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Anar Khamzayeva, Sulton Rahimov,
Ulugbek Islamov, Farhod Maksudov,
Dilafruz Maksudova, Bektur Sakiev

Elisabets, 12 - 08001 Barcelona, España - Tel. (+34) 93 302 6495 - Fax. (+34) 93 302 6495 - info@cidob.org www.cidob.org

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WATER RESOURCES MANAGEMENT IN CENTRAL ASIA: Regional and international issues at stake

**Anar Khamzayeva, Sulton Rahimov,
U. Islamov, F. Maksudov, D. Maksudova
Bektur Sakiev**

November 2009

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Foreword

This publication presents the results of the workshop on *Water resources management in Central Asia: regional and international issues at stake* which was held at the CIDOB Foundation in Barcelona on 23 January 2009. It also presents the 4 background papers and the conclusions. The aim of the meeting, which took place within the framework of the Observatory on Central Asia (a joint initiative set up by the Royal Institute, Casa Asia and the CIDOB Foundation), was to examine the way in which water resources are managed in the Central Asia region, as well as to debate issues such as the prospects for comprehensive water management, the importance of the latter in terms of international security, and the impact on the development of the countries in the region. The workshop's participants also analysed the role of international organisations in Central Asia, with a view to the future role that Spain could play during its EU presidency in 2010. The seminar's participants included four experts from Kazakhstan, Uzbekistan, Tajikistan and Kyrgyzstan, together with some 20 experts and scholars, all specialised in the Central Asia region.

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Water resources management in Central Asia: security implications and prospects for regional cooperation

Anar Khamzayeva
PhD Candidate at LUISS "Guido Carli" University (Rome, Italy)

Abstract

The purpose of this article is to give a general overview of the security implications and regional cooperation initiatives on water resources management in Central Asia. The text begins by examining the legal framework for inter-state relations on water resources management in the region, and then reviews the water management system established by the USSR between Kazakhstan, Kyrgyzstan, Uzbekistan, Tajikistan and Turkmenistan, and its implementation for tackling the current conflicts. The post-1991 international agreements are also analysed, together with long-term mechanisms for water-sharing based on inter-state dialogue.

The article also reviews some of the projected international water infrastructure and management plans with security implications in the region, such as: the Golden Century Lake in the Kara-Kum desert in Turkmenistan; The Rogun and Sangtuda dam and hydroplant projects in Tajikistan; the Kambarata hyproplant projects in Kyrgyzstan; the projected increase of water use demand from the Amu-Darya by Afghanistan, and the plan for diverting the Irtych and Ob rivers to the Aral Sea in Kazakhstan.

Prospects for regional cooperation include: the establishing of legal mechanisms on water resources management in Central Asia based on international water law principles, assistance and support from international agencies and donors, and an integrated basic social, economic and environmental approach.

The author concludes by acknowledging that water interdependence is a factor of major concern in Central Asia, and that concerted action by all regional states should be the way to solve water management problems.

Introduction

The water-related challenges in Central Asia undoubtedly represent a critical issue for the region's states and the international community to address. It has been widely acknowledged that a more efficient water resources management is essential to sustainable development of the whole region. The November 2008 UNDP "*Central Asian regional risk assessment*" report examines *compound crisis phenomena* –the situation in terms of threats to water, energy and food security that took place predominately in Tajikistan during the first quarter of 2008. "Developments during the second half of 2008 have regrettably shown that concerns about the possible repeat and spread of Tajikistan's compound crisis have not been misplaced" (UNDP, 2008). Moreover, the full effect of the global economic slowdown is yet to hit regional economies while sustainable development is projected to be slow-moving and incremental.

The water management issue in Central Asia has been a substantial source of enmity between the riparian neighbors, particularly between Tajikistan and Kyrgyz Republic on the one side and Uzbekistan on the other, and thus has generated an uneasy political climate in the region. It is a complex and difficult situation, with inter- and intra-state tensions over water release regimes and distribution, non-implemented barter agreements and payments, an enormous rise in water usage and wastage, competing irrigation and energy sectors, increasing water shortages, low water levels in the hydropower stations, a deteriorating water ecosystem and the still-shrinking Aral Sea.

The issue at hand is how to tackle complex common management problems –environmental and agricultural challenges– while developing national water policies –problems that have the potential to generate conflicts both within and between states. The regional states have so far managed to avoid open conflict and military hostility over water issues, with relations remaining tense nonetheless. An effective regional

cooperation requires the states' substantial commitment to pave the way toward a coherent regional water-management pact to govern long-term use of Central Asian water resources.

Before examining the current situation in the region with respect to the management of common water resources and the ways forward, the article provides brief background information on the regional water challenges, once the Central Asian republics became independent nations in 1991.

Background

The Soviet system of water resources management kept Central Asian countries closely integrated, establishing a regional trade-off by linking the glacier mountains of Tajikistan and Kyrgyzstan with the arid lands of Kazakhstan, Uzbekistan and Turkmenistan that are rich in gas, coal and oil. Soviet water specialists built 20,000 miles of canals, 45 dams and more than 80 reservoirs across this vast regional space with elaborate engineering, covering the costs of operation and maintenance. "The land of sand and dust was thus turned into one of the world's great cotton-growing regions" (Wines, 2002).

The reservoirs of two great rivers –the Syr-Darya and Amu-Darya– were filled up in autumn and winter so that sufficient water was available downstream for irrigation during spring and summer. By increasing the area of irrigated land for cotton and rice growing, there was, however, little consideration for the local environment; this has led to some drastic environmental consequences, especially for the Aral Sea, which has been shrinking since the 1960s, with the area around it turning into a toxic wasteland.

Since gaining independence in 1991, Kazakhstan, Kyrgyzstan, Uzbekistan, Tajikistan and Turkmenistan were immediately faced with the problem of what to do with the Soviet model of water resource management. And for quite some time after the break-up of the Soviet

Union, the republics were left with little choice but to continue with the management system established by the USSR Ministry of Land Reclamation and Water Management, becoming parties to an *"Agreement on cooperation in joint management, use and protection of interstate sources of water resources"* in 1992 in Almaty, Kazakhstan that basically kept in place the water-distribution scheme of the Soviet times.

Article 1 of the Agreement states that "recognising the community and unity of the region's water resources, the parties have equal rights for their use and responsibility for ensuring their rational use and protection". A continuous inter-state dialogue on water resource management included discussions on what kinds of institutions should be overseeing water management in Central Asia, and the question was raised regarding control of dams and water-release tables. In addition, the discussion circled around whether the short-term water quota agreements or long-term mechanisms for water sharing should be put in place. The Interstate Commission for Water Coordination of Central Asia (ICWC) was set up with the Syr-Darya and Amu-Darya Water Basin Authorities to carry out decision-making according to the consensus of the five member states, and to manage the implementation of the 1992 agreement (ICWC, 2008).

A number of declarations about water reform were signed thereafter, including the 1993 Tashkent Heads of State Decision to create the International Fund for the Aral Sea, the 1993 Kzyl-Orda Agreement, creating the Interstate Council for the Aral Sea, the 1995 Nukus Declaration, pledging the states to fulfill all water agreements existing between them, the 1997 Almaty Declaration, pledging the states to create an International Convention for the Sustainable Development of the Aral Sea Basin, and the 1999 Ashgabad Declaration, urging more international attention to the region (Sievers, 2002, p. 387).

Despite these initial and relatively upbeat attempts by the Central Asian states to keep the common system of water management intact, independence has brought socio-economic hardship which in turn meant that now separate sovereign republics could not have managed

to maintain the water systems or invest in new waste management and water purification facilities, as it was quite costly.

As a result, the decaying irrigation systems cut water supply dramatically. In fact, "50 to 90 % of water diverted for irrigation never reaches crops due to poorly-designed irrigation canals and the fact that water users have historically received water for free. Water has mobilised deep salt reserves, raised the water table, and waterlogged fields as a result of over-irrigation. In Turkmenistan, 95% of irrigated lands suffer from salinization. Approximately 30% of Kazakhstan's agricultural lands are salinated, waterlogged, or at-risk. In Tajikistan, 16% of irrigated lands suffer from some degree from salinization" (Sievers, 2002, p. 366).

For the most part, water sharing and quota levels were not at the heart of most disputes, it was rather that the parties have mostly disagreed over whether *water should be used for irrigation or electricity generation.* The 1992 Agreement did not stipulate the provision of the energy supplies to Kyrgyzstan and Tajikistan for their use over the winter period. As a result, both countries have started to rely on hydropower as a source of energy, thereby releasing large amounts of reservoir water during the cold winter season, leaving much less water available for spring and summer. This situation persists as the principal source of the current water problems in Central Asia.

If we look at the very latest developments: in late January of this year, the Tajik Foreign Ministry warned that Central Asia could face a water shortage this summer. Tajikistan's water reserves are being used to produce additional energy due to a deficit of electricity[1]. This ultimately means that one should expect yet another round of quarrels to take place between the riparian states, perhaps again with no definitive resolution of the problem in sight.

1. "*Tajik Ministry warns of summer water shortages*", Radio Free Europe/Radio Liberty, January 21, 2009, www.rferl.org/Content/Tajik_Ministry_Predicts_Regional_Water_Shortage_By_Summer_/1373056. html.

Continuing with this examination of the legal framework for inter-state relations on Central Asian water resources management, special mention should be made of the 1998 agreement *'On the Use of Water and Energy Resources of the Syr-Darya Basin' between Kyrgyzstan, Uzbekistan, Tajikistan and Kazakhstan*. Article 4 of the 1998 agreement established the principle that water used for irrigation in the summer period in the Toktogul reservoir on the Naryn, a principal tributary of the Syr-Darya, was to be compensated with energy resources.

For several years, the agreement has served as an overarching legal framework regulating the relations between the riparian states, yet by 2000 it was replaced by a number of ad hoc bilateral agreements. An agreement between Kazakhstan and Kyrgyzstan followed and was successfully implemented on the co-funding and maintenance of a number of canals, dams and water reservoirs forming a part of a common water distribution system of both countries on the Chu and Talas rivers (Libert et al., 2008). A number of other related energy and water agreements signed between Kazakhstan and Kyrgyzstan, predominately in the period 2004-2006, have actually served as examples of good cooperation on the natural resources in Central Asia.

It should be noted that the regional states sign new water allocation agreements every year. "Often, as happened in 2001, the states are unable to reach agreement by the beginning of, or maintain their agreement during, the irrigation season (April 1 to October 1) or, alternately, the heating season (October 1 to April 1)" (Sievers, 2002, p. 373).

A very cold winter in Central Asia in 2007-2008 followed by a dry spring and summer have created *a critical situation in the region and thus strained political relations*. The extensive use of hydropower in Kyrgyzstan during the winter resulted in a very low water levels in the major Toktogul Reservoir. As a consequence, the downstream countries –Uzbekistan and Kazakhstan– have not received as much water from the Syr-Darya for irrigation in the spring and summer as they need.

The situation brought renewed attention to the water and energy situation in the region, prompting a series of bilateral and multilateral meetings. In particular, the meeting of Central Asian Heads of States in Bishkek in October of 2008 resulted in concessions and guarantees made by the downstream countries to supply energy in the winter season in return for water release during irrigation season.

On the whole, many important agreements have remained largely unimplemented, limited to some technical and short-term issues. The on-again, off-again relations between Central Asian states have served as a barrier to the implementation of most of such agreements.

Analysts emphasise that "the prevailing *ad hoc* pattern –implementing agreements, sometimes decades after a crisis emerges– is not only risky and inefficient, but in many cases preventable. The key is establishing a process of cooperation early in the trajectory before serious hostilities erupt that make it difficult for nations to sit around a negotiating table together" (Postel; Wolf, 2001).

Security implications

Throughout history, there have been hardly any cases of two countries going to war over water. Experts note that "water disputes between countries, though typically not leading to war directly, have fuelled decades of regional tensions, thwarted economic development, and risked provoking larger conflicts before eventually giving way to cooperation" (Postel; Wolf, 2001).

Johannes F. Linn, Senior Fellow and Executive Director of the Wolfenson Center for Development at the Brookings Institution, who has been extensively engaged in assessment of the region's security and development prospects, foresees the coming of a major humanitarian, economic and political crisis for the region, given the current state of water and energy situation, "that is already difficult and tense at best

during years of normal weather"… with "the looming crisis having the potential to result in cross-border conflicts at the community and state level" (Linn, 2008).

The principle discourse on Central Asia has been largely centred on the plausibility of imminent danger and threats. The region harbours serious long-term security risks, such as the drug trade, illegal migration and religious extremism. In the view of one expert: "in the longer term, the conflicts that can arise out of water resource tensions (not to mention other tensions) in Central Asia threaten not only to embroil the states of the region, but also Russia, China, Iran, Afghanistan, and Azerbaijan. This list of possibly-involved states is another indication of the geopolitical importance of Central Asia and draws attention to the critical need to at least prevent Central Asia's water resource tensions from deepening any further" (Sievers, 2002, p.400).

For Central Asian states, especially for countries such as Uzbekistan and Turkmenistan, water issues stand at the very core of their proclaimed national interests. Understanding this factor has led scholars to examine trends that characterise the hydro-politics of the region. Studies have been undertaken on the hydro-hegemony concept and how it is relevant in the context of Central Asian regional developments. In particular, Wegerich argues that "independence manifested inequitable water allocation, giving rise to the perception that especially Uzbekistan is the hydro-hegemon in the Amu-Darya basin", yet the analysis undertaken "suggest that there is as yet no real hegemon. Instead the different riparian states are currently engaged in strategic resource capture, by increasing their water demand without renegotiating the official agreements" (Wegerich, 2008).

Another study of hydro-hegemonies and co-existence of conflict and cooperation in the Aral Sea basin with Transboundary Freshwater Interaction Nexus (TWINS) approach, carried out by Suvi Sojamo of the University of Helsinki, should also be mentioned. Sojamo states in fact that geopolitical power play is at the root of the basin's water relations, with power-asymmetries complicating water man-

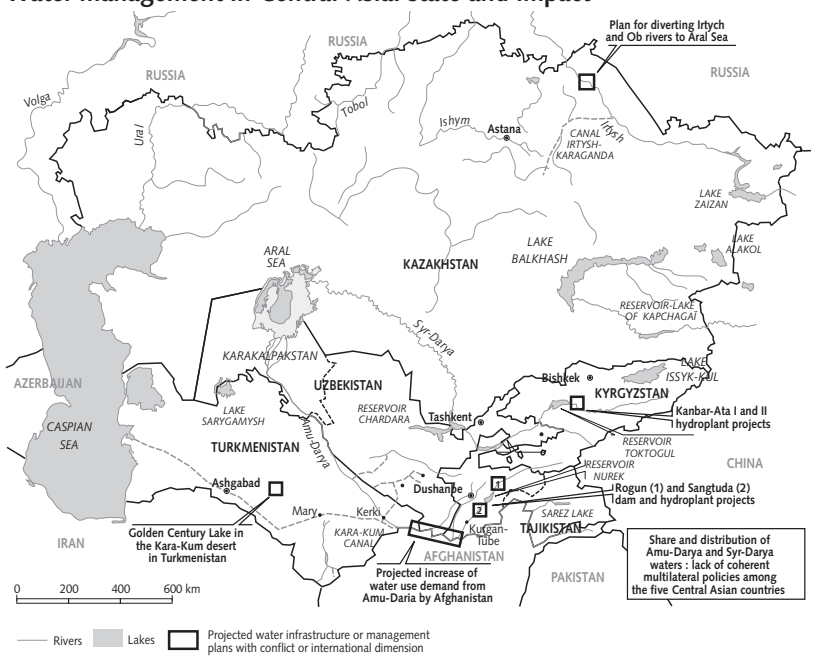
agement process as "hydro- and energy-imperatives of upstream and downstream states have started to collide" (Sojamo, 2008, p. 76). The author utilises the TWINS approach that examines how the dynamics of power manifest themselves in water governance, in the context of Central Asia. While focusing primarily on Uzbekistan's securitised water related bargaining and coercive tactics, the author claims that the transboundary management is complicated by clearly prevailing regional imbalances in power relations, with the politics of water being dynamic due to the fact that "hegemonic actions of the downstream states have aroused counter-hegemonic actions from the upstream states" (Sojamo, 2008, p.80).

On the whole, as the author claims, there are conflictual and cooperative tendencies present in the process of interaction between the regional states on water issues that must be viewed through a holistic approach to examining politics of water and water management. The author concludes on a rather pessimistic note, arguing that establishing an equal and sustainable transboundary water management in the Aral Sea Basin involves a strong commitment on the part of all regional states to cooperate, yet "instead of forming a strong union, the states are today yearning to break free from the regional interdependencies" (Sojamo, 2008, p.85).

