Local Government
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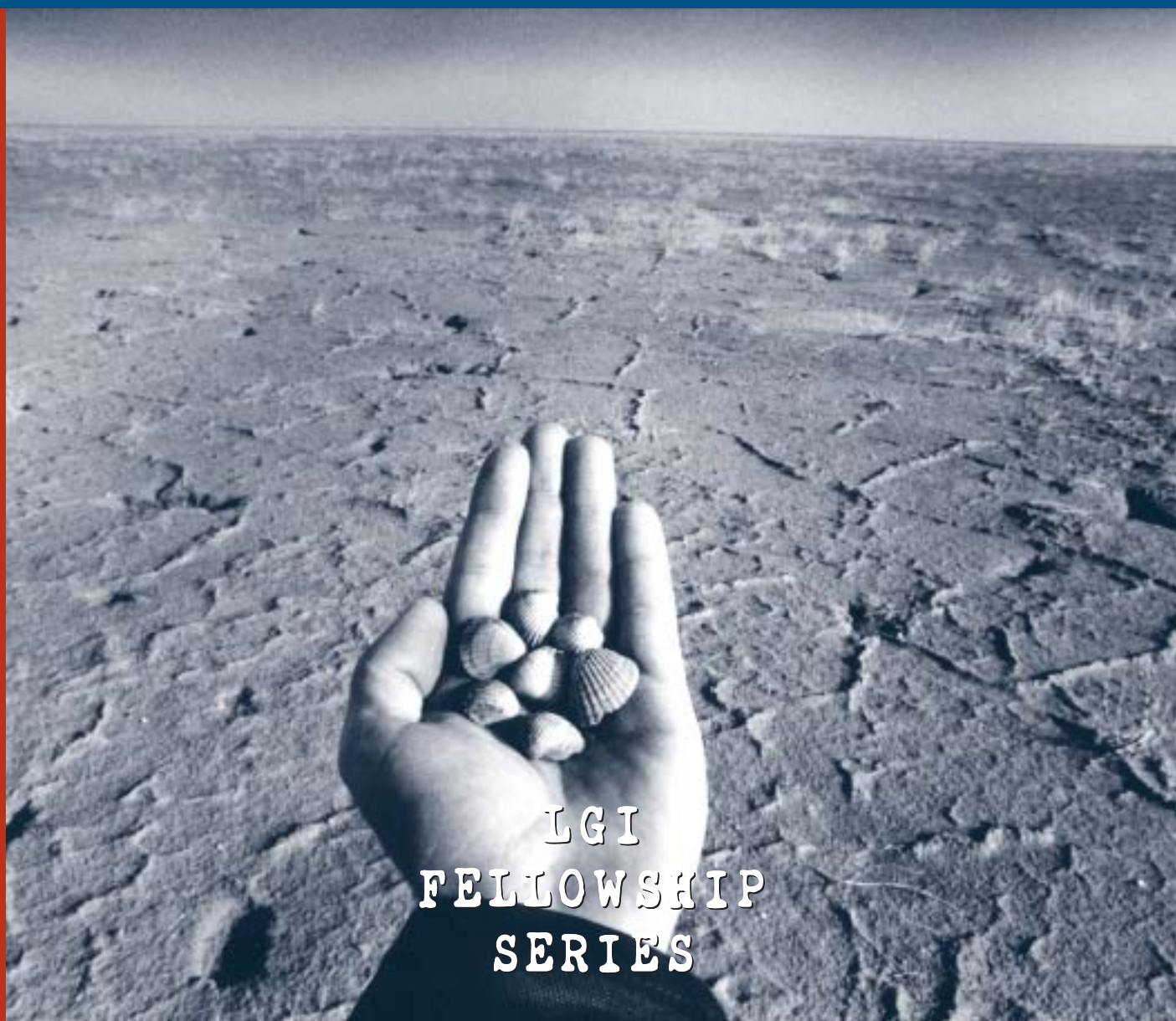
Reform Initiative

# DROP BY DROP: WATER MANAGEMENT IN THE SOUTHERN CAUCASUS AND CENTRAL ASIA

EDITED BY SARAH O'HARA

LGI Studies



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# LGI Policy Fellowship Program

Each year LGI selects talented professionals to participate in its one-year multinational fellowship program. Fellows work in small teams under the guidance of a well-respected mentor to produce analytical studies on a given topic. The mentors help build the capacity of the LGI policy analysts and experts. The studies, such as this publication, present policy options and alternatives and are geared towards the policy-making community in fellows' respective countries. Once the studies have been published, LGI determines the steps it can take to support the proposed recommendations.

The primary goal of the LGI Policy Fellowship program is to support policy research aimed at stimulating innovative and practical policy recommendations related to various areas of governance and the provision of public services. Fellows are encouraged to initiate research and to work on policy conclusions with national and local government officials and advisers. Each year broad topics are identified for candidates from different country groups.

