.1% of the entire flow in the Aral Sea basin is formed in Kyrgyzstan, 43.4% in Tajikistan, 9.6% in Uzbekistan, 2.1% in Kazakhstan, 1.2% in Turkmenistan, and 18.6% in Afghanistan and Iran (Diagnostic Analysis, 2002). There is a very small part of the basin located on the territory of Iran. Only Kazakhstan and Uzbekistan are riparian states on the Aral Sea, with each possessing an approximately equal length of shoreline. It should be noted that the interests of Kyrgyzstan, Kazakhstan and Turkmenistan relating to the use of water resources are not restricted only to the Aral Sea area. Kazakhstan's share of irrigated lands within the Aral Sea basin stands at just 35%, while the share of Kyrgyzstan does not exceed 40%. Different countries in the Central Asia region have very different populations, economic interests and activities,

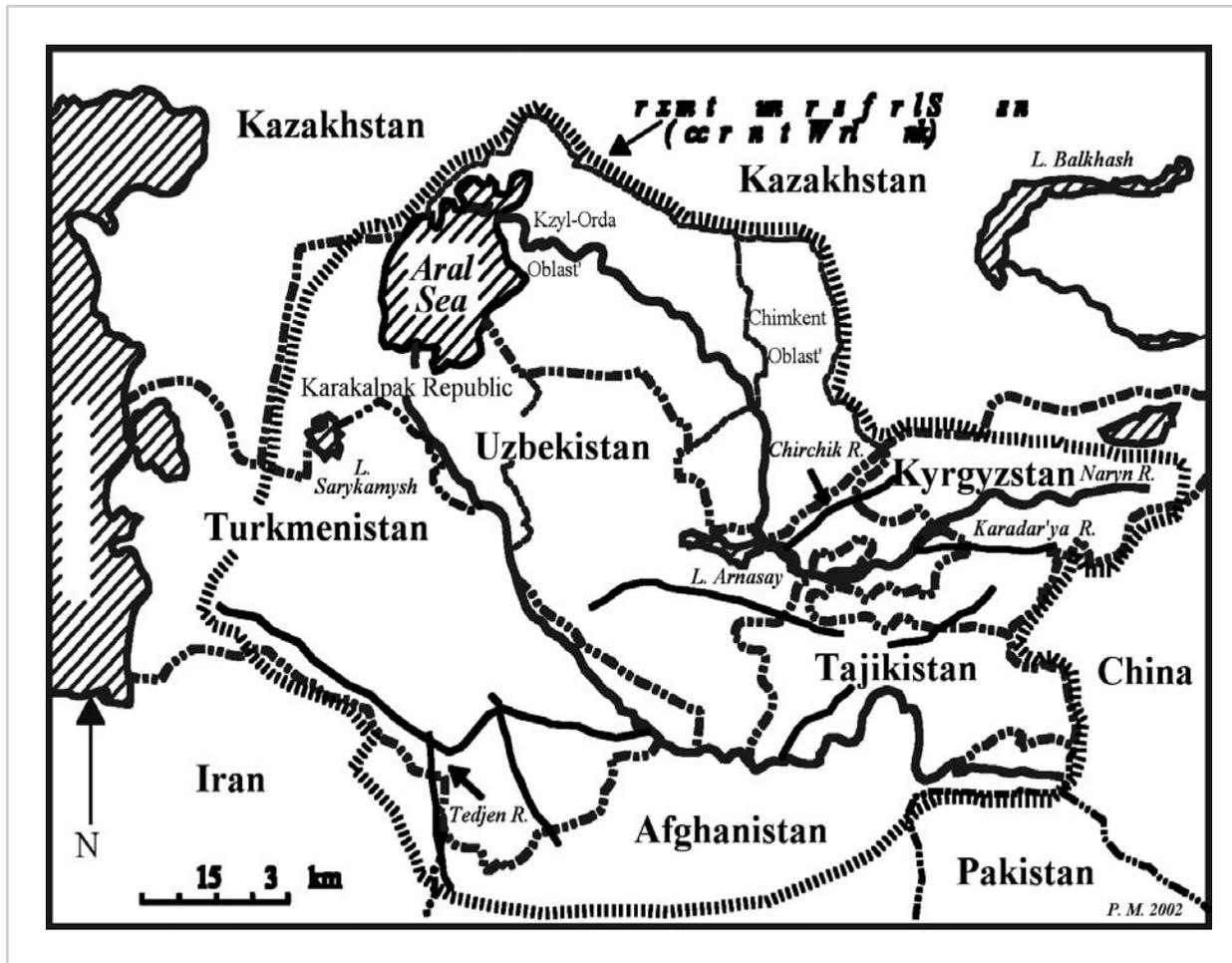


Figure 1. Aral Sea Basin

and exercise different approaches to water management – from a firmly market-oriented approach in Kazakhstan to a full state property of water resources in Turkmenistan.

2. Water Use in the Aral Sea Basin

Water usage, primarily for potable and irrigation, started more than 6,000 years ago. In the 20th century, and especially since 1960, the intensity of water use increased under the pressures of the rapid population growth, industrial development and, most of all, irrigation. Between 1960 and 1990 the water use increased almost 2 fold. Irrigation accounts for 90% of the region's water withdrawal.