This ultimately means that all countries in the region will sustain water-related issues as their national security imperatives. In Kazakhstan, in 2001, the National Security Council began assuming authority for forming and implementing that state's water policies. A decision has been taken recently to build the Koksarai reservoir, which will aid in preventing winter flood situations in the southern regions of Kazakhstan. However, it is difficult and expensive to build reservoirs in the lowlands of the region. Observers are assured that "Kazakhstan could avoid the necessity of doing so, had they worked out a mutually advantageous water and energy resource running scheme with Kyrgyzstan" (Arbenin, 2008).

Apart from Kazakhstan, other Central Asian states have also been developing plans for more infrastructures that they believe would increase their control over resources in the context of their national policies on water issues. A critical goal for most of the region's countries is to expand irrigated land over its territory by intakes from the transboundary rivers. Let us examine closely some of the "projected water infrastructure or management plans with conflict or international dimension", illustrated on the following map:

Water management in Central Asia: state and impact



Source: Water management in Central Asia: state and impact. (2005). UNEP/GRID-Arendal Maps and Graphics Library. Retrieved 18:23, January 19, 2009 from: http://maps.grida.no/go/graphic/water_management_in_central_asia_state_and_impact1

The Golden Century Lake in the Kara-Kum desert in Turkmenistan

It must be noted that for Turkmenistan, water issues lie at the top of its political agenda, which it tends to view as a solely domestic issue. In recent times the country has not been taking part in any regional meetings on management of water resources, having started to follow a unilateral resource capture policy of constructing the Golden Century Lake. Since the year 2000, construction of this large (projected area of 2,000 square kilometres) artificial lake has made good progress, constituting the single largest out-of-basin transfer in the region, substantially increasing the area of irrigated land under cultivation in the country –4,000 square km of farmland. The constructed is projected to be completed in 2010.

The project has been subject to extensive controversy, with experts contending that the lake will, as a result of Turkmenistan's soils and heat, only result in a massive dead lake that will contribute to salinization. Another concern according to the International Crisis Group is related to the fact that around one million ethnic Uzbeks residing in the Dashkhovuz province in Turkmenistan are to be moved to the Kara-Kum desert upon the completion of the lake (International Crisis Group, 2002, p. 26). Uzbekistan has raised concerns that water will be drained from the Amu-Darya to maintain the lake's level, a view in fact supported by many international experts (Allouche, 2007, p.50).

Overall, relations between Turkmenistan and Uzbekistan have remained edgy throughout the independence period, with rumours circulating of a small-scale armed conflict of the Amu-Darya's resources between the two downstream countries. Some observers claim that there have been reports of Uzbekistan troops taking control of water control installations by force on the Turkmenistan bank of the river, and in 2001, there were reports of a massacre of a large number of Uzbekistan troops in Turkmenistan (Sojamo, 2008, p. 82). The reports were unsubstantiated, yet there was a clear presence of tensions that are only expected to worsen in the coming years.

Rogun (1) and Sangtuda (2) dam and hydroplant projects

Despite its internal instability and economic backwardness, Tajikistan has highly prioritised the water issue in its domestic and foreign policy objectives, having the largest hydroelectric potential in the region. Since 1998 it has been planning to re-launch the Soviet projects of the construction of the Rogun and Sangtuda hydroplants.

The construction of the Rogun dam was designed to regulate the hydrological regime of the Amu-Darya, yet the plan could seriously hamper its already-strained relations with Uzbekistan. The latter has been actively protesting against the Rogun project, as it would lead to even greater dependence on Tajikistan and would allow it to cut off water to its key agricultural areas (Libert et al., 2008, p. 15).

There is much less disagreement over the Sangtuda-1 hydroelectric plant, expected to come online in late March of this year, ahead of schedule on the request of the Government of Tajikistan due to power shortages. Experts note that judging from discussions and high-level meetings in 2008, it is likely that flows of investment into developing hydropower will increase.

Iran and Russia are already playing an important role in this sphere, with the latter in particular expressing an interest in engaging in the construction of additional hydroelectric plants in Tajikistan. Iranian investment in the Sangtuda-2 plant should make it operational by 2012. Tajikistan also has signed an agreement with China to build the $300 million, 160-200 megawatt Nurobad-2 hydroelectric power plant (Daly, 2009).

The Kambarata 1 and 2 hydroplant projects

Kyrgyzstan's relations with downstream countries on Syr-Darya have been quite conflictive, with unsubstantiated reports claiming that in 1996 Uzbekistan threatened to use military force to seize the Toktogul dam and reservoir, the strategic water infrastructure, in the event of

Kyrgyzstan attempting to change the prevailing distribution policy. This appears to be believable as cotton fields in Uzbekistan and Kazakhstan were flooded in the winters of 1993, 1998 and 2001, with Kyrgyzstan releasing too much water from the dams in that period and during the summer season not enough was available for irrigation.

Just like Tajikistan, Kyrgyzstan seeks to increase its hydropower-generating capacity with more hydropower stations planned to be built. Yet, the hydro-energy sector of Kyrgyzstan has been in complete disarray with the government in search of investors to construct the Kambarata 1 and 2 hydroplants on the Naryn River. Both hydroplant projects are said to be unattractive to foreign investors, even though the construction of hydroplants upstream of the Toktogul Dam is meant to make it possible to generate hydropower to solve domestic energy shortages, earn hard currency for electricity exports and still accumulate water for irrigation purposes. Continued use of existing hydropower and development of new hydropower stations are likely to remain the priority alternatives for Kyrgyzstan with or without the consent of co-basin countries, which will only aggravate the existing disagreements.

Projected increase of water use demand from the Amu-Darya by Afghanistan

Almost 40% of Afghanistan's territory and 33% of its population reside within the Aral Sea basin, which makes the country an important part of the regional water management scheme. Yet so far, Afghanistan has been ignored as far as inter-state water management of Aral Sea basin is concerned; the country's transboundary water rights and responsibilities were not recognised despite the political changes that have been taking place with the removal of the Taliban in 2002.

Historically, the USSR has concluded a number of water-related agreements with Afghanistan which still remain in force. However, following the creation of new water management arrangements in

1991, there was little consideration given to the question of inclusion of Afghanistan. Moreover there were no bilateral agreements between Afghanistan and its Central Asian neighbours in terms of water issues (Horsman, 2008).

Should Afghanistan's security situation stabilise, this would hopefully lead to a revival of its economic activities, which in turn should stipulate greater demand for increased use of the basin's water resources. In fact, the Afghan government is already planning to build a canal to pump water from the Amu-Darya to be transported to Mazar-e-Sharif (Allouche, 2007, p. 52). In the future this will inevitably lead to tension with its neighbouring countries. Therefore, it is essential to integrate Afghanistan into regional water management schemes and international observers have been urging Central Asian states to do so.

Plan for diverting the Irtych and Ob rivers to the Aral Sea

Uzbekistan is the second-largest exporter of cotton in the world, selling over 800,000 metric tons annually. In a quest to expand its cotton production for export, Uzbekistan –along with Kazakhstan and Russia– have again been making plans to revive a Soviet-era plan to divert rivers from Siberia to Central Asia, intended to save the Aral Sea.[2] In theory, building a canal from Siberia across Kazakhstan to Uzbekistan would bring extra water resources to Uzbekistan and would significantly boost Russian influence in the region.

Awareness of the latter factor has prompted many Russian officials, such as Moscow mayor Yuri Luzhkov, to revive construction of the canal. Luzhkov has stated that the scheme would divert no more than

2. It was in fact estimated that this would restore the Aral Sea to its former size in 20-30 years at a cost of US$30-50 billion. RING, Ed. "Release the rivers. Let the Volga and Ob refill the Aral Sea", Sep 27, 2004, at: www.ecoworld.com/Home/Articles2.cfm?TID=354.

7% of the Ob's annual flow. According to estimates, the project will cost $25 to $30 billion, with $5 billion in annual revenue from sales of water to Central Asia (Daly, 2008).

Various scholars and environmentalists contend that a new diversion project would have disastrous effects on the ecological balance in Siberia and Central Asia. Academics worry that water will remain salinated when it reaches Uzbekistan, making it undesirable for irrigation; that leaks from the canal will swamp vast territories, and that species of fish and bacteria will mix in unhealthy ways. Many also worry that sending Siberian waters to Uzbekistan's warmer terrain will disrupt the climate in both places.

Most of the elaborate and grand water projects outlined above are all highly expensive, environmentally-damaging and potentially dangerous, offering "only short-term relief and merely delaying much-needed reform of the present system" (International Crisis Group, 2002, p. 28). These projects stand to only exacerbate the existing tensions between the riparian states. Instead, it is critical that the international community should seek to encourage regional co-riparian states to adopt effective domestic policies on agriculture, water and energy, and continue the difficult but indispensable process of negotiation and bargaining among themselves.

Prospects for regional cooperation

A thorough study undertaken by Torjesen reveals that "water in fact is a topic well suited for an examination of regional cooperation in Central Asia" (Torjesen, 2007). The assessment carried out reveals that establishing a water-sharing cooperation architecture in the region proved to be extremely difficult, revealing "the wide discrepancy between pledges about co-operation, and actual ability or willingness to act on these pledges" and shows that in fact inter-state cooperation in the region as a whole in the period under study (1991-2004) was highly problematic. Yet it is also emphasised that as far as water issues were concerned, interdependence between the regional states has reached its highest levels.

Such conclusions compel one to emphasise that *although competition rather than cooperation over water issues in the region is likely to endure in the short- and medium-term perspective, it will nonetheless compel the states to prefer agreements*. Water interdependence is indeed a rationale to improving trust and co-operation.

Water-and-security analysts warn that actions carried out in the absence of a treaty or institutional mechanism that safeguards the interests of other countries in the basin clearly stands as a fairly destabilising factor in the Central Asia region. That is precisely why *work on establishing the legal water framework for Central Asia must be accelerated*, clearly stipulating the rights and obligations of upstream and downstream countries, providing a general framework for transboundary water cooperation that would be based on international water law principles, those primarily incorporated in the UN Convention on the Law of the Non-Navigational Uses of International Watercourses (UN ILC, 1997) and the UNECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Water Convention).

It must be noted that Kazakhstan and Uzbekistan are the only Central Asian states to have ratified the Water Convention. And Uzbekistan is the only regional state to have acceded to the UN ILC, in September 2007,[3] thus making it legally obliged to implement the principles of the "reasonable and equitable use" of water. Uzbekistan has been quite active in putting forth many international initiatives, such as the ICID, the World Water Week in Stockholm, Green Cross International (GCI) and the World Water Forum. Overall, the country is said to have benefited the most from the majority of environmental projects funded by international agencies. Claims have been further made that Uzbekistan dominates decision-making in both the ICWC and IFAS.

3. "Status of Watercourse Convention as of 9 January 2008, " at: <http://internationalwaterlaw.org/intldocs/watercourse_status.html..

The work and effectiveness of the ICWC and IFAS has been questioned, with experts calling for more transparency, 'an overhaul to broaden mandate, increase powers of enforcement and change of management structures and approach to attract outside funding' (International Crisis Group, 2002, p. 27). Since the fact is that institutional capacity for managing water disputes in Central Asia is weak, assistance and support from international agencies and donors, such as the World Bank, the Global Environmental Facility (GEF), USAID, UNEP, UNECE, and the European Union are all of the utmost importance.

In the "Water and violent conflict" issue brief released by the OECD, while the complex interrelationship between water and conflict is thoroughly examined, lessons learned and recommendations for preventing and mitigating water-related conflicts are set forward for international organisations, aid agencies, NGOs and the private sector to continue providing their input into helping to sustain efforts to reduce the risk of conflicts over water from arising.

In particular, in relation to Central Asia, several of these are critical, such as "ensuring broad participation in dialogue processes on resource governance and co-operative water management, improving transparency and information flow to stakeholders, strengthening formal and customary institutions and mechanisms to improve water management and peaceful dispute resolution over shared water, supporting those regional initiatives that hold potential to build co-operation and peace by focusing on water, integrating conflict-impact and water-resource assessments, focusing in the long-term on demand-side water management (reuse, efficient use, inter-sector reallocation)" (OECD, 2005).

According to the latest (2007-08) assessments, in particular those done by the Water and Development Research group of the Helsinki University of Technology in co-operation with Global Water Partnership and the ICWC, the per capita water use in Central Asia has soared quite dramatically, "being manifold in comparison to any other comparable part of the world" (Varis; Mizanur, 2008, p. 3). The study shows that the

region's states indeed do not suffer from water scarcity, with countries like Tajikistan and Turkmenistan having more water than the majority of the European countries. In fact "Uzbekistan, for instance, has almost double the amount of water per capita in comparison to Spain, which is one of the major agricultural producers within Europe" (Varis; Mizanur, 2008, p. 4). The study further claims that in looking for solutions to the region's water challenges, the focus should be on water demand.

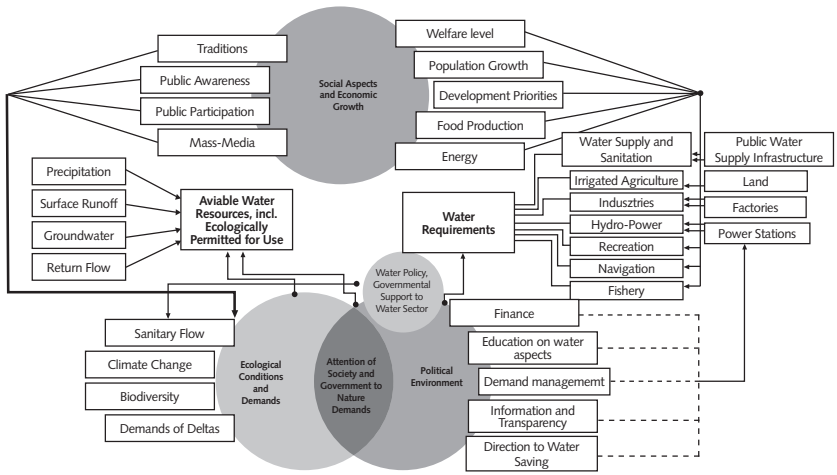
Indeed, a more efficient use of water resources could in fact reduce the demand for water. For decades experts have been calling for a "multifaceted regional approach… to address energy, agriculture and demographic aspects of water use" in the region –an approach that requires taking account of multiple political, social and economic factors (International Crisis Group, 2002, p.ii).

Integrated Water Resources Management (IWRM) as a new water governance and management paradigm has been introduced in Central Asia by the Global Water partnership, founded in 1996 by the World Bank, the United Nations Development Programme (UNDP) and the Swedish International Development Agency (SIDA) to foster integrated IWRM across many regions of the world. The IWRM is defined by the Global Water Partnership as "a process which promotes the coordinated development and management of water, land and related resources in order to maximise the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems" (Global Water Partnership, 2008).

In Central Asia, the IWRM project is focused on improving the institutional arrangement for water management in the Ferghana Valley, addressing the possibilities for saving water, improving agricultural productivity, organising water administrations, promotion and institutional build-up of Water Users' Associations (WUA) and the improvement of water allocation mechanisms among the users and between the three countries- Uzbekistan, Kyrgyzstan, and Tajikistan. The SIDA is the primary donor of the project with the cumulative budget of $9 million.

The ICWC is the implementing agency with the execution of the project being entrusted to an association between the International Water Management Institute (IWMI) and the Scientific Information Centre (SIC) of ICWC as the project contractors, in partnership with local water management organisations, irrigation research institutes and NGOs (Swiss Agency for Development and Cooperation, 2008). Applying the IWRM blueprint in the context of the Central Asia region enables one to look afresh at what is required for a successful water management scheme. The studies in fact reveal that the water resources management process is quite complicated, involving an array of water balance components as shown on the following chart:

Interacting Factors within Water Resources Management Process



Source: DUKHOVNY, V.; MIRZAEV, N.; SOKOLOV, V. "IWRM implementation: experiences with water sector reforms in Central Asia" in *Central Asian Waters: social, economic, environmental and governance puzzle.* Water & Development Publications, Helsinki University of Technology, 2008. p. 20. At: www.water.tkk.fi /global/publications

The chart, developed by the leading water experts of the Scientific-Information Centre of the ICWC in Central Asia and the Global Water Partnership for Central Asia and Caucasus (GWP CACENA), illustrates the complex inter-relationships of numerous uses and users of water as a vital resource. The availability, use, and allocation of water resources must take place within a context of effective institutions and strong, capable mechanisms to handle the array of competing and often contending interests of various stakeholders. This stands as a significant factor influencing relations between riparian states, in addressing the governance and management of water resources.

Undoubtedly, acting early and constructively in close collaboration with international actors in tackling the complex factors that ascertain whether conflicts will arise out of tensions would considerably contribute to promotion of water security. The regional states must engage in joint long-term programmes and technical cooperation under the close guidance from international agencies.

So far, however, the impact of international projects, organisations and external actors, has been rather inefficient and minimal. Coordination between donor agencies is weak, as they tend to have varying mandates and project time frames. It was in fact claimed that "most donor programmes were concerned with building national state capacity rather than enhancing local participation and local capacity building. For those populations in the disaster zones or on the farms, they were often unaware of the international activity that was taking place to improve water cooperation and to mitigate the Aral Sea disaster. Although the international community invested in some local projects, such as supporting water user associations and refitting local canals, most of the large multilateral organisations directed their assistance toward large-scale infrastructure projects such as a drainage collector in the Amu-Darya Basin" (Weinthal, 2006).