Fellows are generally governmental officials, civil servants, members of advocacy groups or professional associations, policy researchers and policy advisers. Fellows join teams of 5-7 members each, which are then supervised by expert mentors. Fellows are encouraged to support each other's work with their expertise and comments within their teams. LGI encourages teams of fellows to develop joint or comparable research agendas.

The four fellowship topics for 2002-2003 are: the digital divide and e-democracy in Eastern Europe and Central Asia; housing the poor in major urban centers; decentralization and transformation of the governance of education; and administrative remedies for abuses at the local level.

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July, 2003

# Contents

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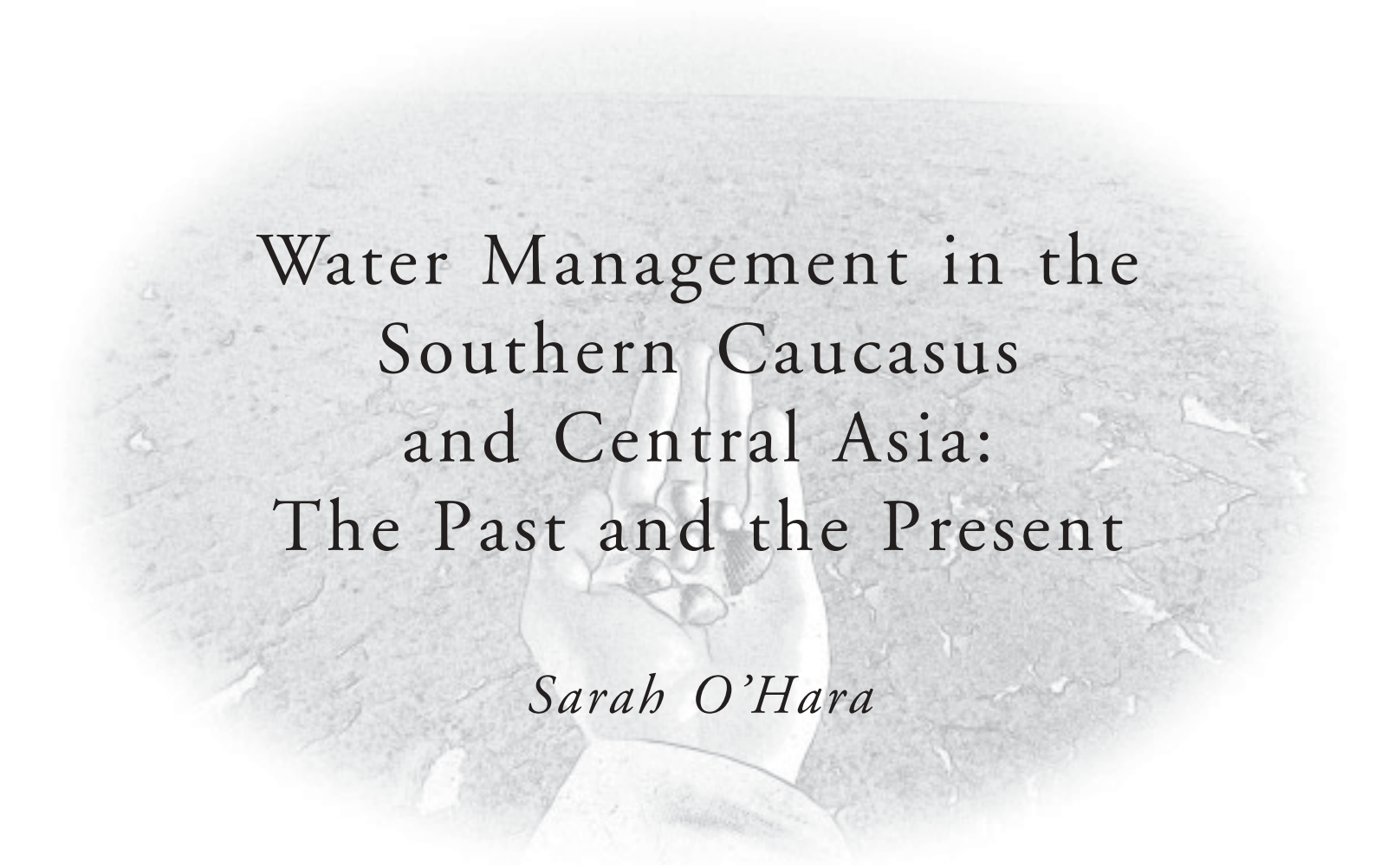
LADA ZIMINA is currently pursuing a MSc in Nationalism and Ethnicity at the London School of Economics, UK. In 1998–2002 she worked as programme coordinator and executive director at the Centre for Conflict Management, Kazakhstan. Her areas of interest include nation-building policies, sources of conflict, and conflict management and prevention in Central Asia.