In the Syr Darya Basin, water needs of the four republics' conflicting economic priorities of individual countries have led to clashes of interest over water release schedules from the Toktogul Reservoir. Kazakhstan and Uzbekistan have been insisting on giving priority to irrigation, while Kyrgyzstan and partly Tajikistan prefer using water for electric power generation. As a result, since 1993, the Toktogul cascade of reservoirs has been applying schedules that make for a sharp increase in summer storage and water drawdown in winter to suit the needs of the Kyrgyz hydro-

power industry. Since 1994 the water regime in the Syr Darya basin has been the main theme in government talks. To meet Kyrgyz demands for increased supplies of heat-producing energy and the needs of Kazakhstan and Uzbekistan in the summer season, in 1998 a decision was made to define mutual obligations of these countries in fuel and energy exchange. This approach, however, does not account for all the environmental problems in the watershed because releases from the Syr Darya will be falling below minimum discharge levels that have been recorded in the last hundred years of observation. On the other hand, the irrigation and water supply concerns of the downstream countries will only be met if the three upstream states fully comply with the terms of signed agreements on fuel and power supply and the purchases of excess electricity. The slightest non-compliance will undermine sustainable water supply. Actual implementation has revealed that conflicting power and irrigation needs of the four states have hindered the fulfillment of agreed water allocation terms and necessitate further talks.

Up until 1992, the allocation of the Amu Darya waters among the four Central Asian republics was based on the water development master plan for the Amu Darya basin. The allocation plan was approved by resolution 566 of the Science and Technological Council of the USSR Water Management Ministry in 1987. The resolution fixed the following allocation of surface waters (% of projected flow in the main stem of the Amu Darya): Kyrgyzstan, 0.6%; Tajikistan: 15.4%; Turkmenistan, 35.8%; Uzbekistan, 48.2%. The quota principle has survived till now, with Turkmenistan and Uzbekistan getting equal shares of the so-called adjusted run-off measured at the Kerky hydrographic section, including diversion to the Karakum Canal. This provision was reiterated in the bilateral agreement signed by the heads of these two states in Cherdzjev (Turkmenabad) in 1996.

An important issue in discussing the water use in the Aral Sea Basin is its efficiency that is inadequate for all economic sectors, especially irrigation farming. Statistics indicate that principal water losses occur in the on-farm delivery networks and directly in the field. According to WUFMAS (SIC/IWMI, 2002), water losses in these two cases may account for 37% of the total supply to farm contours. On average, about 21% of irrigation supply is wasted directly in the field. Since most losses occur in the field and in deliveries among farms, water user associations, along with charges, may be an effective way of streamlining the use and conservation of water. The next section discusses diverse effects of the desiccation of the Aral Sea.

3. Ecological, Economic, Health Consequences of Aral Sea Desiccation

The four basic problems in water and environmental management of the basin were formulated by the World Bank/Global Environmental Facility Aral Sea Basin Program Project Document (Global Environmental Facility, 1998): environmental degradation, with the increase in land and water salinization; the gradual drying up of the Aral Sea, with huge adverse socio-economic and environmental effects; water management in the basin, with its built-in potential threat to peace in the region; and instruments for interstate cooperation, with the commitment of sovereign states the big challenge. Despite the fact that this list of regional issues was produced in 1998, the same issues of concern remain very relevant today.

Environmental degradation, with the increase in land and water salinization

Salt loads in drainage water from irrigated lands in one state and is fully or partially returned to the rivers and passed to downstream states. The salinization occurred because of the salt mobilization in subsoil triggered by irrigation and drainage practices, salt pick-up in upper watersheds and inadequate disposal of drainage water. Increasing salinization of the land and rivers threatens entire economies and millions of people throughout the basin and results in:

- *Erosion and sedimentation* that in turn threatens the basin water regulation infrastructure. As a result of the increasing soil erosion in upper watersheds due to deforestation and overgrazing of mountain pastures, changes in performance of the basin water regulation infrastructure take place that affects the water allocation and distribution in the basin;
- *Soil contamination*. On all irrigated land in Central Asia pesticides and fertilizers were used to an amount that by far exceeded the norms of the former Soviet Union (Water Related Vision, 2000);
- *Diminishing wetlands and biodiversity*. Desiccation of the deltas has significantly diminished the area of lakes, wetlands, and their associated reed communities; and
- *Environmental problems in mountain areas* where water flow originates, including preservation of glaciers and glacier feed of rivers; sustainability of mountain forests; erosion of mountain slopes, especially as conditioned by the development of irrigation in alpine valleys.

The gradual drying up of the Sea and its adverse socio-economic and environmental effects

As a consequence of the drastically reduced water flow from the rivers into the sea, the Aral separated into two water bodies in the end of 1988 – beginning of 1989 - a Small Aral Sea in the north and a Large Aral Sea in the south. The Syr Darya flows into Small Aral Sea, and the Amu Darya into the Large Aral Sea. Between 1960 and January 2003, the level of the Small Aral fell by 13 meters and the Large Aral by 23 meters. A channel (river) has intermittently connected the two lakes, with the flow from the Small Sea to the Large. The area of both seas taken together diminished by 75 % and the volume by 90%. Salinity in the small sea is estimated to have doubled whereas in the western part of the large sea it has increased by more than 6 fold. The two lakes have evolved in different ways. The Small Aral Sea, located in the North, receives run-off of the Syr Darya River and began to overflow due to positive water balance. The surface area of this lake is small, and evaporation from its surface is less than inflows from the Syr Darya, atmospheric precipitation and ground waters. As for the Large Aral Sea in the south, its water balance is negative, and evaporation from its huge surface is still higher than the small inputs of the Amu Darya River, atmospheric precipitation and ground waters (Aladin, Plotnikov, Potts, 1995). These differences in the hydrological regimes of the two new lakes have led to stabilization of the Small Aral Sea level and the continued desiccation and salinization of the Large Aral Sea.