Thus, narrowing down priorities and carrying out projects concertedly should be at the top of donors' agendas. Much work is needed in utilising

available diplomatic mechanisms to bring the riparian states to negotiate a long-term and overarching doctrine to govern an equitable sharing of water that includes provisions on protection of ecosystems and minimising pollution, the creation of a transparent and inclusive system of decision-making, and the installation of dispute resolution systems and mediation mechanisms, while attention should also be given to establishing feasible domestic water regimes in each of the countries of the region. In addition, the international community should express its full support for the creation of a regional water and energy consortia that would foster integration of the water and energy networks of Central Asia. In the words of one observer, "it is important to develop an integrated approach that treats energy, water and food security as intertwined issues demanding a complex and multi-faceted response rather than security challenges to be addressed separately" (Fumagalli, 2008).

Conclusions

Amidst the economic slowdown in the region, it is unlikely that over the short- or medium-term perspective, governments in Central Asia will take the necessary steps towards addressing the prevailing water management problems. And while tensions are most likely to escalate, these would in turn aggravate other non-water-related regional problems.

Establishing an efficient water resources management system is a legitimate Central Asia-wide concern that is precisely why the ruling elites of the countries must acknowledge that finding a solution to the prevailing water issues ultimately involves going beyond unilateral actions that cause harm to their co-riparians, and that a concerted action by all the region's states is a tall order. There are grounds for optimism in examining the prospects for resolving existing water related issues in Central Asia, which must be viewed in a wider geopolitical and socio-economic context.

Central Asian states continue to find themselves in a quite difficult position of prolonged balancing and manoeuvring between external players, while setting forth their own foreign policy priorities. Located at the crossroad of the strategic interests of world and regional powers, it is widely acknowledged that a divided and weakened Central Asia may become a ground for contention among the various external players, primarily Russia, China, US and the EU.

The case of water management issues in Central Asia compels one to pose some fundamental questions over how critical issues at stake such as managing regional water resources come to interplay with broader issues of great power politics, security, energy and democracy promotion agendas in what is a strategically significant part of the world.

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Impacts of climate change on water resources in Central Asia

Sulton Rahimov
Former chairman of the executive committee of the International Fund for Saving the Aral Sea (IFAS)

Abstract

This article focuses on the impacts of climate change phenomena on water resources in Central Asia. The text begins with a geographical description of the region, specifically the degradation of the Aral Sea and the economic and environmental consequences of climate change, due to the importance of water resources for the development of the region. In this context, the text analyses the impacts of climate change on glaciers and surface water resources in Central Asia, and offers some future predictions concerning the reduction of glacial areas and river flow, as a consequence of rising temperatures.

Given the predicted hydrographic changes in the region, the author presents some of the socioeconomic and ecological series of impacts for Central Asia countries. Finally, in order to deal with this future scenario, a few measures for mitigating climate change are set out, such as the reduction of greenhouse gas emissions, the use of renewable energy sources, other technical measures regarding control and data compilation such as the restoration of hydrological meteorological stations, and finally the author calls for a new strategy on water resources management in the interest of all the countries in the region, in order to tackle the threats to sustainable development and security in Central Asia.

Central Asia: general information

Central Asia is located in the centre of the Eurasian continent –at the interface of Europe and Asia– and occupies an area of about 4 million km^2. The region covers the territory of five countries: Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan, which are home to almost 60 million people. Central Asia shares borders with Afghanistan, Iran, China and Russia. Its nature is presented by the highest chain of the Pamirs and the Tien Shan, broad deserts and steppes, while the large Asian rivers are the Amu-Darya, the Syr-Darya and drainless reservoirs, the largest of which are the Caspian and Aral seas. The overwhelming part of the Central Asia region is located in an arid zone, the main distinction of which is a deficit of fresh water.

In the last third of the 20th century, Central Asia suffered an ecological crisis on a planetary scale –the degradation of the Aral Sea, once the fourth largest lake of the world in surface area. The Aral Sea began to dry up owing to excessive water intake for irrigating newly developed virgin lands in its basin. So, from 1960 till 1990 the area of irrigated lands almost doubled (from 4.3 million ha to 8.2 million ha) as a result of which water intake for irrigation also doubled. As a consequence, by 1990 the water level in the Aral Sea had fallen by more than 20 m, while the water area was reduced by more than three times. At present, the level of the Aral Sea is 28.60 m to the level of the Baltic Sea and it continues to dry up –by 2007 its level fell by 1m more. Today, water volume in the sea in comparison with 1960 has reduced by more than 10 times, reaching 93,1 km^3, while the water area has reduced by 5 times (12.37 thousand km^2 against 68 thousand km^2 in 1960).

The consequences of the Aral Sea crisis have been negatively reflected in the socio-economic development of the region. The irrational use of water and land resources led to the increase of mineralization in water resources and a salinity of soil, the deaths of fresh-water lakes and many kinds of fresh-water flora and fauna, the incidence of salt storms, desertification, the worsening of public health and the quality of drinking

water and the loss of fishing grounds. Some estimate that the economic losses connected with the Aral Sea crisis reach the massive sum of up to several hundred million US dollars in a year.

Central Asia's countries are making considerable efforts to mitigate the consequences of the Aral Sea crisis, but the situation is aggravated by new global challenges, and especially by global climate change, the influence of which is more tangible in this region.

About climate change

Climate change is one of the most important problems for the environment; it is caused by high concentrations of greenhouse gases in the atmosphere, which leads to the intensifying of the greenhouse effect and a rise in global temperatures. Sources show that considerable climatic changes occurred repeatedly in the past. However, these changes were caused exclusively by natural factors. The present climatic changes are undoubtedly caused by intensive human activity. Industrialisation, urbanisation, increasing volumes of industrial and agricultural production, the development of motor transport and road economy, in addition to socio-economic benefits have all resulted in an increasing anthropogenic influence on the environment and climatic system, raising the volume of the emissions of greenhouse gases.

The Intergovernmental Panel on Climate Change determined that for the last 100 years (1906-2005) the average temperature of the Earth's surface has risen approximately by 0.74°C; thus the average indexes on warming for the last 50 years almost double the indicators for the last 100 years. The data also specify that the quantity of ice in the Arctic has been decreasing on average by 2.7% every 10 years, while the level of the world's oceans has risen on average by 17 cm in the 20th century. Scientists and experts have linked these figures on climate change with phenomena observed during recent decades such as powerful thermal waves, new wind conditions, frequent droughts, catastrophic flooding, abundant precipitation, thawing

snowfields and glaciers, the reduction of ice volumes in the Arctic waters, as well as the increase of the world's oceans.

In each of the coming two decades, scientists forecast a future warming of approximately 0.2°C, connected with a lack of actions implemented for reducing the amount of greenhouse gases. Experts are concerned about the reducing of efforts on poverty control due to climate change. So, according to data from the United Nations Human Development Report for 2007, as a result of global warming, about 332 million people, living in coastal or waterside areas will be ecological refugees. 70 million people in Bangladesh, 6 million people in Egypt and 22 million people in Vietnam will be victims of flooding. 1.8 billion people around the world will have no access to drinking water. To prevent such a scenario the authors of the report suggest that all countries should develop adaptation plans for future changes, and that industrialized countries should reduce emissions of greenhouse gases by 80% by 2050. Failure to address this problem will result in 40% of the poorest population of our planet (about 2.6 billion people) being doomed to a future with progressively decreasing possibilities.

The influence of climate change on public health, economy and the environment

Climate variability produces very negative effects on the health of populations, promoting an increase in "thermal" diseases, death and trauma as a result of natural disasters. Climate change also promotes the occurrence of outbreaks and epidemics of infectious-parasitic diseases connected with rising temperature and air humidity.

The influence of climate change is very considerable on agriculture, hydropower and transport infrastructure, which are a source of economy development for the region. The most vulnerable sphere in this plan is agriculture and, in particular, irrigated agriculture, which consumes the lion's share of water resources and provides employment for a large

part of the rural population. Vulnerability of the rural population is also caused by an increase in natural hydrometeorological phenomena. The negative consequences of climate change for hydropower at a given stage are mainly landslips and mud-flows, thus promoting an increase in the silting-up of reservoirs. The decrease in river flow, which is expected over the medium and the long-term, will also be unfavourable for hydropower. The influence of climate change on transport infrastructure is especially typical for highmountainous regions where the main part of this infrastructure are the highways on which the basic proportion of goods turnover takes place.

The influence of climate change is more obvious on the environment. The speeding-up of processes of land degradation and desertification, the acceleration of natural hydrometeorological phenomena and the loss of efficiency of ecological systems all point to an increase in active climatic fluctuations in the region.

However, experts consider that water resources are especially vulnerable to the influence of climate change. Rising temperatures have already speeded up the hydrological cycle. A warmer atmosphere retains more humidity, becomes less stable and, as a result it leads to an increase in precipitation. Rising temperatures also speed up the evaporation process. The loss of quantity and quality of fresh water resources will be the end result of these changes in water circulation in all the different regions. In regions with a temperate climate, the thickness of mountain glaciers and snowcaps have already reduced, and especially during spring.

The glaciers of Central Asia have undergone considerable changes owing to global climate change. According to some data, in recent decades their surface area has reduced by 30-35%. Changes in areas of glaciations and the snowiness of a zone of flow formation can have considerable influence on hydrological regimes and water resources. Considering the key role played by water resources in the socio-economic development of the countries in the region, such a trend can lead to major negative consequences during coming decades.

Central Asia's water resources and their importance for the region

In Central Asia, water is life. It represents the basis of socio-economic development for the countries of the region and also a major link for national and regional security. More than 90% of the region's water resources are used for irrigated agriculture, which produces about 30% of the regional GDP and provides employment for more than 60% of the region's population. The proportion of used by the region out of the total electricity consumed is 27.3%. In some countries (Tajikistan and Kyrgyzstan) this figure rises to over 90%, a fact that that shows a clear dependence of these countrie's economies on the availability of water resources.

Water resources allocation throughout Central Asia is non-uniformly that predetermines necessity of interaction of all countries of the region for their management and use.

The water resources of Central Asia consist of the river flow formed owing to water from atmospheric precipitation, melt glacial waters and underground waters. Table 1 shows the volumes of surface flow of the large rivers of region –the Amu-Darya and the Syr-Darya, which are of particular interest owing to their special importance, both for economic management and for geopolitical purposes.

There are more than 4,000 reservoir-lakes and water reservoirs in Central Asia. The largest of them are: the diminishing Aral Sea, one of the deepest lakes of the world –Issyk Kul (668 m), Lake Balkhash and Lake Sarez. On the Naryn river lies he Toktogul reservoir measuring 19.5 km^3, while on the Vakhsh river there is Nurek reservoir (10.5 km^3). Along with them there are more than 3,000 very small high-mountainous glacial lakes, tens of seasonally regulated reservoirs of, and thousands of basins and ponds of a decade and daily regulation.

The underground water resources of Central Asia within the framework of the Aral Sea Basin are estimated at 43.77 km^3, with available resources totalling 15.83 km^3.

Table 1. Formation of surface flow in the Aral Sea Basin

Countries	Amu-Darya River		Syr-Darya River		Total	
	km³	%	km³	%	km³	%
Kazakhstan	0.00	0.00	4.50	12.12	4.50	3.89
Kyrgyzstan	1.90	2.42	27.40	73.77	29.30	25.35
Tajikistan	62.90	80.17	1.10	2.96	64.00	55.36
Turkmenistan with Iran	2.78	3.54	0.00	0.00	2.78	2.40
Uzbekistan	4.70	5.99	4.14	11.15	8.84	7.65
Afghanistan	6.18	7.88	0,00	0,00	6.18	5.35
Total	**78.46**	**100.00**	**37.14**	**100.00**	**115.60**	**100.00**

Source: Fundamentals of Water Strategy of the Aral Sea Basin, 1996.

Table 2. Underground water resources of the Aral Sea Basin

State	Estimation year	Regional resources km³/year	Proven available resources, km³/year
Kazakhstan	1990	1,845	1,224
Kyrgyzstan	1990	992	688
Tajikistan	1994	18,230	6,016
Turkmenistan	1994	3,033	1,120
Uzbekistan	1990	19,679	6,781
Total		**43,769**	**15,829**

Sources: Fundamentals of Water Strategy of the Aral Sea Basin, 1996.

The main sources for river flow in Central Asia are glaciers and snowfields, providing 25-30% of annual flow and up to 50% for the vegetative period. They are distributed unequally through the countries of the region. Within Kyrgyzstan there are 8,200 glaciers with a total surface area of 8,169.4 km², occupying 4.2% of the country's territory. Kyr-

gyzstan glacier water reserve is estimated at 650km^3. The number of glaciers in Tajikistan is 14,509 with a total area of 11,146 km^2, or about 8% of the country's territory. The total ice reserve in glaciers is 845 km^3. Other glacial areas in Kazakhstan can be found on the Zailijsky Ala Tau, Jungarsky, Kungey and Terskey Alatoo ranges, and an inconsiderable part on Uzbekistan's territory (basically in the Ojgaing Basin with a glacial area of 59.5 km^2).

The glaciers are more subject to the influence of climatic change, which leads to the reduction of the flow of melt water into rivers. The water flow accumulated in glaciers is important during years of little precipitation, and at the end of summer when seasonal snow cover has mostly thawed. Thus, glaciers act as buffers, operating as flow regulators and providing security during periods of low flow. Over the short-term, thawing glaciers will provide an inflow of additional water into rivers, though in the more remote future, when glaciers thaw, their buffer effect will disappear. Thus, there will probably be an increase of flow changeability with an according change in its reliability (Kotlakov; Seversky, 2006).

The impact of climate change on water resources in Central Asia

The impact of climate change on glaciers

Glaciers are one of the striking indicators of climate change and, to a certain extent, an environmental reaction of a zone of flow formation to global warming. At present in Central Asia there is an intensive reduction in glaciations, which explains the increase in the general background temperature and the change in the nature of precipitation. Sources show that during the period 1956-1990, the glacial resources of Central Asia were reduced by more than three times, and they continue to be reduced at an average rate of 0.6-0.8% a year of glacier area and about 0.1% of ice volume (Seversky; Tokmagambetov, 2004).

Observations of Tien-Shan's glaciers show that a warming climate leads to their steady reduction. So, on Tuyuksu glacier (located in the ridges of the northern Tien-Shan) and Kara-Batkak glacier (Issyk Kul mountain range), glacier surface area from 1957 to 1997 reduced by 16.5 and 18.0 meters, or more than one-third of the glacier's average thickness. The largest glacier in the Kyrgyz Ala Too –Golubin Glacier– shrank by 6m from 1972 till 1993 (Podrezov; Dikikh; Bakirov, 2003). On Ak-Shyjrak massif, for the period of 1943-1977, in height intervals of 3700-3900 meters, glacier surfaces reduced by 13,3-14,4 meters, and of 4,800-5,000 meters–3.7-6.0 meters (Kuzmichenok, 2006). Observations show that glacial areas of Kyrgyzstan could be reduced approximately by 20% since the creation of the "Catalogue of USSR glaciers" in the 1950's-60's.

Tajikistan's glaciers, which form a considerable part of the glacial river flow of Amu-Darya basin, are subject to considerable influence by climate change as well. The surveys of the front of Zeravshan Glacier showed that from 1908 till 1986 it actively degraded and reduced by almost 1 km. The lower border of Abramov Glacier from 1850 till 1984 retreated by 80m, while the ice volume on the glacier tongue decreased by 630 million m^3. Fedchenko Glacier which, at over 70 is the largest in the country, reduced by almost 1 km during the 20th century, while its surface area decreased by 11 km^2 and it lost about 2 km^3 of ice. Thus all the inflows on the right have almost separated from it, becoming independent glaciers. Now the lower part of the glacier is broken up for 6-8 km into cracks and covered by glacial lakes that testify to the continuing degradation of this, the largest glacier in Central Asia. According to the most conservative assessments, the glaciers of Tajikistan have lost more than 20 km^3 of ice in the 20th century. Intensive degradation has affected small glaciers with areas of less than 1 km^2, which make up 80% of all glaciers.[1]

1. Climate change - forecasts of Tajik experts. Dushanbe, 2002. Results of expeditions organised by the Executive Committee of the International Fund for Saving the Aral Sea (IFAS), the Regional Center of Hydrology (RCH) and the National Hydrometeorological Services (NHMS) of Tajikistan, 2005-2006).

In Kazakhstan's mountain systems, a reduction in the number and size of glaciers is also observed. Most intensively, glaciation decreased from the middle of 1950 till 1980, reaching a maximum in the first half of the 1970s. During the period from 1956 till 1990, glaciations in the mountains of south-east Kazakhstan was reduced by an average intensity of 0.85% a year as regards glacier area, and 1.0% in ice volume (Alamanov et al. 2006).