The mainly human-induced desiccation of the Aral Sea has had severe negative impacts. Striking ecological, social and economic problems have arisen in the Pre-Aral area, including:

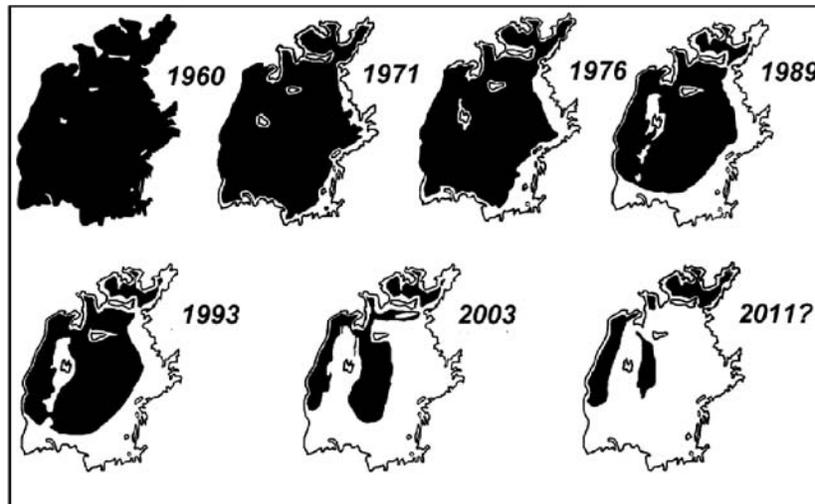


Figure 2. The changing Aral Sea (See Table 1)

- *Desertification.* Greatly reduced river flows through the deltas, the virtual elimination of spring floods in them, due to both the reduced river flow and construction of upstream storage reservoirs, and declining ground water levels, caused by the falling level of the Aral Sea, have led to spreading and intensifying desertification.
- *Dust and salt winds.* One of the results of the sea drying and the desertification is that strong winds blow sand, salt and dust from the dried bottom of the Aral Sea, now largely a barren, salt covered desert with an area near 50,000 km², onto adjacent lands. Estimates of the total deflated material, which were made in the late 1980s, ranged from 13 million to as high as 231 million metric tonnes/year (Glazovskiy, 1990, p. 22). The salt and dust also have ill effects on wild and domestic animals by directly harming them and by reducing their food supply (Palvaniyazov, 1989).
- *Changes in the regional climate.* Owing to the sea's shrinkage, climate has changed in a band up to 100 km wide along the former shoreline in Kazakhstan and Uzbekistan (Micklin, 1991, pp. 52-53; Glazovskiy, 1990, pp. 19-21). Maritime conditions have been replaced by more continental and desertic regimes.
- *Health problems of the population.* The population living in the "ecological disaster zone" suffers acute health problems (Micklin, 1992; Medicins sans Frontieres, 2000). In an interview made by Manchester Guardian Weekly in November 2003 (Brown, 2003) an aid worker who was one of the last to visit the southern Aral region said: "The people are in a terrible state, drinking out of muddy ditches, which is all that remains of a once mighty river. We had a plan to relocate the people but Uzbekistan refused to agree and threw us out. No one has any idea what happened to the people we were trying to help."

Local health experts also consider airborne salt and dust as a factor contributing to high levels of respiratory illnesses and impairments, eye problems, and possibly even throat and esophageal cancer in the near Aral region (Abdirov et. al, 1993; Tursunov, 1989). More recent field work by a British-led group indicates that salt and dust blowing from the dried bottom (and likely from irrigated farmland in regions adjacent to the Aral Sea) is laced with the heavy use of toxic chemicals

(e. g., pesticides and defoliants for cotton) in irrigated agriculture, mainly during the Soviet era. However, the most serious health issues are directly related to 'Third World' medical, health, nutrition and hygienic conditions and practices. Bacterial contamination of drinking water is pervasive and has led to very high rates of typhoid, paratyphoid, viral hepatitis, and dysentery. Tuberculosis is prevalent as is anemia, particularly in pregnant woman. Liver and kidney ailments are widespread; the latter is probably closely related to the excessively high salt content of much of the drinking water. Medical care is very poor, diets lack variety, and adequate sewage systems are rare. Health conditions in the Karakalpak Republic in Uzbekistan, with the possible exception of places in the formerly civil war-torn Tajikistan, are likely the worst in the Aral Sea Basin. Surveys conducted in the mid to late 1980s showed the average infant mortality rate at more than 70/1000 live births whereas several districts adjacent to the former seashore ranged from 80 to over 100/1000 live births (Micklin, 1992). These rates are three to four times the national level in the former USSR and 7-10 times that of the U. S. Although efforts have been made in the post-Soviet period to improve health conditions here, it is doubtful these rates have declined in any substantial way.

Water management in the basin, with its built-in potential of conflicts

Degradation of lands due to the soil salinization and contamination results in the loss of lands that can be used for agriculture. The introduction of cotton monoculture has violated traditional sustainable crop rotation practices using mainly alfalfa and manure, and has exhausted the nutrients of the soil. With yield outputs dropping in the 1970s, the cotton was planted even on private plots where peasants grow their own vegetables and fruits and traditional agriculture was destroyed. Losses in the commercial fisheries, transport routes in the Sea, and in agriculture resulted in poverty in the region.

There are seven countries in the Aral Sea Basin of different sizes, different political orders, and different political and economic interests, including conflicting interests on natural resource use. Because there are conflicting interests between the states in use of scarce water resources, undeveloped institutions for resolving differences in opinions between the states, drastic economic and ecological problems in the region, tensions exist between the different countries. In particular, tensions between Kazakhstan and Uzbekistan (that share the Sea) have increased (Brown, 2003).

The legal basis for the interstate cooperation between the Central Asian states is still in the development process. There is still no interstate agreement for the Aral Sea Basin that addresses responsibilities and cost sharing of operations, maintenance, rehabilitation and modernization of the infrastructure. There is also no interstate agreement for the Aral Sea Basin that would address issues of regulation of the information exchange. This creates some difficulties in coordination of water governance and planning. Draft of such agreement was prepared under WARMAP project in 1999 (SIC, 2002), but still countries have not approved it for operational use.

Interstate cooperation is still emerging; the process of institutionalization of the Aral Sea interstate cooperation is still at its beginning. In the context of the underdeveloped formal system of resolving conflicts of interests, interstate disputes over water allocation between the riparian countries occur every year about seasonal water delivery scheduling since the states feel that the existing agreement on annual water allocation (the agreement is based on central policy consideration of the former Soviet Union) is not consistent with principles of equitable rights and sustainable devel-

opment. The reasons for the disputes are that the water releases for hydropower during winter by the upper riparian states reduce the amount of water available to downstream users for irrigation in summer and water allocated to one country is only partially returned to a transboundary river or the Aral Sea. Even when there are agreements between the countries on the water distribution, for a number of reasons, they are either improperly implemented or not implemented in the required time. Implementation of the signed agreements remains to be a challenge along with the development of the legal and institutional base for the interstate cooperation in the Aral Sea Basin.

4. Available management options to address the consequences of the environmental degradation

Significant improvements in irrigation efficiency in the Aral Sea drainage basin could save considerable water resources that if delivered to the Aral Sea would measurably improve its water balance; however, this would require a massive and very expensive reconstruction of irrigation systems as well as radical social and economic changes in the way the water resources are managed in the region; this is a very unlikely probability for many years to come.

To address the major environmental challenge of the Aral Sea desiccation, the only realistic means for substantially increasing inflow to the Aral is reducing the consumptive use of water for irrigation in the sea's drainage basin. This water intensive activity, conducted on around 7.9 million hectares and the basis of agriculture here, accounts for 92% of withdrawals and an even larger share of consumptive use (Ruziev and Prikhod'ko, 2002;). The largest irrigated area in the basin is found in Uzbekistan, and Turkmenistan; these two nations, respectively, account for 54% and 22% of all irrigation withdrawals (Micklin, 2000, p. 37). It is irrigation that has depleted the flow of the Amu Darya and Syr Darya and led to the great reduction in discharge of these rivers to the Aral as well as the consequent desiccation of the water body with all its attendant negative ramifications.

Irrigation in the Aral Sea basin is inefficient. Substantial improvements to it, technical, economic, and institutional, could save considerable amounts of water. Attempts are underway to implement improvement measures but the substantial and comprehensive program needed would be extremely costly and faces concerted opposition from forces within governments and from segments of the public. Taking costs as an example: complete renovation of irrigation systems on 6 million hectares could likely save 12 km³ a year but would cost at least 16 billion USD (Micklin, 2002). To reach the maximum potential savings of 28 km³ (based on technically, economically, and institutionally reforming irrigation on the «Israeli» model) would cost multiples more. These figures are far beyond the willingness and ability of the basin states, in combination with international donors, to pay. Furthermore, the technical condition of irrigation systems in the basin, far from improving, is steadily deteriorating owing to inadequate funding for, and lack of management responsibility over, operation and maintenance activities.

Switching to less water intensive crops (e. g., from cotton and rice to grains, soybeans, fruits, and vegetables) and reduction of the irrigated area are other means of significantly reducing water usage in irrigation. The former strategy is being employed. Between 1990 and 1998, the area of cotton as a percent of the total irrigated area dropped from 45% to 25% percent while the area of winter wheat rose to 28%. This probably was a major factor in the drop in irrigation withdraw-

als from 109 to 92 km³ (16%) at the same time the irrigated area increased 10%. However, there are limits to such a program as the two primary irrigating nations (Uzbekistan and Turkmenistan) are intent on keeping cotton as a major crop since it plays a key role in earning foreign currency. Reductions in the irrigated area are unlikely in the near to mid-term future. All the former Soviet republics, except Kazakhstan, intend to expand irrigation, mainly to meet food needs for a growing population (Water Vision 2025, UNESCO, 2000).

There are also engineering measures that have been proposed and are already in the implementation stage with the support of the World Bank aimed to revive the Small Aral through constructing a dam and raising water level in the small sea (see below the project short description – see in the sub-section *Experience of international projects*).

It is possible to bring water to the Aral Sea from outside Central Asia. During the latter part of the Soviet period, water managers in Moscow and in Central Asia proposed diversion of massive flow, up to 60 km³, from Siberian rivers to the region as the panacea for perceived water shortage problems. Although real and serious potential ecological threats (of regional, not global magnitude as claimed by some opponents) were given as the chief reason for canceling the project, economic considerations were the fundamental factors in this decision. This grandiose scheme was taken up again in 2003 under the leadership of the Moscow mayor Mr. Luzhkov. It is extremely unlikely that implementation of this project will take place. Costs would be enormous, at least 30 billion USD by latest estimates, and even if Russia were willing to help finance the project, it is doubtful sufficient funds could be accumulated for construction (Temirov, 2003) and there would be a shared agreement on the project from all the relevant authorities of the Central Asian states and international funding organizations.

The studies in the region showed that the ground water contribution to the Large and Small Aral is much bigger than it was considered before and this factor should be taken more seriously into account in the process of developing recommendations for sustainable management of water resources in this region.

Roadmaps to the improvement of the situation in the Aral Sea Basin were developed by the respective governments in cooperation with different agencies and projects (for example, the Global Environmental Facility/the World Bank regional water strategy, UNESCO Water Vision, EU TACIS Aral Sea Programme, the UN ECE and ESCAP Special Programme for the Economies of Central Asia (SPECA) Strategy for use of water resources; and others).