The arranged research shows that glaciers –depending on their size, character and height– react differently to climate changes. So, on Glazyrin's assessments (2006), the higher that river basins are located, the steadier the glaciations. Exactly because of this, the Pamirs glaciations (which on average lay higher), was reduced to less than the lower glaciations of Gissaro-Alay. Data also show that the smaller a glacier is, the more it is subject to the influence of climate change. Furthermore, it was shown that the ablation of small glaciers is more intensively at the edges than in the middle. Glacier location also has a considerable influence. So, the glaciers lying on slopes of southern rhumbs are on average more resistant to climate change, and are reduced more slowly than on the slopes of northern rhumbs. And this is true in spite of the fact that they are, as a rule, smaller in size (Glazyrin, 2006).

The experts claim that if rates of glacier thawing are halted saved, then over the medium and long-term, the flow of mountain rivers will be lowered twice more.

Impacts of climate change on surface flow

Observations show that climatic changes have considerable influence on the hydrological regime of surface flow. In regions where the essential part of river flow is at present formed from melt waters, the maximum flow values will move from spring to winter, whereas the majority of precipitation will fall there in watery form because of high air temperatures. The increase of river flow in high latitudes –and also its decrease– is characteristic of Central Asia.

Hydrometeorological observations showed that the asynchronous course of atmospheric precipitation and air temperature in the high-mountain zone of Tien-Shan negatively affects the balance of glaciers and is reflected in the general water content of rivers, with a considerable glaciation of catchment areas (>10%). Thanks to negative trends in precipitation and positive trends in temperatures in the rivers on the northern slopes of Kyrgyz Ala-Too, Terskey Ala-Too and large inflows of the Sary-Jaz river, the flow for the period of 1963-1990 (in comparison with the flow for 1930-1960) increased by 11.0-28.6% in July, while annual values increased by 11.3-17.1%. The implemented estimate of the change of volumes of glacial flow of the Naryn river (being a basic component of Syr-Darya) by 2010, in conditions of continuing warming, showed that they will increase in the basins of all its main inflows that will lead to growth in the general flow (Podrezov; Dikikh: Bakirov, 2003). This conclusion has been based on the analysis of hydrometeorological conditions for 1991-2000, when average summer temperatures for a high mountain zone were above the norm by 0.6 °C, and July temperatures by 0.9 °CCThe precipitations here were lower than the norm by 22%, while in the mid-mountain zone they were near the norm. Thanks to these conditions of warming and humidity, the annual flow of the Naryn river exceeded its average water content for 1991-1996 by 15.7%, thus a compensating role of glacial flow was clearly shown here. According to data from V. Kuzmichenok (2006), the total river flow in Kyrgyzstan increased by 6.2% from 1972 till 2000.

The dynamics of river flow during the decades (data from NHMS of Tajikistan) shows that in Tajikistan a general tendency was observed of a decrease of surface flow during the period of 1971-1980, in rivers with a snow-glacial source type within 11-14%, and snow-rain 8-21%. In the following decade, 1981-1990, the flow volume in rivers with a glacial-snow source type decreased a little (1-10%), and in rivers with snow-glacial and snow-rain source type it increased

(5-25%). A mid-annual flow volume for the period of 1990-2000 rose with respect to the last decade because of an increase in precipitation and temperature rise. During the period of 1961-1990, the total amount of the average annual flow formed in the territory of Tajikistan decreased by 4 km^3/year, i.e. an annual reduction of flow that represents 0.13 km^3/year.

According to data from the Scientific-Information Centre of the Interstate Coordination Water Commission of Central Asia (SIC-ICWC) the flow of the Syr-Darya river and its inflows for the last 17 years totalled 41.6 km^3, that is, above the mid-long-term and annual volume for 1950-1990 by 3.4 km^3 (or 8%). If we compare the average values of annual flow of the Syr-Darya river for 17 years with the mid-long-term flow for the entire period of observation of 1911-2007 (37.6 km^3) then the flow growth for 17 years will be higher (10%). The flow of the Amu-Darya river and its inflows for the last 17 years totalled on average 69.2 km^3, that is, lower than the mid-long-term annual volume for 1950-1990 by 1 km^3 (1.5%), but it practically coincides with the mid-long-term flow for the entire period of observation (1911-2007) –69.3 km^3 (Dukhovny et alias, 2008).

Thus, it can be stated that in general, river flow did not undergo special changes, though its interannual fluctuations with inconsiderable deflections are obvious. At a given stage, both increase and lowering of river flow is observed simultaneously, depending on the nature of their nourishment. According to data from Agalceva (2002), a river flow with a snow source type reduces faster according to rising temperatures. The rivers with considerable contribution from glacial flow are more "inert" in this plan, as temperature rise intensifies the thawing of high-mountain snow and glaciers, creating some compensation conditions for flow formation. At the same time, in connection with the continuing degradation of glaciation which progresses with rising air temperatures, it is estimated that there will be flow reduction here as well, probably, even more actively (Agaltseva, 2002).

Prediction assessment of climate change influence on glaciers and river flow

For research of possible scenarios for climate change in Central Asian countries, the following different scenarios and models of global climate change –HadCM2, CCCM, GFDL, GISS, UK-89, ECHAM4, GFDL, IS92 etc.– have been used. The estimates show considerable changes in glaciation and surface river flow in the region for the medium and long-term future. To a greater degree, these changes will be shown in the form of reducing the glaciers' areas and volumes and reducing river flow owing to the rise in temperature and increased precipitations.

Predicted assessment for glaciers

Glaciation change will depend on such factors as temperature rise, precipitation and structure of relief, which vary in the different basins. If we consider the evolution of glaciation for the last 50 years, and we compare data on the morphometry of glaciers of the USSR Catalogue published in 1965-1982 with data from ground observations and the ACF of glacial areas, then against the general background of a reduction in the number of glaciers, there were stationary indicators and some expansions (increasing linear dimensions, the "revival" of "dead" tongues). For the great bulk of glaciers, reduction indicators are characteristic: the disappearance of glaciers of 1 km^2, the reducing of ablation areas, the breaking up of large glaciers into separate inflows, the increase of moraine areas and natural glacier pollution (Agaltseva, 2002).

Forecasts by experts and scientists in Tajikistan show that by 2050, one thousand small glaciers will disappear in the country, the glaciation area will be reduced by 20%, and the ice volume will decrease by 25%. This will lead to a reduction in the glacier supply of rivers by 20-40%. The total flow of the Zeravshan, Kafarnigan, Vakhsh and Panj rivers will lower by 7%. The predictive increasing quantity of atmospheric precipitation by 14-

18% will not have a considerable influence on flow, as the most part, fallen precipitation will evaporate from surfaces of catchment areas.[2]

An expedition of Kazakh glaciologists that took place insummer 2005 confirmed this continuing reduction of glaciers in the Northern Tien Shan. Connecting this process with global climate warming, the expedition's participants note that, if glaciers' thawing rates persist, within the next 10-15 years the flow of mountain rivers will be reduced by double (Seversky, 2006). According to materials from the 13th Glaciologist Symposium (Materials of glaciologist researches, 2004) the available tendency may already lead to the disappearance of glaciers in the Southern Jungaria by the middle of the 21st century.

In general, according to experts' assessments, the air temperature rise by on 1-2 °CGwill strengthen the process of glaciation degradation. During 1957-1980 the glaciers of the Aral Sea Basin lost 115,5 km^3 of ice (about 104 km^3 of water), which represented almost 20% of ice reserves for 1957. By 2000 the losses have totalled 14% of the reserves for 1957. By 2020-2025, the glaciers will lose no less than 10% of their initial volume (Agaltseva, 2002).

Predicted assessment for surface flow

Analysis of existing research shows different forecasts for the influence of climate change on river flow in Central Asia. Data from research studies varies from inconsiderable flow changes (2-7%) to considerable (10-40%) over the long-term future.

According to Agaltseva's data (2002), calculations carried out on a mathematical model of the formation of mountain rivers flow at the

2. Climate change - forecasts of Tajik experts. Dushanbe, 2002. Results of expeditions organised by the Executive Committee of the International Fund for Saving the Aral Sea (IFAS), the Regional Center of Hydrology (RCH) and the National Hydrometeorological Services (NHMS) of Tajikistan, 2005-2006).

realisation of various climate change scenarios allow us to assume that in the next 20-30 years, a considerable change of water resources should not be expected. However, as a result of climate warming there will be a reduction in average water consumption for the vegetative period. The possible flow changes of this period will be within natural variability: from +3 to -2. In particular, a considerable reduction in the flow of the Amu-Darya and Syr-Darya rivers in the next 20-30 years is not expected (Agaltseva, 2002).

Table 3. Expected change in water resources of the main rivers of the Aral Sea basin at realisation of various climate scenarios (in % from base rate)

River	Base rate (km³/year)	Climate scenarios		
		ECHAM4	HadCM2	IS92ab(t)
Syr-Darya	37.9	-2	-1	-2
Amu-Darya	78.5	-3	-3	-4

Source: Agaltseva, 2002

According to predicted assessments in the First National Report of the Republic of Tajikistan under the United Nations Framework Convention on Climate Change (2002), glacial supply of rivers in Tajikistan will be reduced by 20-40%, and the total flow of the Zeravshan, Kafirnigan, Vakhsh and Pyandj rivers will fallby 7% (an optimistic assessment). In the more remote future, the temperature rise by 3-4ºC in comparison with that of the present will lead to considerable glaciation degradation, which will result in a catastrophic decline of the water content of rivers, by 30% or more. The same opinion is shared by some experts in Kazakhstan, who consider that within the next decades, owing to global climate warming, the water resources of Kazakhstan's main rivers of may be reduced by 20-40%.

Considering the fact that flow forecasts for the long-term future should be based on the above long-term climate forecasts which are characterised by their low reliability, it can be supposed that in the future, nature will give us many surprises, in particular regarding the change of hydrological regime in Central Asia's rivers. However, in spite of forecasts on flow change, it must be remembered that the growth in water consumption in the region, linked with population growth and the intensive development of the countries's economies, will reach 15-20% by 2025-2030.

Socio-economic and ecological consequences of climate change in the region

There are not many countries in the world that depend so much on each other as these five Central Asia countries. Water and power resources are one of the basic links of this region's countries. The upstream countries have one of the world's largest resources of fresh water, while the downstream countries have considerable mineral resources. And if the latter countries depend on their "upper" neighbours for the intensive irrigation needed for cotton growing, then the upstream countries depend on their "lower" neighbours to the same degree for power.

Natural flow resources in the Aral Sea Basin have already disappeared completely, and the region's economy is developing in conditions of increasing water shortage. Their total use has now reached 130-150% in the Syr-Darya river basin and 100-110% in the Amu-Darya river basin (Kipshakbaev; Sokolov, 2002). Therefore, the impact of climate change will be especially marked in agriculture, and, particularly, in irrigated agriculture that consumes more than 90% of water resources of the region. Irrigated agriculture also provides about 30% of the GDP and ensures food security in the countries of the region. Cotton the dominant crop in irrigated agriculture, representing 20 to 40% of the exports of some countries of the region (Tajikistan, Turkmenistan and Uzbekistan). Besides the considerable economic benefit, irrigated agriculture also pro-

vides employment for much of the rural population. The lives of some 22 million people in Central Asia directly or indirectly depend on irrigated agriculture. The vulnerability of agriculture is also caused by an increase in natural hydrometeorological phenomena, the loss of water supply and the expansion of areas of soil degradation.

The negative consequences of climate change for hydro-power at the given stage are caused more by landslide and mud-flow phenomena than by a change in the hydrological regime of the rivers. So, the infrastructure for constructing Rogun HPP in Tajikistan was a victim of the flood in 1993. In the same river basin, in March 2002, owing to a complex influence of geodynamic and meteorological factors (storm precipitation), a large landslide massif was formed in the tail-water of Baipaza HPP. The increase in precipitation, especially in the areas subject to water erosion, has intensified the increase in silting of reservoirs. The formation and break-up of glacial lakes also constitute a potential threat to hydro-power infrastructures in this area. The reduced river flow that is expected over the mid- and long-term future will be unfavourable for hydro-power; it will also require reconstruction and change of the operating regime mode of waterworks facilities, the construction of additional reservoirs, protection facilities etc.

The influence of climate change is more obvious on the environment. More long, dry periods together with high spring and summer air temperatures can potentially increase the risk of processes of soil degradation and desertification. The anthropogenous influence occurring within climatic changes will aggravate these processes even more. In this region, more than 5 million hectares of irrigated land is in an unsatisfactory state as regards soil-reclamation, and is subject to salinization and waterlogging. There is uncontrolled felling of trees and shrubs in a zone of flow formation that is linked with hydro-power deficit in winter periods. The structure and efficiency of ecological systems are also subject to risk by the influence of global climate change. It is expected that in connection with reductions in river flow and temperature rise, together with an increasing anthropogenous load, the riparian woodlands will be degraded. In the case of frequent, pro-

longed drought, hygrophilous vegetation may be under threat. Warming will result not only in a change in diversity of flora and fauna species, but also in changes of biological interrelations in ecosystems. Against this background, new kinds of flora and fauna may also occur, species that are not characteristic to the region. Expected climate change may have a negative influence on the state of natural pastures and hayfields, which are a source of production of cheap food for animal husbandry.

Different disasters such as droughts, floods, mudflows, landslips, etc are increasing in the region owing to the climate changes that are occurring. Annual economic losses from such phenomena total hundreds of millions of dollars, not counting human lives. According to the Human Development Report on Central Asia (2005) the potential economic costs may reach 70% of the GDP of Tajikistan, 20% of Kyrgyzstan's, with more moderate figures of 3-5% in Kazakhstan, Turkmenistan and Uzbekistan.

Owing to climate change occurring in the region, phenomena have been observed such as an increase in cardiovascular system pathologies, a growing influence of hypoxia in high-mountain areas, and outbreaks of epidemics of infectious-parasitic diseases connected with temperature rise and air humidity. In the case of floods, storm precipitation and the deterioration of the state of public water supply systems, together with abackground of high temperatures, the risk of typhoid fever, paratyphois, salmonellosis, dysentery, amebiasis, helminthiasis, etc. has increased (Kajumov; Makhmadaliev, 2002).

The above problems require urgent measures to be taken to adapt to climatic changes and to mitigate their influence in all Central Asia countries.

Measures for adaptation to climate change

Mitigating the influence of climate change requires a complex approach, including measures for reducing emissions of greenhouse gases and adaptation. One of the main measures in this plan is to reduce emis-

sions of greenhouse gases and to improve the state of natural carbon absorbers. All the countries are signatories of the UN Framework Convention on Climate Change, which came into force on 21 March, 1994. The ultimate aim of the convention is to stabilise the concentration of greenhouse gases in the atmosphere at such a level that would not represent a dangerous anthropogenic influence on climatic system. Within the framework of the aforementioned convention the countries of the region develop national programmes for reducing climate change and adapting to its consequences, as well as submitting information on an inventory of greenhouse gases to the convention secretariat.

Considerable emissions reductions in the atmosphere would be encouraged by giving priority to the use of renewable energy sources instead of fuels that are the main sources of air pollution. Within this plan, hydroresources (which have an effective potential of 460 billion in KW hours/year, exceeding the consumption of the Central Asia region by more than three times) are preferable. Up to 10% of this potential is used. Construction of the Rogun and Dashtijum HPPs in Tajikistan and Kambarta HPPs in Kyrgyzstan, with reservoirs that will enable the maximisation of flow regulation levels for the Amu-Darya and Syr-Darya for many years to come, and will provide a secure water supply, and may improve the situation in this sphere. Besides being an ecologically clean and cheap power supply, hydro-power is also important from the point of view of the sustainable use of natural resources in the long-term future, after oil and gas reserves (which are intensively used by some countries in the region for generating electric power) have been exhausted. The reservoirs of waterworks facilities, besides their reliable long-term and seasonal flow regulation maintenance, also promote the prevention of such extreme hydrological phenomena as flashing, mud-flows and flooding, and the mitigation of the consequences of drought.

Mitigating negative water-related consequences also requires a safe hydrometeorological monitoring system. After the collapse of the Soviet Union, the hydrometeorological network of the region declined. However,

since then adequate measures have been taken which have considerably improved the situation. At present in the region, thanks to financial support from the Swiss Agency for Development and Cooperation, the project "Swiss support to NHMS in the Aral Sea Basin" has been implemented, aimed at restoring hydrological and meteorological stations, improving the quality of forecasts and data exchange at national and regional levels, and also providing the necessary NHMS of CA countries with equipment and software. In 2007, the Executive Committee of IFAS and World Meteorological Organization commenced the project "Hydrological Cycle Observing System in the Aral Sea Basin" (Aral-HYCOS) which is also intended for strengthening the capacity of the NHMS of Central Asia in the sphere of water resources assessment and research into the global hydrological cycle. The project is supported by some donor agencies.

In conditions of climate change, there is a need for effective use of soil and water resources, with the minimisation of anthropogenous influence. This, first of all, concerns irrigated agriculture, and the need for the development of new ameliorative regimes, an increase in the efficiency of irrigation systems and introduction of progressive irrigation methods, encouraging water saving, and the optimising of an agricultural composition by moving from hygrophilous to more drought-resistant crops for reasons of food security. It would be promoted appreciably by the introduction of Integrated Water Resources Management (IWRM).

However, a primary factor in ensuring water security against the predictable reduction of river flow in Central Asia is undoubtedly the regulation of the use of water resources at the interstate level. Central Asia needs a new strategy of water distribution, to be developed taking into account the climatic changes occurring and development scenarios on a medium- and long-term basis and considering the interests of all the countries of the region. At present, water resources in the Central Asian part of the Aral Sea Basin are used on the basis of feasibility studies from the USSR period, adopted by agreements from the Post-Soviet period. In the new political and economic conditions, the interests of the countries of the region were

divided. Tajikistan and Kyrgyzstan –where the main flow of the Aral Sea Basin (more than 80%) is formed– are interested in using the available water resources for power generation, but the downstream countries (Kazakhstan, Turkmenistan and Uzbekistan) intend to continue to use the same resources for irrigation. The situation is aggravated by the fact that the upstream countries are interested in the maximum water discharge in winter, when electricity needs are very high, while the downstream countries need the same maximum water discharge in the summer for irrigating land. All these gradually become a potential risk for starting conflict in the region.

Thus, it can be stated that the extent of the problems and tasks with respect to mitigating the influence of climate change is impressive and covers almost all the spheres of human life activity. Priority attention in the region should be paid to this problem, together with to the extensive drying-up of the Aral Sea. Mitigating and overcoming these crises will require the mobilisation of efforts by all stakeholders and more harmonious cooperation between the Central Asian countries. The difficulties of the last winter, followed by a drought-affected summer have shown again the necessity for valuable and effective cooperation in the region. Only together can we withstand all these threats.

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Integrated Water Resources Management (IWRM) issues in Uzbekistan[1]

Ulugbek Islamov
Specialist on land and water resources, UNDP in Uzbekistan
Farhod Maksudov
Environment Specialist, UNDP in Uzbekistan
Dilafruz Maksudova
Research student at Tashkent Irrigation and Melioration Institute

Abstract

The economy of Uzbekistan depends heavily on the availability of water resources because of its geographic location in an arid climatic zone. The current population growth in Uzbekistan's rural areas has led to a present-day situation of increasing competition for water among backyard and farm field holders (respectively called *dehqans* and *farmers*), since modern irrigating networks do not take into account the population growth. Improved integration of water resources management on a local level can mitigate the conflicts and considerably decrease expenditures on water supply in the future. Thus, there is only one solution, which is the creation of the system of economical and rational water use, leading to the country's survival of the in a situation of water shortage. These tasks require absolutely new approaches. The United Nations Development Programme (UNDP) Country Office in Uzbekistan has conducted a study and, as a result, in consultation with the specialists from relevant state agencies, it has developed a programme for a step-by-step implementation, and generally, by mainstreaming the Integrated Water Resources Management Organization (IWRM) principles and approaches for Uzbekistan, which will be based on a pilot site. Based in the inputs of more than 20 Uzbekistan State agencies, the project will include components at national and basin levels. The potential to attract all sectors and beneficiaries into the process of decision-making, which can be done only with the IWRM, enables us to reflect on the all-inclusive "value" of water for society in general, and to solve the difficult issues of water distribution. Mainstreaming the IWRM will create an opportunity to integrate sustainable systems for cleaning territories, which will be directed the minimisation of waste during production.

1. Opinions expressed in this article are of the authors only and do not reflect the position of the UNDP.

Review of water-related issues

The Republic of Uzbekistan covers about 447,000 km^2 or 44,7 million ha. The irrigated area is about 4.3 million ha, or 10% of the total area; the rain-fed area totals 900,000 ha, pasture land 22.4 million ha, forests cover 1.3 million ha, while the area not in use totals 16 million ha (UNEP, 2006). Precipitations have a highly uneven distribution throughout the country, since its natural landscapes vary from high mountainous *alpine* meadows, down to the fertile piedmont foothill zone, down to steppes of so-called Central Asian Mesopotamia (between the two main rivers – the Syr-Darya and the Amu-Darya) and then down to the sandy deserts of the Turan Lowland. Average rainfall in desert areas is 200 mm/year, 400-800 mm/year in the piedmonts and highlands, and reaches 2,000 mm/year in high mountain areas (UNDP, 2007).

In 2005, the population of Uzbekistan reached 26,021,300. The rural population represents 63% of the total figure[2]. Agriculture accounts for 28% of the GDP, 44% of employment, and 60% of export revenues. Uzbekistan is the fourth largest cotton producer in the world. Cotton production contributes to 40% of export revenue, while wheat production is a key component of the nation's food security strategy. The government currently procures all the cotton production and 50% of the wheat production.

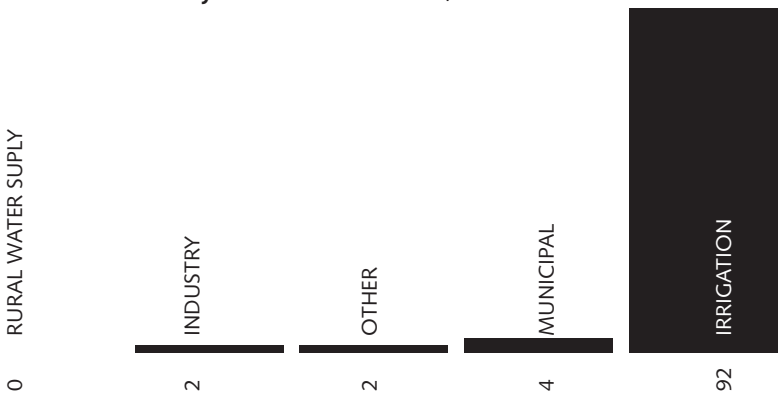
The country's u0nderground water reserves are estimated at approximately 24.3 km^3. About 276 of the nation's 357 underground aquifers are currently in use (UNDP, 2007). There are restrictions on drinking for many sources of groundwater due to high levels of mineralization and other types of pollution.

As of 2006, irrigation accounted for 92% of total water consumption, municipalities consumed 4%, industry consumed 2%, and other users

2 www.statistics.uz.

consumed 2%. By 2015, the percentage of water use among agricultural users is anticipated to decline by 10%, while total consumption among municipal water users is expected to increase by 5%; industrial water use will be increased by less than 1%, rural domestic water supply will also increase by 1%, and other uses of water will be increased by 3%. The reduction in agricultural water use is anticipated to be achieved through water conservation measures in this sector (ADB, 2007). Uzbekistan's water resources are 100% allocated. Thus, water conservation is necessary to ensure water supplies that can support future economic growth.

Figure 1. Water use by sector in Uzbekistan, 2006



Source: Asian Development Bank, 2007

Current estimates indicate that 6 million people (or 22% of the total population) are exposed to significant water pollution, and the poor are disproportionately affected. ADB estimates that 30% of the population in rural areas and 70% of the population in urban areas have access to water. Drinking water delivery systems face long cross-country transmission, and there are high distribution losses. There are significant financial constraints to treating wastewater adequately. Deterioration of

the quality of drinking water due to groundwater pollution is another closely-related problem (UNDP, 2007). Thus, the single most pervasive environmental challenge for Uzbekistan is to establish sustainable patterns of land and water use.

Uzbekistan's irrigated land area increased from 2.5 million ha to 4.22 million between 1960 and the mid-1980s. Raw cotton production increased from an average of 2.95 to 5.37 million tons annually during this period (UNDP, 2007). The irrigation system supporting agricultural output was 80-85 % efficient. However, the productivity of arable land declined due to environmental impacts, while water scarcity limited the expansion of irrigated areas in the mid-1980s (UNDP, 2007).

Generally, 50% of the irrigated area is currently affected by salinization, while 19% is threatened by water erosion. Salinization reduces cotton yields by 20-30% on slightly salinized land, by 40-60% on moderately salinized land, and by 80% or more on heavily salinized land. Agriculture faces declining productivity, as high water tables, inappropriate irrigation and under-maintained drainage systems increase salinization and water logging, and erode the fertility of arable land. This reduction in the resource base is estimated to cost about $1 billion annually in foregone economic output. However, even accepting the most pessimistic assumptions (including consideration of environmental externalities), 88% of the irrigated area is considered profitable, with only 12% of irrigated land producing at a loss. Analysis indicates that rehabilitating irrigation and drainage (I&D) systems is less expensive than cash transfers equivalent to the value of the lost income from irrigation and the social disruptions that would derive from a decision not to invest in these systems (World Bank, 2003).

Currently, 32% of the inter-farm and main canals require reconstruction and 23.5% are in need of repair. More than 42% of the on-farm irrigation network requires reconstruction. The majority of the nation's 1,130 pumping stations that supply water to 2.1 million ha have exceeded their design life. Additionally, 11 of the nation's 27 reservoirs are in need of de-silting, with silt almost reaching the outflow level of 5 res-

ervoirs. Water losses from distribution systems are estimated at 12.9 km^3 per year. The World Bank estimates that a total of $23 billion would be needed to cover all these costs (UNDP, 2007).

The State budget currently finances only 20% of the level of investment that was in place prior to independence. During the period 1995-2004, Government expenditure on the water sector declined from 22.6% to 7.5% of the GDP[3]. While land productivity also declined by 23%, the cost of agricultural input increased significantly. The operation and maintenance costs of the nation's irrigation system more than tripled during the period 1999-2004[4]. The cost of electricity more than doubled. Currently, the agricultural sector consumes 20% of the nation's electricity, with electricity costs currently comprising 70% of the Ministry of Agriculture and Water Resources (MAWR) budget.

There are an estimated 4,235 water consumers/users nationally, including 2,733 agricultural associations and 1,496 non-agricultural users (UNEP, 2006). The average coverage area of water user associations is 2,500 ha of farmland. Some 73% of Uzbekistan's Water Users Association (WUA) are made up of private farms and 27% of *dekhan* farms. The average plot size per WUA member is 21.6 ha. The equipment owned by the associations is quite limited[5].

Domestic water supply and wastewater facilities also suffer from a lack of funding for upgrades, operation and maintenance on a scale comparable to that of irrigation systems. Only 65% of the rural population have an adequate water supply, though there are current plans to increase this to 90% by 2010.

3. Source: Report on the Study of Efficiency of Budget Expenditures for Financing of Water Organizations, and MAWR's and Ministry of Macroeconomics and Statistics Data.
4. Source: Report on the Study of Efficiency of Budget Expenditures for Financing of Water Organizations, and MAWR's and Ministry of Macroeconomics and Statistics Data.
5. Overview of Current Legislation and Normative Base on Water and Land Resources Management in the Republic of Uzbekistan.

Potential IWRM Strategy for Uzbekistan?

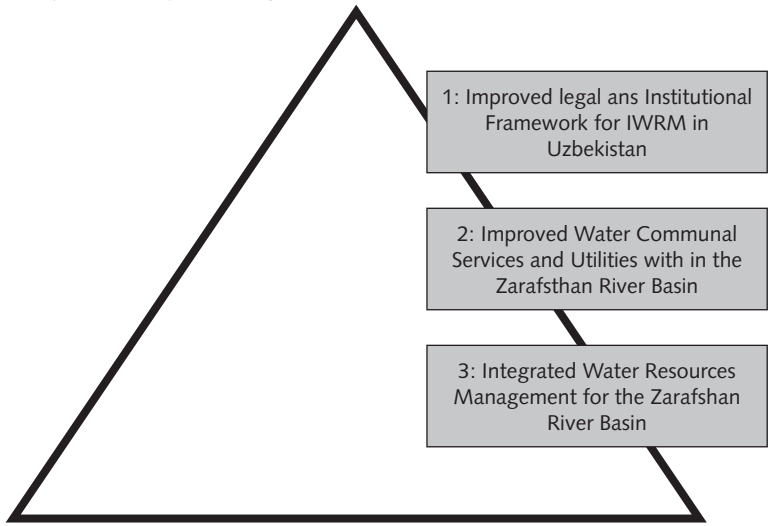
The United Nations Development Programme (UNDP) Country Office in Uzbekistan has conducted a study and, as a result, in consultation with the specialists from relevant state agencies, has developed a programme for a step-by-step implementation, and generally, mainstreaming the Integrated Water Resources Management Organization (IWRM) principles and approaches for Uzbekistan, which will be based on a pilot site. For this purpose, more than 20 Uzbekistan state agencies were consulted during the preparatory assistance phase in order to obtain input on the design of the IWRM Project at both the national and the basin level. Based on their input, the IWRM Project will include components at the national and basin levels.

The national level aspect of the programme will focus primarily on improving the legal and institutional basis for integrated water resources management in Uzbekistan. At the basin level, a pilot programme will be conducted within the Zarafshan river basin to develop an integrated water resources management and water use efficiency plan that incorporates actions for meeting the Millennium Development Goals (MDG) goals and the Welfare Improvement Strategy Plan (WISP) targets for water and sanitation for this basin. Later, the lessons learned from the Zarafshan model can then be scaled up to the national level.

The IWRM Project for Uzbekistan will include three main components:

- Improved Legal and Institutional Framework for IWRM in Uzbekistan
- Improved Water Communal Services and Utilities within the Zarafsthan River Basin
- Integrated Waer Resources Management for the Zarafsthan River Basin.

Figure 2. Project Components



Source: IWRM**,** Project Components

All three components of the project will be conducted through a stakeholder-driven process, where consultative working groups are established to oversee the main project and provide specific technical inputs at the national and basin levels for each of the component tasks and subtasks. The Project provides programme support for each of the three components, support for meetings and facilitation, and capacity building where necessary. It also supports the drafting of detailed assessments and technical assistance, where it is necessary to develop strategies. The demonstration pilots under components 2 and 3 for verifying underlying assumptions of strategies to be incorporated into the IWRM and Water Use Efficiency Plan for the Zarafshan river basin are also supported by the project.

Figure 3. Overview of Project Schedule

Source: IWRM, Overview of Project Schedule

Improving Legal and Institutional Framework for IWRM

Within this component the institutional and legislative framework for the water sector will be adopted to ensure adequate quality and availability of water resources to support the following WISP goals:

(a) A macroeconomic policy environment that ensures GDP growth rates as a percentage of prior year from 108.2 in 2007 to 108-109% in 2015 and Per Capita GDP Growth rates that increase from 107% in 2007 to 107-108% in 2015 (WISP, Anex 2, vii).
(b) An increase in the contribution of the Industrial sector to GDP from 21.1% in 2007 to 27.2% in 2015 (WISP, Anex 2, vii).
(c) Development of agriculture through completing the process of moving to private farming, strengthening the institution of long-term leasing in order encourage farmers in the efficient use of and long term capital investment in their land. Production volumes of farms as % of gross output of agriculture increases from 35% in 2007 to 50% in 2015 (WISP, Anex 2, x).

This component includes two major tasks:
(1.1) Establishing the government's Project Advisory function
(1.2) Modernizing the national water legislation.

Within Task 1.1, the government's Project Advisory function should be produced by government decree that will form a Project Steering Committee and Technical Advisory Group. The Project Steering Committee will be an inter-sectoral group comprised of representation from ministries, State committees and institutes linked with water resources management or ministries representing sectoral water users. This group should meet on a quarterly basis throughout the project. The Technical Advisory Group will be comprised of national experts who are designated as key points of contact by the Steering Committee for day-to-day interaction with the project. This group will meet on a monthly basis. The output of this task will be an improved inter-sectoral coordination at the national level for integrated water resources management.

Within Task 1.2 the Republic of Uzbekistan's Law on Water and Water Use will be updated and modernised. One objective of this effort would be to create a legislative framework that would include water committees (registration, licensing, taxation, tariffs, etc.) set up in rural areas to manage water supply and sewage utilities. Water committees are non-governmental non-profit organizations of citizens based on self-government in rural areas that will promote an economical use of water (consumption) at the lowest cost and energy-saving in the operation and maintenance of water systems. The creation of Water Committees as a form of organisational management of water supply in rural areas will contribute to the further development of market relations in the public sphere.

The work in this component should be completed within the first 18 months of the project to enable effective IWRM planning at the basin level. An inter-sectoral working group to revise national water legislation will be established through a government decree, preferably at the inception of the project. A comprehensive review of the body of exist-

ing Uzbekistan Law and regulations and water law in the international context will be conducted. Recommendations for changes to Uzbekistan's legislation will evolve from this review. Using this as the starting point, the draft principles for changes to the current law will be developed and agreed on among the working group. In addition, in consultation with the government, the working group will develop an institutional framework for integrated water resources management. This framework will consider the need for national level inter-sectoral coordination, the need for streamlined institutional management of the nation's water resources, the need for the creation of basin councils, and the need for providing basic operational mandates for water users associations.