The general recommendations developed by different organizations with regard to addressing the regional and national issues of water use and protection in the Aral Sea basin could be summed up as follows:

- Improvement of the interstate cooperation on integrated water resources management
- Orientation to water saving and increasing of water and land productivity
- Introduction of the basin principle for water governance
- Development of water allocation principles, including economic instruments
- Development of national water use policies taking into account agreed national and regional interests

- Construction and improvement of water delivery infrastructure
- Creation of a joint system for monitoring the status and quality of water resources
- Creation of a joint information system and information exchange
- Strengthening of capacity building activities, including training programs
- Establishment of agreed environmental requirements relating to the protection of aquatic ecosystems
- Establishment of mechanisms for coordination and further development of foreign aid

An important resource in addressing environmental challenges in the region is more effective coordination of efforts of governments, stakeholders and donors supporting water projects in the Aral Sea Basin.

5. Regional cooperation in the Aral Sea Basin as a factor contributing to solution of regional environmental issues

Intergovernmental cooperation

Development of the mechanism and procedures for the interstate cooperation in the Aral Sea Basin is one of the main challenges of today. The procedures for the regional cooperation should be developed using the Integrated Water Resources Management principles, i. e. with the involvement along with the governments of the concerned states, of all stakeholders, such as businesses, farmers, scientists, environmentalists should be insured in the process of the discussion of the issues, developing policies and making decisions on the use of natural resources in this region. However, until now there was little involvement of stakeholders in the political process of the transboundary water cooperation in the Aral Sea Basin as involvement of the stakeholders is not something which is encouraged by the Central Asian governments. Also the regional cooperation in the strict sense (i.e. involving all the five countries of Central Asia) has in the past proven difficult to realize at the political level. The larger states, Uzbekistan and Kazakhstan, have vied for the position of regional leader to the exclusion of pursuing political cooperation with their more immediate neighbors. In contrast, the poor and resource-deprived economies of Kyrgyzstan and Tajikistan have recognized that they are very much dependent on regional integration for their future growth prospects (Strategy Paper, 2002).

Historically, during the Soviet time, the water management was centralized on the federal level and each republic in the Aral Sea basin received its share of water in accordance with quotas approved by the USSR State Planning Committee. Annual plans essentially determined reserves for the main long-period storage reservoirs (Toktogul, Andizhan, Charvak, Nurek) and were approved on the federal level.

When the republics in the region gained their independence as new nations, it became necessary to set up a mechanism for regional cooperation in the organization of water resource management. On 12 October 1991, Water Ministers of the new independent states jointly declared they would con-

tinue using the earlier existed Soviet principles of water allocation (Water Related Vision, 2000). An interstate agreement was signed on 18 February 1992 to reflect this commitment and also laid a foundation for the regional cooperation by establishing a technical Interstate Commission for Water Coordination (ICWC), responsible for determining and approving annual water allocations for each state and approving schedules for the operation of reservoirs.

On 26 March 1993, the five states of Central Asia signed a new agreement that affirmed the commitment of these states to cooperate in the management of the basin's water resources. The agreement established regional institutions charged with comprehensive water management, including Interstate Council on the Aral Sea Problems (ICAS), a high level body charged to recommend actions to the five governments in the name of the basin as a whole; The Executive Committee of ICAS (EC-ICAS), a secretariat for ICAS; the International Fund for the Aral Sea (IFAS), a high level body charged with financing the activities of ICAS.

The ICWC was placed under ICAS by a later decision; but because ICWC decisions had legal force and ICAS's did not, the precise relationship between them remained unresolved. Another agreement of 19 July 1994 resulted in establishment of an Interstate Commission for Socio-Economic Development and Scientific, Technical and Ecological Cooperation, the name of which was later changed to Sustainable Development Commission (SDC); this body also operated under ICAS. Following a Heads of State meeting in February 1997, ICAS and IFAS were merged into a newly structured IFAS – International Fund for Saving the Aral Sea. As a result, the political level of decision related to water and environmental sectors in the region belongs only to the Board of IFAS consisted of the deputy prime ministers of five states. This is the highest political level of decision-making before approval by the heads of state (if appropriate). The most important issues can be decided only at the meetings of the heads of states followed by their recommendations/approval for IFAS. IFAS Executive Committee was established as a permanent body that included two representatives from each state and implements the IFAS Board decisions through the IFAS National Branches.

In 1994, the Heads of States adopted the Aral Sea Basin Program that was designed to be administered by the new regional institutions. Establishment of the Program was aimed to prepare a general strategy for water distribution, rational water use, and protection of water resources in the Aral Sea Basin. Following the establishment of the Program, Heads of States have met at least once a year during the next 6 years to further develop, approve and express support to the Program. In 1999, Heads of States adopted Ashgabat Declaration where they stressed their support to joint actions to address shared environmental problems in the basin and promote better quality of life for people living in the Aral Sea Basin. At the summit of the Head of States in 2002 in Dushanbe, Main Directions of a program of specific measures aimed to improve socio-economic and ecological situation in the region for the period until 2010, were adopted. At both high level meetings it was stressed that the measures that are being taken are not enough and there should be more international efforts are needed to improve the environmental and social situation in the Aral Sea area. The latest summit of the heads of the states – members of the Organization of Central Asian Cooperation (Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan) took place in Almaty, Kazakhstan, on 5 – 6 July 2003. In the adopted joint statement heads of the states stressed the importance of the regional and international (with international organizations and donors) cooperation in the water, energy and transport sectors (Kazakhstanskaya Pravda, 5 July 2003).

During the past decade there has been progress in the development of the interstate regional cooperation in the Aral Sea Basin as multiple agreements and conventions were signed and institutions established. However, with regard to the organization of the cooperation, it is important to stress that the institutional arrangements in the Aral Sea Basin are a mix of the institutions for the interstate cooperation and of procedures and rules that are still used since the time of the existence of the Soviet Union, and therefore, the regional cooperation cannot be yet considered as truly intergovernmental. One example is that the 1991 agreement establishing ICWC embodies a degree of interstate cooperation. However, first, the decree establishing the Commission did not provide a basis on which the states could address water issues in a comprehensive and integrated manner, and second, the implementation bodies of the Commission are in fact managed within one country only, Uzbekistan, and therefore recommendations produced by these bodies were not quite trusted by states other than Uzbekistan. This created tensions with Kazakhstan and has impeded the cooperation between the two countries to address shared environmental challenges in the Aral Sea Basin.

There is still a long way towards achieving genuine interstate cooperation in the Aral Sea Basin. This will require development of awareness and understanding at the state level of the differences between the nature and character of the cooperation between the states during the Soviet times and nowadays, when it is cooperation between independent states. This will also require elaboration of a comprehensive and multilevel legal and institutional framework for interstate cooperation, starting from the international level of management to the local in cooperating countries. This will also require development of the political process in support of cooperation based on a shared vision of the Aral Sea Basin development where high representatives of the cooperating countries would be willing to put the common regional cooperation interests above the national interests. At present, the Central Asian Cooperation Organization is the only political forum for regional cooperation on an exclusively Central Asian level (without participation of Turkmenistan) (Strategy Paper, 2002). Development of an agenda for the political cooperation on water management issues in the Aral Sea Basin and involvement into the discussion of the highest political representatives as well as diverse stakeholders are necessary.

Stakeholder cooperation

Involvement of stakeholders in the regional water cooperation is very important. However, today very few larger organizations – of economic interests and NGOs are active on the regional level; the rest are involved in water management on the local and national levels only. Since the dissolution of the former Soviet Union, most environmental NGOs in the region were funded through Western NGOs such as ISAR (Initiative for Social Action and Renewal in Eurasia), however the Central Asian governments have over time become less receptive to international democracy building efforts (Source: http://www.fpif.org/briefs/vol5/v5n06aral_body.html) and due to that the international funding has shifted away from civil society enhancement to the promotion of economic reform. As a result, Central Asian NGOs rarely focus on political activity and policy reform but rather on education, economic development, health, and awareness building. Among the larger organizations involved in international water projects in the Aral Sea area is the Regional Environmental Center for Central Asia that is supported by various international funding agencies

and in turn the Center implements NGO development, environmental management and education projects.

To develop multi-stakeholder cooperation in region, the Central Asian Global Water Partnership was created that is developing in the region a network for sharing information and knowledge and involving stakeholders in the water cooperation. The GWP network includes NGOs, representatives of the economic sectors, researchers and other stakeholders. Among major regional networks of stakeholders dealing with community development, including environmental protection issues, is Zhalgas-Counterpart that is a network of NGOs registered in different states of Central Asia. Local grassroots organizations in Central Asia are weak in the region.

In the region there is today significant attention from the donors to the water user associations, which are to play an important role in management of the Aral Sea Basin. However, they are becoming more active on sub-regional and national scales; on the regional scale their input to the water management is still low.

Role of researchers in developing a common vision of the sustainable development of the basin is important. Research projects in the Aral Sea Basin were supported by the North Atlantic Treaty Organization (NATO) and International Association for the promotion of co-operation with scientists from the New Independent States of the former Soviet Union (INTAS). However, there is a need for support of more policy oriented research, which would help scientists in the region to get more active in the actual management of transboundary waters.

Experiences of international projects and activities

After the collapse of the USSR in 1991 and following expression of the political commitment by the Central Asian states for the cooperation in the Aral Sea Basin, international aid donors played a major role in promoting cooperation in the management of the transboundary water resources in the Aral Sea Basin. The World Bank (International Bank for Reconstruction and Development - IBRD) was the first major agency to become involved. In the early 1990s, the Bank formulated an Aral Sea Basin Assistance Program (ASBP) to be carried out over 15 to 20 years at around 250 million USD, later upped to 470 million USD. The main goals of the program were (1) rehabilitation and development of the Aral Sea disaster zone, (2) strategic planning and comprehensive management of the water resources of the Amu Darya and Syr Darya, and (3) building institutions for planning and implementing the above programs. The Bank encouraged the basin states to create ICAS and IFAS and has worked with and through these organizations to realize the ASBP. The overall international donor contribution to the above-mentioned program during 1993-2000 was about 45 million USD (10 Years of ICWC, 2002).

Another Bank effort, supported through the Global Environment Facility (GEF), is the Water and Environmental Management Project (World Bank, 1998, pp. 19-34). It was implemented during 1998-2003 at a cost of 21.5 USD million. In line with a new emphasis on regional responsibility for the ASBP, the Executive Committee of IFAS was managing the program, with the Bank playing a cooperative/advisory role. Key tasks were: (1) improvement of the management of water and soil salinity related to irrigation practices, (2) development of low-cost, local, on-farm water conservation measures, (3) reduction of the amount of irrigation drainage water flowing back into

ivers, (4) strengthening the existing interstate water sharing agreements, (5) improving public awareness of critical water problems, (6) enhancing dam and reservoir management and safety, (7) monitoring of water quality and quantity at transboundary river crossings, and (8) implementing a program to restore wetlands in the lower Amu Darya delta, particularly Lake Sudoche, which is a RAMSAR (wetland of international importance) site. According to the GEF assessment (see details at <http://www.gefonline.org/projectList.cfm> and Supervisions Mission Report, 2002) the project implementation status was rated unsatisfactory primarily due to: delays in start-up and other issues which need to be resolved for the center piece sub-component A1 for national and regional salt and water management studies; and problems in component B for public awareness. The Implementation Review by the World Bank of the World Bank/GEF Aral Sea Basin Program (February 2003) confirmed that the technical and technological project's components within the ongoing projects were eventually implemented without major problems. Implementation of the proposed and ongoing technical and infrastructure projects or projects' infrastructure components did not present any big challenge since there are available in the region funding for the investments as well as international and local know how and expertise. However, the same review concluded that the "soft" components aimed at facilitating the interstate dialogue and developing interstate agreements and as well as of public participation and capacity building were not completed successfully and in time.