The legislative drafting process will be based on consensus reached regarding the legislative principles and the institutional framework. The new legislation will be circulated within the government and submitted to Parliament for adoption.

Improving Water Communal Services

The goal of this component is to improve and develop the existing wastewater treatment system develop a strategy for meeting the MDG goals for water and sanitation and WISP goals for improving access to water communal and utility services, specifically for the Zarafshan river basin through the period of 2010-2015. The strategy will recommend non-revenue options and investment options that contribute to the following MDG and WISP goals:

(d) Meeting MDG Goals for water and sanitation for the population living within the Zarafshan river basin by doubling the number of people with access to safe drinking water and sanitation from 2000 to 2015.
(e) Meeting WISP goals by increasing the percentage of rural households of the Zarafshan river basin with water supply from 79% in

2007 to 90% in 2015 and urban households with water supply from 82.6% in 2007 to 87.1% in 2015.
(f) Meeting WISP goals by increasing the percentage of the population of the Zarafshan river basin with sewage treatment from 60.2% in 2007 to 70% in 2015, and for urban areas from 9.2% in 2007 to 13% in 2015. And increase the number of apartments and houses with sewage systems from 31.5% in 2007 to 46% in 2015.
(g) Meeting WIS goals for the improvement of control systems and promotion of efficient water use by increasing the percentage of households with meters for measuring cold water consumption from 70% in 2007 to 100% in 2015, and with meters for measuring hot water from 60% in 2007 to 100% in 2015.

Currently the coverage of the Bukhara province population with centralised water supply is 51.6%, sewage coverage in the cities of Bukhara province is 34.5% (including the city of Bukhara, 48.7%). Coverage of the entire population of Bukhara province with centralised sewerage is 8.5%. The coverage of the population in Samarkand province with centralised water supply is 77%. Coverage of cities in the Samarkand province with centralised sewerage is 55.9% (including 64% in the city of Samarkand). Coverage of the entire population of Samarkand province with centralized sewerage is 9.7%.

This component includes four major tasks:
1.1 Improving drinking water supply for the basin population
1.2 Wastewater treatment, recycling and reuse within the basin
1.3 Demonstration pilot verifying critical assumptions of either strategy
1.4 Integrated Strategy for Water Supply and Sanitation

The objective of Task 2.1 is to devise a strategy for ensuring adequate water supplies for populations in a basin with increasing water scarcity, which will be a challenge until 2015. Therefore, attention to improving

and maintaining the quality of existing groundwater supplies, reducing water loss through the water distribution system and promoting user water conservation will be essential. The strategy should comprehensively examine options for investment in drinking water delivery systems to improve access to water, control water losses and improve drinking water quality, measures for protecting groundwater resources, and implementation approaches for service cost recovery that will ensure the financial health of utilities and which promote water conservation measures.

The objective of Task 2.2 is to devise a strategy for wastewater that evaluates measures for improving domestic waste treatment services which are currently either inadequate or non-existent in some areas. The strategy might consider innovative options for recycling and reuse of treated waste water. Wastewater treatment to certain levels can support water uses for industry and energy in areas where water may not be available. For example, recycling treated wastewater to levels acceptable for use in thermal power plant cooling tower use might be desirable for ensuring stable water supply to the Navoy Thermal Power Plant.

To prepare the strategy for water supply and sanitation, one working group each for drinking water and wastewater will convene at the basin level. These groups will oversee development, including baseline assessment, data collection, implementation options analysis (policy, institutional, or technology options), cost and benefit assessment, investment options and financing options. The results will be used to support development of the strategies. Once the strategies are developed, they will be presented to a broader audience for input prior to the development of the final strategy.

Within Task 2.3, a demonstration will be conducted that will be necessary to verify a key strategic recommendation that will evolve from either Task 2.1 or Task 2.2.

Within Task 2.4, an integrated strategy combining the results of the above three tasks will be prepared which will then be incorporated into the IWRM plan to be completed in component 3.

IWRM and Water Use Efficiency Plan

The primary objective of this component is to develop an integrated water resources management and water use efficiency plan for the Zarafshan river basin. This plan effectively incorporates the relevant institutional, economic and regulatory arrangements that evolve from component 1 and the strategy for meeting MDG and WISP Goals for water supply and sanitation within the broader integrated water resources management plan for the basin.

The objective of the IWRM and Water Use Efficiency Plan for the Zarafshan river basin will be to lay out a programme of non-revenue and investment options to support the MDG and WISP goals mentioned above, as well as WISP goals related to increasing income, promoting industrial growth, the development of agriculture and the protection of the natural environment.

This component includes 12 major tasks that will support the technical basis for the IWRM Plan, as well as integrating outputs from all three Project components.

Socioeconomic and Gender Assessment of the Zarafshan River Basin (Task 3.1) will focus on the people and households of the basin, to determine baseline economic information and gender status and issues related to IWRM. Information from the assessment will be used in the design process of the IWRM, but should be used, over the long term, to measure results from IWRM interventions until 2015. Therefore, careful design of the assessment is essential. Ideally, a statistically-based random and representative sample of the population could be selected for study over time to assess the impact of IWRM interventions in meeting WISP and MDG goals. Such an approach would ensure that results from the data collection effort represent the entire basin, and as such can be used with a high level of confidence in monitoring the success of IWRM interventions over time.

Improving the Institutional and Participatory Framework for Integrated Water Resources Management (Task 3.2) will evaluate the institutional

constraints and opportunities within the basin related to effective water resources management. It will develop recommendations for institutional streamlining, strengthening, and capacity building. Some of the recommendations that evolve through the course of dialogue within this task can be fed into the parallel institutional dialogue taking place at the national level. The role of water users should figure prominently in this strategy and recommendation for a basin water resources management structure that involves the BISA, a basin council that represents all water user groups (e.g. municipal, energy, industry, agriculture, and environment), confederations of water users associations, and water users associations.

Improving Agricultural Productivity to Improve Crop Yields and Water Use Efficiency within the Basin (Task 3.3) will examine the cropping pattern of the basin, farm water use in crop production, crop production practices, crop yields, agricultural income and other agricultural factors to determine the overall water use efficiency of this area. It is recommended that a statistically random and representative survey which is a subset of the socioeconomic and gender survey sample be used so that it can be studied over time to measure results of the IWRM implementation programme until 2015. Once water use efficiency is determined, a crop budget analysis could be conducted that determines alternative cropping which reduces water consumption, thus developing enhanced on-farm livelihoods. Technology options for achieving water savings will be evaluated, their costs assessed, cost and benefits compared, payback periods estimated and investment options explored. Developing measures for water savings, the creation of a system of accounting and monitoring of used water, measures towards land preparation (levelling, etc) and selection of drought-resistant crops are just some of the interventions that will be considered within this task.

Improving the Surface Water Delivery System and Irrigation and Drainage Network (Task 3.4) will be implemented through a strategy which will be developed. It identifies and prioritises measures in light of their ability to

improve irrigation water supply, reduce land salinization, and improve rural livelihoods. Within this task, the review of investments for the creation of an automated control system will be examined. In association with this, investments in an automated management system of hydro-technical facilities on the irrigational system will also be evaluated.

The creation of a system of accounting, supervision (quantity and quality), monitoring and management of returnable water within the basin (1.3 km^3) will also be explored. The creation of a uniform system for basin information sharing with required equipment, software and a database that allows for improved operation, maintenance and projects would also be of benefit, and will be assessed within this task.

Within the task *Ensuring Environmental Protection Measures and In-Stream Flow Requirements for Improved Ground And Surface Water Quality, Land Quality and Biodiversity* (Task 3.5), a strategy will be developed for environmental protections within the basin that addresses surface and ground water quality, instream and sanitary flow requirements, land degradation, resources conservation, and biodiversity issues. The relative costs and benefits of each of the measures will be outlined as the basis for prioritisation.

Within the task *Improving Water Use Efficiency in the Energy Sector and Energy Efficiency in Water Pumping to Reduce Water Delivery Costs and Reduce Greenhouse Gas Emissions* (Task 3.6), the issues related to the energy sector's use of water resources within the basin will be evaluated. In addition, energy use in water pumping will be examined to detect ways to improve energy efficiency, to reduce the cost of water pumping as well as reduce carbon emissions. As a result, a strategy will be developed for improving energy sector water use efficiency and energy efficiency in water pumping. This task will examine the potential energy savings as well as carbon offsets that can be achieved through energy efficiency associated with water use.

The Industrial Water Use and Economic Growth task (Task 3.7) will be one of the major areas for economic development within Uzbekistan.

The need for water, particularly in this basin, could be a limitation to such growth. Therefore, a careful analysis of the impact of water scarcity on industrial growth and the impacts of industrial water use on water quality and water supply needs to be conducted. The strategy should develop means for sustainable industrial development within the region that promotes clean water, clean technologies, and innovative industrial development —particularly as it relates to the processing of raw materials from agriculture.

Within the task *Improved Data Collection, Data Management and Information Sharing for Informed Decision-Making* (Task 3.8), a strategy will be developed for improving information management within the basin. It will examine the need for data at the farm, inter-farm, river basin and trans-boundary level and the investments in hardware and software that would be necessary to link information and data systems among users. It will also examine ways to conduct basin level information sharing and coordination.

Within the task *Pilot Demonstration Projects* (Task 3.9), the two pilot demonstration projects will be conducted to verify the results and findings of the project and to demonstrate the most important elements highlighted through development of the strategies. The results of these are anticipated to demonstrate how IWRM plan proposals support achievement of WISP indicators.

The *Education and Outreach* task (Task 3.10) will evolve from the strategies and demonstration projects. Based on these needs, an education and outreach strategy will be developed with detailed activities, costs, and associated financial alternatives.

Within the task *Equitably Balance Water Needs within the Basin* (Task 3.11), the process for integrating the results of strategies developed under components 2 and 3 will be initiated. The sectoral strategies for water and sanitation, irrigation, environment, energy and industries will be used to evaluate critical issues and concerns for each sector. A care-

ful analysis of values associated with the basin's major water uses and an options analysis for optimized water use within different scenarios will be conducted. Although the water use values may not necessarily dictate the priority of water uses, they can indicate the trade-offs that are inherent in various water use scenarios. Based on this analysis, a strategy will be developed for balancing competing water needs until 2015 and beyond that takes into consideration economic growth, potential upstream development, and potential impacts of climate change on water supply.

The Integrated Water Resources Management and Water Use Efficiency Plan for the Zarafshan River Basin task (Task 3.12) will also be developed. At this point in the project, it is anticipated that the legislative changes will be adopted to enable the creation of a basin council. The basin council, in partnership with the BISA, will direct the compiling of the final plan. The plan will work primarily from the strategy for the equitable balancing of competing water needs, and then outline the prioritised non-revenue options and investment plans that evolve from the other strategies. It will also incorporate the lessons learned from pilot demonstration projects to shore up other findings and incorporate a plan for education and outreach. The monitoring and evaluation plan for the IWRM implementation phase will be based on results of the socioeconomic and gender assessment surveys conducted when completing other tasks (e.g. on farm surveys, drinking water supply and wastewater surveys) that allow monitoring over time of the impact of IWRM interventions as they relate to the MDG and WISP goals.

In linking activities within the IWRM plan for the Zarafshan river basin, it is essential to scale the indicators and measures specifically to the basin itself. Current information on these measures is either reported nationally or on administrative units within the basin. A key objective of the detailed project reports for each task will be to establish the baseline information for these measures specifically for the basin.

Conclusions

As the biggest water user (97% of all water), agriculture is at the same time the main source of surface and underground water pollution. During times of water shortage, agriculture loses out to other sectors because of its low added value production. This means that with the development of the economy, water can be redistributed from agriculture to other more profitable sectors like industry. However, the poorly-thought-of decrease of water supply can have deep negative economic and social consequences. Especially, this is a problem of today in Uzbekistan, where more than half of the population lives in rural areas and are closely connected with irrigated agriculture. From this point of view, the IWRM is more needed for countries like Uzbekistan, taking into consideration the climate and domination of watered agriculture. The main thing is to ensure that the compilers of the plans/programmes/strategies on water issues have incentives for considering the impact of water-related solutions on employment, environment, and social justice.

The potential to attract all sectors and all beneficiaries into the process of decision-making, which can be done only with the IWRM, enables us to reflect on the all-inclusive "value" of water for society in general and to solve the difficult issues of water distribution. What does that mean? It means that there will be an opportunity to compare the contribution of food production (i.e. irrigated agriculture) to health care, the elimination of poverty and the empowerment of women using purely economic approaches, when profit is compared for each cubic metre of water. Again, this is very important in the situation of Uzbekistan, when agriculture is crucial for the welfare of the greater part of the country's population.

The IWRM enables us to consider the comprehensive planning of water, land and other resources with provision of sustainable development. Currently, more than a half of irrigated land in Uzbekistan is subject to salinization and degradation; these are related, mainly, to the absence of sustainable practices of water and land resource management. This, in

turn, decreases the country's profits, since agriculture plays a vital role in shaping the country's GDP.

The strategy, based on the IWRM, will provide high security for the municipal water supply and a decrease in expenditure on water treatment, because people will fight pollution more effectively. Increasing water effectiveness in the industrial sector and decreasing the level of pollution by industrial wastes will favourably impact the state of the municipal water supply and the environment.

From a legislative point of view, Uzbekistan is more or less prepared to implement the IWRM. The Republic of Uzbekistan's Law on "*Water and Water Use*" adopted on 6 May, 1993 governs the water sector. The government cabinet is responsible for the overall implementation of the Law. The Ministry of Agriculture and Water Resources (MAWR) is responsible for management of all surface water resources, the State Committee on Geology and Mineral Resources (SCGMR) is responsible for groundwater resources, the State Committee for Nature Protection (SCNP) is responsible for water quality and natural resources management, and, finally, the Agency for Communal and Utility Service (ACUS) is responsible for the delivery of water and wastewater services.

In addition, today, the sanitary services have to use their resources and efforts on cleaning the populated areas from wastes in order to maintain clean, healthy living conditions. This, in turn, creates problems of waste utilisation in other places, usually with harmful environmental consequences. Mainstreaming the IWRM will create the opportunity to integrate sustainable systems for cleaning territories, which will be directed to minimise waste during production.

Currently, the population growth in rural areas is leading to increasing competition for water among backyard and farm field holders (respectively called *dehkans* and *farmers*), since modern irrigating networks do not take population growth into account. That's why the improved integration of water resources management on local level can mitigate conflicts and considerably decrease expenditure on water supply in the future.

As we can see, Uzbekistan's economy depends heavily on the availability of water resources because of its geographic location in an arid climatic zone. Currently, water withdrawal stands at about 2,000 m^3 per person per year; however, taking into account the trends of population growth and industrial development in the region, we can predict that in the future, average water consumption per person in 2025 will decrease to 1,500 m^3, which means that Uzbekistan could face more and more problems if it continues with the existing principles and approaches in the water management sector. Thus, there is only one solution, which is the creation of a system of economical and rational water use, leading to the survival of the country in a situation of water shortage. These tasks require absolutely new approaches.

The global experience demonstrates that the countries located in the arid climatic zones usually face heavy water shortage and have to deal with water management problems. Governments that carry out the necessary assessments of the emerging threat and develop effective measures are able to reduce the consequences of water shortage and provide sustainable development for the country. To achieve this, what is required is the Integrated Water Resources Management (IWRM) a fundamentally new method and approach that can harmonise all stakeholders' activities.

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Land and Water Management patterns in Ferghana Valley

Bektur Sakiev
Central Asian Regional Liaison Officer at Foundation for Tolerance International

Abstract

The proliferation of conflicts related to how to share and use the region's water resources that flourished among these states is a clear example of the legacy of a Soviet-style economy. The Soviet government built huge water reservoirs in Kyrgyzstan and Tajikistan, primarily for the cotton industry in Tajikistan and Uzbekistan. Several hydropower stations were also built. Power grids in the region were linked up into one single regional network, and the coordination of the water flows to the cotton fields during the hot season was managed from Moscow. Nonetheless, the break-up of the Soviet Union led to the emergence of 15 new sovereign states, including five in the Central Asian region. Until today, this issue has remained at the top of the agendas of the newly-independent Central Asian states. Basically, the main problem is that these water resources are concentrated unequally throughout the region's territory. More than 90% of all water resources in Central Asia are concentrated in the mountains of the two smallest and poorest states, Kyrgyzstan and Tajikistan. The region's two main rivers, Syr-Darya and Amu-Darya, have their sources in these two countries, whereas the main consumers of water, Uzbekistan and Turkmenistan are located downstream. Despite such obvious mutual interest in bargaining, and the great chances and great potential for mutual benefit, the upstream and downstream states have failed to come up with a long-term solution over water resources management.