In 2003, the World Bank started a project that supported efforts to revive the northern part of the sea, known as a Small Sea, while giving up on the largely dead Big Sea to the south. The project funding is 85 million USD. Work on the project, a 12 km dike started in July 2003, the construction is expected to be completed in 2004. With the help of this project, Syr Darya water will be prevented from flowing into the Large Aral, where it has been losing a battle with evaporation. Instead it will flow to the Small Sea, which in four years or so engineers expect to rise four meters and recover about 600 square kilometers of exposed former seabed. Then a sluice will be opened, and the excess water will be allowed to flow south again into the Large Sea - the World Bank project includes rebuilding waterworks along the Syr Darya to increase the flow of the waterway substantially. As a result of the two components, the salt content of the Small Aral should drop, to somewhere between 4 parts per thousand to 17 parts per thousand (now it is according to Micklin – 20; Pala (2003) gives a number of 35) . Many of the 24 fish species that once supplied a 50,000-ton-a-year fishery are expected to return (Pala, 2003). To the Kazakhs near the Small Aral, the benefits will be considerable. Revival of the Small Sea the most importantly will help to reduce poverty by bringing back the commercial fisheries into the region and not least important it should increase rainfall in the area which should result in better quality of groundwaters and are likely to reduce dust storms that cause respiratory diseases among the population in the region.

A number of other international donors, directly or indirectly, have been contributing to Aral Sea region improvement. The United States Agency for International Development (USAID) funded the Environmental Policy and Technology (EPT) project in 1993 – 98 and initiated a new, major effort in 2001 known as the Natural Resource Management Project (NRMP). This is a 5-year effort focusing on providing assistance to Kazakhstan, Kyrgyzstan, Turkmenistan, Uzbekistan and, to a lesser extent Tajikistan, to improve management of water, energy, and land.

Governments of the Netherlands, Japan, Finland, Sweden, have committed funds to support construction of the water management infrastructure and necessary studies. The European Union

(TACIS) initiated a major aid program for the Aral Sea Basin states in 1995 known as the Water Resources Management and Agricultural Production in the Central Asian Republics Project (WARMAP) (Aquater, 1997).

UNESCO (United Nations Educational, Scientific and Cultural Organization) funded a research and monitoring program for the near Aral region from 1992-1996 focusing on ecological research and monitoring in the Syr Darya and Amu Darya deltas (UNESCO, 1998). The UNICEF (United Nations Children's Fund) launched the Aral Sea Project for Environmental and Regional Assistance (ASPERA) in 1995. It provides assistance to the disaster zone around the sea and focuses on health, nutrition, health education, water and environmental sanitation, and support to NGOs. UNDP (United Nations Development Program) assistance in the region had two primary foci: strengthening regional organizations that have been established to deal with the Aral Crisis (earlier ICAS and IFAS, now the reconstituted IFAS) and promoting sustainable development to improve conditions for the several million people in the parts of Kazakhstan, Uzbekistan, and Turkmenistan which are closest to the Aral Sea.

The Swiss government aid program for improving the water sector in Central Asian region emphasizes the support to institutional development, capacity building and human resources development linked with infrastructure investments, the promotion of regional partnerships and donor coordination. Geographical focus of the Swiss assistance is concentrated on three priority countries - Kyrgyzstan, Tajikistan and Uzbekistan - with limited inputs to Turkmenistan and Kazakhstan in connection with regional programs.

However, as it is expressed in the World Bank "Water and Environmental Management Project" Implementation Completion Report (2004), one of the lessons learned in working in the Aral Sea Basin is that "multi-donor projects are extremely difficult to implement". Different donors with different political agendas and interests should coordinate their efforts in the region and the riparian states in a more effective manner; meetings of donors should be taking place on regular basis in the Aral Sea Basin. Perhaps, the global organizations such as the World Bank or otherwise the UN should take a lead role in organizing coordinated efforts of different donors on a regular basis.

6. Lessons Learned and Recommendations

The continuing drying of the Aral Sea has brought multiple social, environmental and ecological disastrous consequences into the region and potential solutions to these problems demand great attention, political will, and human and financial resources. Although many projects have been implemented or are being implemented in the Aral Sea Basin, there is still a long way towards achieving the situation where quality of life of the population, including quality of the environment and of the social and economic conditions in the region, will be satisfactory. Among the lessons learned from the cooperation in the Aral Sea Basin are the following.

- Political commitment from the governments of Central Asian countries to the regional cooperation in the Aral Sea Basin is a foundation and a necessary condition of the successful implementation in the region of environmental protection measures. The authors agree with the conclusion of the World Bank that development of the "*strong client commitment*,

including client leadership in project preparation and implementation, even at high costs; enhanced interest of States through equal treatment and systematic consensus building” (Aral Sea Basin Program, 1998) should be the main focus of attention of funding agencies and international organizations. In similar settings as the one existing in the Aral Sea basin, where the history of interstate cooperation is very short, institutions and the legal basis for the cooperation are still under development, and the actors lack experience of an interstate cooperation; key international players should use their status and resources to promote the political commitment of the states and developing trust and consensus over the ways to address shared regional water management challenges. It is not only money that those international institutions should provide but they should also get involved in the cooperation in the role of a mediator and a facilitator of the cooperation.