Introduction

The break-up of the Soviet Union led to the emergence of 15 new sovereign states, including five in the Central Asian region. Such an unexpected collapse of the biggest communist state brought not only political disillusionment to the region and to each state in particular, but also the need to transform the central-planned economy to a market economy. It was the most important and vital task of the newly-created governments to ensure their suddenly-gained sovereignty.

However, this was also the most difficult task, since the economies of the new states were closely interdependent and had been an integral part of the uniting Soviet economy. The proliferation of conflicts related to how to share and use the region's water resources that flourished among these states is a clear example of the legacy of a Soviet-style economy. Until today, this issue has remained at the top of the agendas of newly-independent Central Asian states.

In order to understand the nature of the current disputes among the Central Asian states, and perhaps to explore new ways and methods for their resolution, we must focus on the historical background of the existing conflicts over the exploitation of water resources in the region. It is also crucial to identify key interests of each state-party (as well as their lack of interest in resolving water disputes) in order to describe the trends and prospects that might lead to positive developments in water resources management.

Central Asia is a heterogeneous region, comprising high mountainous areas and vast, dry steppes and deserts. If we look at the region as a united whole, it is hard to detect the conditions for this water shortage problem, as there are considerable water resources available. Basically, the main problem is that these water resources are unequally concentrated throughout the region's territory. More than 90 % of all water resources in Central Asia are concentrated in the mountains of the two smallest and poorest states, Kyrgyzstan and Tajikistan. The region's two

main rivers, Syr-Darya and Amu-Darya, have their sources in these two countries, whereas the main consumers of water, Uzbekistan and Turkmenistan, are located downstream.

The Central Asia region became a victim of geopolitical rivalry between Great Britain and Russia at the end of the 19th century, and fell under the influence of the latter. The region was annexed to the Soviet Union in the early 1920s, and five newly-formed republics, with new, redrawn boundaries, emerged in the region.

Central Asia changed dramatically under Soviet rule. The new borders did not comply with any historical or national legacies. They did not even respect the basic population distribution, often dividing national or ethnic communities, with some of them automatically becoming minorities in the neighbouring republics. This also led to complicated borders which undermined political relations and made economic development more difficult.

Otherwise, new social, economic and cultural structures were more or less successfully introduced. Besides simply extracting natural resources (mostly energy resources), some parts of the region became an agricultural oasis that produced agricultural goods for the rest of the USSR. Amongst these agricultural regions was the Ferghana Valley, at present divided up between Uzbekistan, Kyrgyzstan and Tajikistan.

Cotton production and the destruction of the environment

In the Soviet days, many of the people living in the mountains were relocated to lower-lying areas, like the Ferghana Valley, to produce cotton. The valley turned into a major cotton-production area during Soviet rule. During that time, as I have already mentioned, the production system ignored the republics' boundaries.

For example, the water reservoirs for irrigating cotton crops in Uzbekistan were constructed in Kyrgyzstan; Kyrgyz cotton was ginned in Uzbekistan, and the route between them ran through Tajikistan.

Throughout the next few decades, the region was turned into a huge cotton plantation, and this logically led to a rise in water consumption. An impressive irrigation network, canals, and reservoirs were all built to serve the cotton production. As a result, the region became one of the world's largest cotton producers, with Uzbekistan alone producing and exporting as much as four million tons of cotton annually (Zanidin, *http://meria.idc.ac.il*).

However, this development has had disastrous effects on the environment. The region's two major rivers, Amu-Darya and Syr-Darya, were almost fully diverted for cotton irrigation. As a result the water level in the Aral Sea, which is fed by these two rivers, fell by seven metres in 20 years, from 1964 to 1984. This, the worst man-made disaster in the world, has also damaged the population's health. Infant mortality in surrounding areas has reached 110 deaths for every 1,000 births, one of the highest in the world (Zanidin, *http://meria.idc.ac.il*).

The Soviet government built huge water reservoirs in Kyrgyzstan and Tajikistan, primarily for the cotton industry in Tajikistan and Uzbekistan. Several hydropower stations were also built. Power grids in the region were linked up into one single regional network. Through this network, upstream countries exported electrical power to downstream countries during the winter, and imported from them during the summer when water was piped to cotton fields. Coordination of water flows to the cotton fields during the hot season was managed from Moscow.

The cotton production system and water resources management were disrupted when the Soviet Union collapsed. Instead of one single water management system and a single hydropower system, now five new independent states had appeared, all wanting to create their own independent hydropower systems and struggling to satisfy their demand for water resources.

With their newly-gained independence, the downstream countries (Uzbekistan, Kazakhstan and Turkmenistan) have undertaken a policy of energy self-sufficiency, and reduced their dependency on imported hydropower from their neighbours. Upstream countries have pursued a

policy of developing and utilising their hydropower potential, which has significantly reduced water flows to downstream countries.

The urban population of the upstream countries is, to a large extent, dependent on the gas and coal supply from the downstream countries, especially during winter. The downstream countries thus want water for cotton, and can use their energy supplies to bargain for it; the upstream countries can bargain with their water but their energy strategy requires that they retain more of it. The upstream states view water as a commodity for trade and profit, especially since they are poorly endowed with other resources. Control over water is also important for them as they need it to generate much of their own power needs.

The poorer upstream states, despite their huge water resources, have few other resources to develop. Devoid of sufficient energy resources, they are highly dependent on natural gas supplies from the downstream states, and consequently, the Kyrgyz and Tajik governments are constantly under domestic pressure, especially from the urban population, for whom natural gas is vital for surviving the cold winter season. In turn, the downstream state governments have to consider that without water flows from the upstream states for irrigation they will have to deal not only with angry farmers, but also huge economic losses.

Let us take Uzbekistan as an example: cotton exports from this country make up around 20% of all its exports (ICWC). It is the single major sector on which Uzbek political leadership is highly dependent. A fall in cotton income, which relies greatly on water supplies, would further impoverish the Uzbek rural population and consequently lead to social discontentment.

Working towards a solution to the water conflict?

Despite such obvious mutual interest in bargaining, and the great opportunities and potential for mutual benefit, the upstream and downstream states have failed to come up with a long-term solution over water resources management. The constant negotiations on water distribution

can be characterised as an *ad hoc* agreement (bilateral and multilateral), arrived at simply as a temporary solution that has usually been violated in the short term by one side or the other.

When a state/party in such agreements felt that its leverage was greater, and thus it could get a better deal, it often broke its commitments. Such unstable results in negotiations, due to the permanent violation of the agreed terms, explain why the water issue can be defined as a failure by Central Asian states to resolve the issue, or can also be explained by their hidden agenda that led their lack of interest in solving them.

It should be noted that the use and distribution of water resources have been a source of various conflicts from the very beginning, at state level as well as at the level of ordinary people residing in the Ferghana Valley. One of the clearest examples of such a confrontation were the tensions over water resources between Kyrgyzstan and Uzbekistan in 1997, which led to a Uzbek military build-up across from the water reservoir located close to its border, but on Kyrgyzstan's territory. This move raised concerns and anger among the Kyrgyz government and population. The Kyrgyz government adopted a resolution declaring that water was a tradable commodity, by which it codified its right to use it for its own profit. The government also threatened to sell water to China if Uzbekistan failed to pay for it (Zanidin, *http://meria.idc.ac.il*)

In response, in February 1998, Uzbekistan cut off gas supplies to Kyrgyzstan and Tajikistan. This act also aroused anger in those two states, with the Kyrgyz government using especially strong rhetoric when denouncing it. The Uzbek side replied with similarly harsh words. Such cases became usual in the interstate relations between the region's countries over water and energy issues.

Recent events regarding disputes over water resources show that not much has changed. One incident that took place in Batken oblast in March 2008 was when around 150 Tajik citizens entered Kyrgyz territory and tried to destroy the dam that was preventing water from flowing into Tajik land. This shows how disputes over water resources are taking

a new form when ordinary people, residents of the Ferghana Valley, try to solve their problems on their own[1]. This, of course, is a dangerous trend, due to the higher probability of conflicts among people residing near the valley's borderline.

In light of growing water consumption of all the regions' states and the emerging energy crisis in Kyrgyzstan and Tajikistan, it is important that all state-parties address the issue of water management with seriousness and responsibility. The signing of long-term agreements on water issues, and especially the ability to work out necessary mechanisms for the appropriate control of these agreements that will ensure their implementation, is crucial today, more than ever before. However, analysing developments in current situation, the above-mentioned new challenges that Central Asian states currently face appear rather as obstacles instead of as incentives to the governments.

Due to the energy crisis in Kyrgyzstan and Tajikistan, the governments of these states started actively working on projects to build new Hydro-Power Stations (HES) which would create bigger problems for downstream countries. Attracting investors for building Kambarata 1 and 2 hydro-power stations in Kyrgyzstan and Rogun HES in Tajikistan brought some results. The Russian government agreed to help the Kyrgyz authorities in the construction of the stations, and allocated $1.7 billion for such purposes (Kirsanov, http://www.eurasianhome.org) The Tajik government also achieved a preliminary agreement with the Russian government to invest in its hydro-power sector. Such news has already brought negative reactions from the leaders of downstream states, especially from Uzbekistan.

The possibility of Kyrgyzstan and Tajikistan being deprived of natural gas supplies by Uzbekistan triggered a dramatic increase in gas prices. Kyrgyz consumers suffered an increase from $145 to $240 (for 1,000

1. «Kabar News Agency». Kazakhstan. February 1, 2009. www.kabar.ru.

cubic metres)[2]. This will create a huge deficit in the small budgets of Kyrgyzstan and Tajikistan in the future and will directly affect water issues in the very near future, when upstream countries try to use water as a leverage to get a better deal on gas prices with Uzbekistan.

Such opposed interests between the upstream and downstream countries regarding the region's resources have been further complicated by another common problem- border disputes. Though in general the delimitation of borders among the region's states has been relatively successful, there are still some disputes regarding some parts of the borderlines. Because of this, to this day most Central Asian states do not have fully delimited borders with their neighbours. This is especially evident in the case of Uzbekistan, which has ongoing border disputes with all the countries in the region.

Most of the current disputed border areas are in the Ferghana Valley. Within the valley, the most acute tensions are between Uzbekistan and Kyrgyzstan over two enclaves that belong to the latter. Uzbekistan and Tajikistan also claim parts of each other's territories. Numerous clashes have occurred on the Tajik-Uzbek and Kyrgyz-Uzbek borders leading to the closing of border zones and the placing of numerous land mines by the Uzbek Army.

Thus, the Ferghana Valley has become not only an area with a water shortage but also an area of border disputes, which complicates overall inter-state relations.

Now, after that brief summary of the existing situation regarding problems of water resources in the region (and particularly in the Ferghana Valley), it is important to observe what water resources mean to the Central Asian states and what particular steps have been taken to ensure the management of water resources and to settle the disputes between states over this issue.

All Central Asian states recognise water resources as being the most important resource and the main factor of social and economic develop-

2. «AKIpress News Agency» December 24, 2008. www.akipress.kg

ment in the region. Thus each state has adopted its own water code and laws. According to clause 4 of Kazakhstan's Water Code, "the State owns the water in Kazakhstan"; clause 4 of Tajikistan's Water Code states that "the State owns all water in the Republic of Tajikistan in accordance with its Constitution"; as clause 3 of Uzbek Law "On Water and Water Use" states "water is the state property – national treasure of Uzbekistan. The water must be used rationally and is protected by the State". Clause 5 of Kyrgyzstan's water law declares that "the State owns the State water fund of Kyrgyzstan" (Kasimova, 2000).

In the Central Asia region, Kazakhstan enjoys the largest reserves of coal (88%) and the third largest of natural gas. Uzbekistan possesses 23% of natural gas reserves, and Turkmenistan, 44%. Most of the known gas resourses are located in Kazakhstan, Uzbekistan and Turkmenistan. Meanwhile the majority of the water resources (two major rivers: the Syr-Darya and the Amu-Darya) originate in and become full-flowing watercourses in Kyrgyzstan and Tajikistan. These two rivers provide the lower-lying countries with 115 km^3 of water, out of which almost 90% is used for irrigation and the remaining 10% for public utilities and industrial purposes. This can be explained by simply attending to the particular agricultural exploitation in the region. For instance, over 2 million tons of cotton fibre is collected in the region, which represents nearly 94% of all cotton production in the former USSR.

As I have mentioned previously, during Soviet times the water management and energy supplies were strictly centralised under a single energy system. A common gas system provided all the Central Asian countries with gas. In return, the hydro and reservoir systems of Tajikistan and Kyrgyzstan were strictly scheduled for generating and distributing water during irrigation periods. At present, this integrated system of the water, energy and fuel supply has been broken up, and these circumstances have left Tajikistan and Kyrgyzstan with a severe energy shortage, despite possessing a considerable hydro energy capacity.

Ecological disasters such as the Aral Sea, soil erosion , pollution of water and land resources with chemicals and radioactive elements inflicted by anthropogenic factors were all inherited from the Soviet regime by new Central Asian countries. These issues demand joint efforts and cooperation today from all the states in the region. Aware of this fact, governments in Central Asia have made certain arrangements for the joint management of water and energy resources and conservation of the environment. For instance, on September 12 1991, the region's water ministers expressed their commitment to share those resources on a mutually beneficial and equal basis. Less than a year later, in 1992, an intergovernmental agreement was signed, establishing the Intergovernmental Coordination Water Commission (ICWC). The Commission has the task of distributing water resources –annually– among the countries, and in accordance with the reservoirs' schedules. The decisions of the ICWC are mandatory in all five states (Kasimova, 2000).

In 1992, the Electrical Energy Council of the United Electric Energy System (UEES) of Central Asia was founded. The council convenes on a quarterly basis and is responsible for addressing issues related to ensuring the stable operation of the UEES; specifically, the Council makes decisions to determine the volumes of nodal transfers of energy and its capacity. It also coordinates the operation mode of the Naryn Cascade –the Syr-Darya great cascade and reservoir. Moreover, in 1993 the International Fund for Saving the Aral Sea (IFAS) was established, with the aim of promoting a rational use of water that could stop and even reverse the drying-up of the Aral Sea.

In 2001, the Kyrgyz Parliament adopted a law "On Interstate Use of Waterworks and Water Resources of the Kyrgyz Republic", which was criticised by Kazakhstan and Uzbekistan. Under this law, Kyrgyzstan declared that water should be recognised as a commodity based on international practices and conferences held in Dublin and Rio de Janeiro (Usubaliev, 2001).

Kyrgyzstan justified selling water with expenses incurred to the republic through the maintenance and operation of a huge system of water reservoirs. In fact, Kyrgyzstan uses 20% of all water generated in the reservoirs, the remaining 80% goes for the irrigation and agricultural needs of the two other downstream states: Kazakhstan and Uzbekistan.

Also, the Kyrgyz Parliament stated that even though all the objects of water management were constructed during Soviet times, with Moscow's financial back-up, the expenses were later calculated as debts to Russia, and paid back by the Kyrgyz Republic. Moreover, all those reservoirs and dams caused the submersion of fertile lands belonging to the republic, thus decreasing the amount of land suitable for cultivation. And finally, probably the most important issue in this debate was the energy issue. Due to the lack of oil and gas supply, Kyrgyzstan had to use its hydropower facilities for generating electricity in wintertime for its population, and preserving water during summer when the demand for electricity was not so high. However, despite the fact Kyrgyzstan has adopted the law, it was not recognised by other countries, and heated discussions are still taking place.

Tajikistan and Kyrgyzstan are interested in using water resources for generating power in order to fulfil their domestic demand and also for export. Meanwhile Kazakhstan, Turkmenistan and Uzbekistan insist on using the water reservoir system constructed during the USSR and new planned hydropower stations for mainly irrigation purposes.

Kyrgyzstan and Tajikistan are demanding increasing financial compensation from their neighbouring countries for the maintenance of hydropower stations in irrigation mode, in which Kazakhstan, Uzbekistan and Turkmenistan are interested. In recent years, Bishkek and Dushanbe have been unhappy about the significant losses and expenses accrued for maintaining the hydropower infrastructure. Bishkek is especially active in this matter, having suggested that water be treated as a commodity and that payment should be required for it (currently Kyrgyzstan is receiving compensation from Uzbekistan and Kyrgyzstan for the surplus electricity it

produces). However, paid water usage is unrealistic in Central Asia, due to the high risk of social and political unrest in all the countries.

Rapid development of hydropower facilities over irrigation may become the complementary factor for tension in the region. Lately, Tajikistan has shown serious energy ambitions. Devoid of oil and gas, the Tajik leadership is focused on accelerating the development of the hydropower sector. By 2010-2015, Tajikistan is planning to free itself from Uzbek energy dependence and to start exporting electricity to Iran, Pakistan and India (approximately 8-10 billion KwH per year).

The Tajik Ministry of Energy's construction schemes of demonstrate the large scale and seriousness of its intentions. The government is planning the construction of 14 hydropower stations with an annual capacity of 86.3 billion KwH in Pyanj River, the main tributary to the Amu-Darya River. Tajikistan's economy will reap great benefits from the construction of Dashtijum Hydropower Station, with an annual capacity of 15.6 billion KwH and with a dam that has a volume of 17.6 km^3. This project has been presented as a profit-generating enterprise to investors from the US and Pakistan. China has expressed great interest in building a hydroelectric power station on the Zeravshan River. This has already brought a cautious reaction from Uzbek officials. Experts warn that Dushanbe's one-sided water-energy policy may cause tensions in the region, and may in the future result in trans-border conflict, firstly with Uzbekistan.

Kyrgyzstan is trying to keep up with Tajikistan on the matter of enhancing its energy capabilities. Presently it is searching for investors for the construction of cascades at Kambarata 1 and Kambarata 2 Hydro power stations on the Upper Syr-Darya.

The Kazakh government made a call to "hinder the construction of Kambarata Hydro Power Station on Kyrgyzstan's territory", exploitation of which will break the fragile balance of the electricity and water supply in the whole region". Indeed, Bishkek and Astana have come to an agreement on their water-energy demands. The special Kyrgyz-Kazakh commission and expert groups have worked extensively and with positive results on

water management in the Talas and Chu rivers[3]. Kazakhstan has also agreed to finance Kyrgyzstan's hydropower infrastructure on a joint basis.

Over the long-term, the problem with water use in Central Asia will be serious due to rapid population growth. According to experts' assessments, demographic growth in Central Asia will inevitably increase the demand for water by 40% in the coming 20 years. Such a situation might put more pressure on interstate conflicts.

All the countries in the region bear economic losses due to the unresolved water issues. For instance, according to the United Nations Development Programme (UNDP), Central Asia's annual losses constitute $1,7 billion due to insufficient water management (UNDP).

Paradoxically, there is sufficient water in Central Asia for everyone if it is used rationally. Excessive water loss is caused by outdated land cultivation systems, for which the water supply needed for one unit of production exceeds the international standards by three times, (sometimes even ten times). According to experts, application of up-to-date agricultural technologies and rational water consumption will enable the region to save up to half of the all trans-border river flow. Apparently, the integrated management of water resources will optimise the performance of hydro stations in accordance with national and regional interests[4].

As I mentioned before, Kazakhstan is situated in the area with the least water, and experiences a permanent scarcity of drinking water. Amongst the countries of the Community of Independent States (CIS), Kazakhstan possesses the least water provided: 37,000 m^3 per km^2; 6,000 m^3 of water per person annually[5].

3. www.talaschu.kz/ — official web-page of Kyrgyz-Kazakh joint commission on use of Talas and Chu rivers.
4. www.caresd.net/iwrm/ru/Prodoc-%20Feb%2010%20rus.doc — National Plan on Intergrated management of water resources of Kazakhstan.
5. www.undp.kz/library_of_publications/files/2496–16076.pdf — «Water Resources of Kazakhstan in New Millennium» Review.

The intensiveness of water consumption exceeds the natural water supply. Kazakhstan's scientists claim that a lack of water is creating a serious threat to sustainable development in Kazakhstan. This is explained by the fact that only 56% of surface waters are formed inside the country, the remaining 44% comes from neighbouring countries.

Moreover, apart from the scarcity of water resources, water pollution is a serious issue. It has reached its highest point due to the extensive development of industry. For instance, the activation of industry, and exploring and developing oil and gas go hand in hand with the increased pollution of rivers and the Caspian Sea.

Currently, Kazakhstan enjoys favourable economic conditions for the stage-by-stage solution of water problems on a national as well as a regional level. The country has already made positive attempts in this respect. The Kazakhstan Water Resources Commission,set up in June 2004 within the framework of UNDP, and with the support of the Norwegian Government, the British Department for International Development (DFID) and the Global Water Partnership (GWP), is carrying out a national Plan on Integrated Management of Water Resources (www.caresd.net/iwrm/ru/Prodoc-%20Feb%2010%20rus.doc).

However, despite numerous meetings of Central Asia's leaders and the traditional signing of agreements declaring their willingness to cooperate, it is clear that the water resources issue demands more complex, deeper measures and compromise. Until today, no state in the region has showed real interest in solving this issue. One might think that the Central Asian states are more interested in keeping the issue unresolved rather than doing something to bring solutions to the water disputes between the states. The situation will change as new challenges emerge regarding water resources, and maybe then the region's states will realise that it is better to cooperate than to isolate themselves from each other.

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Final Report[1]

Workshop on Water Resources Management In Central Asia: Regional And International Issues At Stake

Organised by the CIDOB Foundation within the framework of the Central Asia Observatory

The Observatory on Central Asia (OAC) was launched in 2007 by three institutions with a common interest in the region: Casa Asia, the CIDOB Foundation and the Royal Elcano Institute

Managing water resources in Central Asia

The opening address pointed out the importance of the issue of water management in the Central Asia region as an element of cooperation or conflict between states. Next, the first presentation analysed the implications of the subject with respect to security, and the prospects for regional cooperation on water management in the region. It was stretched that, firstly, the debate on water management in Central Asia revolves around the use of water for irrigation or for generating energy. It was also pointed out that in spite of the fact that several agreements and declarations have been signed since 1992, no legal framework exists on which to base inter-state coopera-

1. This report presents a summary of the main conclusions of the seminar and is based on the different speeches and debates during the meeting. This report was produced by Francesc Fàbregues, coordinator of the CIDOB seminar, with the valuable collaboration of Aurelia Mañé, Director of the Central Asia Observatoryand Carlos Fernández-Jáuregui, rapporteur of the workshop and former director of the UN-Water Decade Office , Zaragoza.

tion or to manage conflicts, and that some agreements are not implemented adequately. In this respect, it was declared that it is of the utmost importance to build a stronger legal framework adapted to the countries in the region. The final conclusion stressed that water management is a matter of national security in her country, Kazakhstan, just as it is in Uzbekistan and Turkmenistan, and was mentioned, as an example of a possible area of conflict, the case of the Kok Caray dam project, which envisages a dam being built between Kazakhstan and Kyrgyzstan.

There was also a second exposition, on the Integrated Water Resources Management (IWRM) project in Uzbekistan, the aim of which is to introduce comprehensive management of water to encourage sustainable development in the area. In this context, there were some complains about the lack of coordination between international donors and agents in the region is a factor that directly affects the results of the projects that have been implemented. It was also highlighted the unfavourable legacy of water management strategies that date back to the days of the Soviet Union.

In the debate that followed, the participants emphasised the issue of the lack of governance in water management in the Central Asia region and mentioned several symptoms, such as: the lack of national authorities dedicated to water management; the absence of a suitable legal framework that would enable the public participation of the different communities; the lack of adequate human resources and sufficient funding and, finally, the absence of reliable and transparent information on the real situation of water resources. Another issue that came up in the debate was the role of international donors and agents, thereby acknowledging the important role played by the international community in the region. Other issues mentioned by the workshop's participants included: the various levels of legislation and of its practical implementation in the different countries in the region, the lack of political will to solve conflicts, the need to perceive electricity as a common element in the different countries, and the fact

that the authorities in the region have a need for both financial aid and assistance in the area of governance. Finally, the participants pointed out that the shared management of water resources is and has always been an opportunity for regional cooperation, and not a direct source of conflict.

The second part of the seminar gave warning warning about the effects of climate change on Central Asia, and particularly with respect to the degradation of the Aral Sea area. There was also a description of the water management problem in the strategic Ferghana Valley. The speaker bemoaned Kyrgyzstan's poor water management over the past 17 years, before going on to stress the difficulty of managing river watercourses, given that they involve different countries through their common borders. The participants stressed the importance of foreign investment in water infrastructures in the region, and called for greater presence from the EU, to act as a mediator in the event of possible conflicts over water in the region, remarking the fact that water management could be a possible factor for integration and cooperation between States.

During the debate, participants focused on topics such as the presence of the private sector for investing in infrastructures, as well as on the roles of other countries in the region, such as Turkmenistan, Afghanistan and China. In this context, emphasis was placed on the arbitrariness of borders and on the need to include all the countries with shared water basins in negotiations on water management in the region. An emblematic example of this problem is the Aral Sea basin: in order to solve it, a climate of complete trust and transparency must be created among all the public authorities in the region.

Various arguments were also presented during the debate concerning the potential for conflict in Central Asia over water management issues, such as: the disappearance of the regional water strategy linked with the now-defunct Soviet Union; the problem concerning the use of water for irrigation or for generating energy; the absence of any legal or institutional framework that could help to arbitrate in the event of conflict; the regional

strategy of exchanging water for energy between the different countries in the area (a dynamic that encourages the presence of external actors in the region); obsolete and "nationally" segmented infrastructures that require enormous spending; the environmental cost of bad water management that leads to increased poverty; the migration phenomenon and the loss of traditional ways of life; the lack of political will among leaders in the region; the prospects for water shortages, and the absence of political and economic cooperation among the countries of the region.

The workshop's conclusions were presented by Carlos Fernández Jáuregui, Director of the Water Assessment & Advisory-Global Network (WASA-GN) and former Director of the Office of the United Nations Decade of Water. Finally, Aurèlia Mañé, Director of the Observatory on Central Asia, closed the workshop while stating that the Observatory would continue this kind of activities in the future.

Conclusions

1. The participants agreed that a crisis situation exists with respect to water management in Central Asia, caused by a series of factors such as the lack of governance in this sector, owing to an absence of neutral and high-level officials dedicated to water management.
2. The legislation on water management in the region is obsolete, a situation that is aggravated by the fact that most of the data available are out of date. In this respect, new laws need to be developed and implemented that will facilitate greater governance in this field, as well as more public participation and investment in the region. In this context, it is important to stress water's value not only as an economic asset, but also as a cultural, social and religious one.
3. There is a need to strengthen human resources in the field of water management, given that in this respect, the shortage observed relates more to quantity than to quality.

4. The lack of funding was seen as an obstacle to ensuring the increased and improved management of water in Central Asia; the funds required would be spent on areas such as improving infrastructures and equipment, setting up training programmes at all levels, and on initiating water projects to facilitate sustainable development in the region. However, a shortage was also observed in the identification of the use of the necessary economic resources.

5. Finally, an absence of reliable, transparent information on the subject was observed in the region. In this respect, the need was expressed to encourage all the regional actors with shared water basins to participate in the management of water, thereby creating a climate of complete trust in order to tackle any possible differences. In this context, emphasis was placed on the need to secure a long-term view and security strategy when managing projects relating to water resources in the region, given that it represents a matter of national and international security.

Recommendations

1. For the national authorities in the region:

– Develop higher levels of governance with respect to the management of water resources, by creating top-level regulatory instruments.

– Improve and update the information on the subject, while employing greater transparency in this respect and incorporating all the governments that are geographically affected by the management of water resources in the region, so as to create an improved climate of trust between them.

– Improve legislation on water management, as well as its implementation.

2. For international organisations:

– Establish greater coordination between all the organisations present in the region, with the aim of improving the effectiveness of projects and preventing any unnecessary repetition of efforts.

– Adopt a long-term perspective when planning future projects in the region.

– When designing joint projects, include all national actors with shared water basins.

3. For the European Union:

– Contribute technology and human and economic resources, to promote better sustainable water management in Central Asia.

– Act as a mediator to overcome any possible conflicts or differences between states.

– Support the search for new channels and scenarios of inter-state co-operation, with the aim of turning water management in the area into a factor for regional integration.

4. For Spain, in view of the country's upcoming presidency of the Council of the European Union in 2010:

– Public opinion and the elites of Central Asian countries view Spain with friendliness and without suspicion, since the country has never been involved in historical political conflicts, unlike many other external actors in this region. Therefore, Spain should take advantage of this asset to act as a third party and to develop an active role as a facilitator to foster regional cooperation mechanisms in the area of water resource management in the region.

Resumen

Gestión de los recursos hídricos en Asia Central: cuestiones regionales e internacionales en juego
U. Islamov, Anar Khamzayeva, F. Maksudov, D. Maksudova, Sulton Rahimov, Bektur Sakiev

Publicación que nace como producto del taller de debate "Gestión de los recursos hídricos en Asia Central: cuestiones regionales e internacionales en juego", un encuentro académico organizado por la Fundación CIDOB, en el marco del Observatorio de Asia Central, que copatrocina junto a la Casa Asia y el Real Instituto Elcano. El libro recoge la investigación de cuatro de sus ponentes académicos, así como las principales conclusiones alcanzadas y algunas recomendaciones de gran relevancia para los actores nacionales e internacionales, así como para las principales potencias internacionales, con intereses en la región. Se trata de un documento de gran valor para todos aquellos interesados en la gestión de los recursos hídricos y las dinámicas de cooperación y de conflicto que se generan entorno a ellos, una cuestión clave para comprender pasado, presente y futuro de las relaciones entre los estados centroasiáticos en temas tan cruciales como los recursos hídricos, la energía o los prejuicios del cambio climático y la contaminación sobre el medio ambiente. El tema se desarrolla de la siguiente manera. En primer lugar, mediante una aproximación general a la cuestión, a cargo de Anar Khamzayeva, doctoranda de la LUISS Guido Carli University y ex analista del Institute for World Economy and Politics (IWEP) de Kazajstán, que presta atención a la necesidad de crear marcos de cooperación entre los estados de la región. Seguidamente, Sulton Rahimov, ex presidente del Comité Ejecutivo de la International Fund for Saving the Aral Sea (EC-IFAS) trata de los efectos del cambio climático en Asia Central, particularmente en la degradación de la zona del mar de Aral. Farhod Maksudov, investigador de la Uzbek Academy of Sciences, y experto en medio ambiente de la oficina del PNUD en Uzbekistán nos ofrece un artículo de analisis de un programa específico, el proyecto Integrated Water Resources Management (IWRM) que tiene como objetivo una gestión integral del agua para el desarrollo sostenible en la zona. En el último estudio, Bektur Sakiev, de la organización Foundation for Tolerance International de Kirguiztán, aborda el estudio de un caso práctico, la gestión del agua en el estratégico valle de Ferghana. Finalmente, se incluye el informe del taller que recoge las principales conclusiones de los expertos centroasiáticos y algunas recomendaciones, que buscan convertir el taller y la presente publicación, en un documento provechoso para todos aquellos interesados en la gestión eficiente de los recursos y las dinámicas que se generan entorno a ellos, cuando son escasos.

Palabras clave: Agricultura, Asia Central, Cambio Climático, Conflictos sobre agua, Cooperación internacional, Desarrollo, Kazajstán, Kirguiztán, Mar de Aral, Medio ambiente, Recursos hídricos, Seguridad, Tayikistán, Uzbekistán, Valle de Ferghana.

Abstract

Managing water resources in Central Asia: regional and international issues at stake
U. Islamov, Anar Khamzayeva, F. Maksudov, D. Maksudova, Sulton Rahimov, Bektur Sakiev

This publication came about as a product of the debate workshop "Managing water resources in Central Asia: regional and international issues at stake", an academic meeting organised by the CIDOB Foundation, within the framework of the Observatory on Central Asia, which co-sponsored the event together with Casa Asia and the Royal Elcano Institute. The book includes research studies by four of its academic speakers, as well as the main conclusions reached and a few recommendations of great importance for national and international actors, as well as for the main international powers with interests in the region. This is a document of great value for anybody who is interested in the management of water resources and the dynamics of cooperation and conflict that are generated around such an activity, and area that is of key importance to understanding the past, present and future of relations between the Central Asian states in such crucial areas as water resources, energy and the damage done to the environment by climate change and pollution. The subject is developed as follows: firstly, through a general approach to the subject, given out by Anar Khamzayeva, a doctorate student at the LUISS Guido Carli University and ex-analyst at the Institute for World Economy and Politics (IWEP) of Kazakhstan, and who places attention on the need to create frameworks of cooperation between the different states in the region. Subsequently, Sulton Rahimov, ex-Chairman of the Executive Committee of the International Fund for Saving the Aral Sea (EC-IFAS) deals with the effects of climate change on Central Asia, focusing particularly on the degradation of the Aral Sea area. Farhod Maksudov, a researcher from the Uzbek Academy of Sciences and an environmental expert from the Office of the UNDP in Uzbekistan offers the reader an analytical article on a specific programme: the Integrated Water Resources Management (IWRM) project, which was created with the aim of establishing comprehensive water management for sustainable development in the area. In the final study, Bektur Sakiev, from the organisation Foundation for Tolerance International of Kirguiztan, examines one particular practical case: the management of water in the strategic Ferghana valley. Finally, the publication includes a report from the workshop that brings together the main conclusions of the experts on Central Asia and a few recommendations, in order to turn the workshop and this publication into a document that is useful for anyone interested in the efficient management of resources and the dynamics that are generated around them when they are in short supply.

Key words: Agriculture, Aral Sea, Central Asia, Climate change, Development, Environment, Ferghana Valley, International cooperation, Kazakhstan, Kirguiztan, Security, Tajikistan, Uzbekistan, Water conflict, Water resources.