- To promote the political commitment from the states to the regional cooperation, a national ownership of the regional initiatives should be ensured by supporting a larger share of projects and activities on a national level. Support to nationally implemented projects is important as different countries have different legal and institutional frameworks and there are considerable gaps between the countries' levels of social and economic development. Activities implemented on the national level in different countries, are to be complimented by a regional umbrella water management program focused on water management priorities important for whole transboundary basin. This kind of a transboundary umbrella program should mostly contain communication and coordination, and public outreach activities. Regular communication should be organized between teams developing transboundary water management strategies and national water management projects.
- In most of the projects in the past, the water management challenges have been addressed in a narrow sectoral way. The water management issues should be connected to other economic and political issues; the water cooperation should be an important part of the discussions of economic development and integration processes in the region; these discussions should involve both governments and stakeholders. This approach is likely to contribute to a higher political commitment from the states involved in the regional cooperation. Also there should be more discussions and activities on the basin level bringing together water quality and quantity.
- Experiences of implementation of international projects in the Aral Sea region showed that technical and technological projects were usually implemented successfully while the soft components of the projects aimed at developing institutional frameworks for regional cooperation and public awareness were often unsuccessful. The reason for that is a sufficient know how and knowledge for implementation of the technical projects; low awareness and a lack of relevant experiences in organizing “soft” water management activities reflecting Integrated Water Resource Management principles to water management. As experience of transboundary water management projects in Europe showed, for example, implementation of Danube River and Lake Peipsi/Chudskoe GEF-funded transboundary water projects, at least 60 % of the funding has to go to the soft measures aimed to develop regular communication, information exchange between the riparian governments to raise their awareness about the need of the transboundary cooperation. It is also important that allocation of resources for the “soft components” is done in a focused way. Comprehensive communication strategies and tools for communication and information exchange to ensure involve-

ment of not only the governments but also stakeholders on different levels of governance in management of waters should be developed tailored to the needs of different stakeholders in the region.

- Starting regional cooperation initiatives in the geographical areas with little experience of an interstate cooperation requires a discussion of possible institutional models of the future interstate regional cooperation to be developed. In the Aral Sea Basin many regional cooperation organizations operate with rules and procedures that are a mix of the approaches from the old Soviet centralized system and are partly based on the principles of the cooperation between the independent states. Therefore, measures promoting development of the real interstate cooperation should be supported; unless the states do not cooperate on the fully independent international grounds, they will not be motivated to put their resources to promote the regional cooperation. The legal and institutional framework to be developed in the Aral Sea Basin should help the countries to bring together and negotiate diverse state and regional interests.

Institutional models of the interstate cooperation in basins of other regional seas that have proven to be successful could be proposed for study as a possible basis for the development of the interstate cooperation in the Aral Sea Basin. For instance, the intergovernmental cooperation model developed around the Baltic Sea (Water Security, 2000) could be used as a model for the Aral Sea cooperation. The 25 years of experience of the cooperation around the Baltic Sea where a multilevel governance system bringing together environmental and economic priorities can be very valuable for the Central Asian states and could help them in solving their shared water management challenges in the Aral Sea Basin. The existing platform of the EU Global Water Initiative aimed at disseminating knowledge of organization of implementation of the EU Water Framework Directive by states of the European Union could be effectively used to transfer the knowledge from Europe and the Baltic Sea Region to the Aral Sea Basin.

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Appendix 1

Indicator	Unit	1960	1970	1980	1990	2000
Population	Million	14,1	20,0	26,8	33,6	41,5
Area under irrigation	thousand hectares	4510	5150	6920	7600	7990
Irrigated area per capita	ha per capita	0,32	0,27	0,26	0,23	0,19
Total draw-off	cu. km/year	60,61	94,56	120,69	116,27	105,0
including for irrigation	cu. km/year	56,15	86,84	106,79	106,4	94,66
Unit draw-off per ha under irrigation	cu.m/ha	12450	16860	15430	14000	11850
Unit draw-off per capita	cu.m/person	4270	4730	4500	3460	2530

Table 1. Basic indicators of water and land use in the Aral Sea basin

Source: SIC ICWC, 2000

Year	Level (meters)	Area km ²	% of 1960	Volume km ³	% of 1960	Salinity g/l	% of 1960
1960 (whole sea) ^b	53.4	67,499	100	1089	100	10	100
<i>Large Sea</i>	53.4	61,381	100	1007	100	10	100
<i>Small Sea</i>	53.4	6,118	100	82	100	10	100
2003 (whole sea) ^c		17,158	25	108	10		
<i>Large Sea</i>	30.4	14,293	23	85	8	(East. Sea) >110 (West. Sea) >80	480 600
<i>Small Sea</i>	40.4	2865	47	23	28	20	200
2011 (whole sea)		10,033	15	92	8		
<i>Large Sea</i> ^d	27.3	6,113	10	53	5	~190	1900
<i>Small Sea</i> ^e	45.1	3,920	64	39	48	~15	150

Table 2. Hydrologic and Salinity Characteristics of the Aral Sea, 1960-2010^a

^aValues derived from Soviet data, data from Glavgidromet of Uzbekistan, data from Shivareva, *et al* from information provided by the GIS Research Center, Nukus, Karakalpakstan, and from annualized water balance and salt balance models developed by the author as well as from a 1:500,000 bathymetric map and satellite imagery of the Aral.

^b annual average ^c on January 1 ^d the sea will have divided into a western and eastern part ^e assumes implementation of north Aral project in 2004. Effect: - negative, + positive, 0 none, ? unknown