# Water Management in the Southern Caucasus and Central Asia: The Past and the Present

*Sarah O'Hara*

# Water Management in the Southern Caucasus and Central Asia: The Past and the Present

*Sarah O'Hara*

## INTRODUCTION

Water is a key resource for the countries of the Southern Caucasus and Central Asia (SCCA), contributing significantly to the agricultural sector, the export economy and energy production. During the Soviet period, the region's water resources, like other natural resources, were managed with the aim of ensuring that centrally determined output targets were achieved. Until the 1980s, when the Republics were given a greater say in how their water was managed, all developments were orchestrated by Moscow, which allocated funds for these activities. The situation changed following the collapse of the Soviet Union; overnight, the fledging and often fragile governments of the eight newly independent SCCA states inherited the responsibility for the management and maintenance of the vast, highly complex and extremely bureaucratic water resources sector.

Unprepared—and in some cases unwilling—for independence, the SCCA Republics have faced considerable economic, social and political upheavals in the post-Soviet era. Four of the countries, Armenia, Azerbaijan, Georgia and Tajikistan became embroiled in civil and interstate conflict, prompting vast outmigration from the region and bringing widespread poverty to those left behind. The remaining countries, all in Central Asia, while maintaining stability saw their economies decline dramatically. The combination of civil unrest and economic crisis has had enormous implications for the water sector. Loss of personnel, budget slashes and in some cases open hostilities between the different states has had an immense impact on water management. There has been a significant decline in data collection; even when data is collected, little information is exchanged with neighboring countries. In some countries maintenance programs have come to a halt, while in others they are operating at a minimal level. As a result, irrigation and drainage systems are rapidly degrading, and in some areas, they are no longer functional. Domestic water supplies have deteriorated rapidly as equipment has failed and repairs have become impossible. Many settlements are now without a central water supply, while others often find that their water is cut-off and the quality of water is poor—and deteriorating.

Ironically, as the management and maintenance of the water sector has declined, the demands on it have increased. Agriculture, which has been and continues to be the mainstay of most of SCCA economies, is almost entirely dependent on irrigation. Moreover, for many, the produce of small garden plots has become essential to food security and in some SCCA countries more than 80% of the population relies on their garden plots for virtually all their food. The needs of the individual, however, are often in competition with the needs of the state, while the needs of the state are often in competition with those of neighboring states. Although such competition existed during the Soviet period, decisions on prioritizing needs were made by Moscow; today, this is the responsibility of independent national governments.

The situation has been further complicated by the fact that many Soviet-built water management facilities are multipurpose in nature. Reservoirs not only regulate flows and store water for domestic, industrial and agricultural purposes, but can also be used to produce hydroelectric power (HEP) and to provide flood protection. In addition, they often served more than one Republic and were built with little regard for natural boundaries or national borders. The decentralization of water management in the SCCA region, which occurred by default following the collapse of the Soviet Union, therefore had huge implications for the

region as a whole. Decisions made at the national level can have immense implications for neighboring countries and have caused tension between the various states sharing rivers and lakes. For example, Kyrgysztan's decision to operate the Toktogul reservoir on a winter HEP regime has caused tensions with its downstream neighbors of Uzbekistan and Kazakhstan, which want the reservoir to be operated on a summer irrigation regime.[1] Despite the immense social, political and economic upheavals of the post independence period, SCCA countries are beginning to recognize the need for improved and better-integrated water management strategies. Significantly, officials are increasingly aware of the benefits of shared ideas and experiences and the need to rebuild links with organizations in neighboring states. With this in mind, the Local Government and Public Service Reform Initiative (LGI) network program of the Open Society Institute sponsored this particular fellowship in 2001-2002. Entitled "Decentralization of Water Management: Public Service Reform in Central Asia and the Caucasus," the purpose of the program was to compare regional experiences and to adopt relevant management and financing perspectives of water management in a changed—and changing—political and economic environment. The project was designed to research one or more of the following issues:

- The role of the local administration in water management;
- The delegation of responsibility for service delivery;
- The economic aspects of reforming of water management: water pricing application of and market tools in the management; and
- Public participation in water management (Water Users Association and its applicability for the FSU countries).

In this endeavor, LGI included fellows from throughout the region. Mentored by Mr. Iskandar Abdullaev (Uzbekistan) of the International Water Management Institute for Central Asia and the Caucasus, the following fellows participated in the project: Lilit Melikyan (Armenia), Aydin Aslanov (Azerbaijan), Lada Zimina (Kazakhstan), Ahmat Madeyuev (Kyrgyzstan), and Anvar Buzurokov (Tajikistan). Fellows carried out their research for ten months in 2001-2002 in their home countries and met periodically to compare their findings and methodologies. At the end of the fellowship, participants reported on their activities and findings in relation to their home country. This publication includes two of these reports: Lilit Melikyan's study on the economic and social aspects of reforming water resources management in Armenia; and Lada Zimina's paper on the development of water management in Southern Kazakhstan. These two reports not only highlight country specific issues, but also provide important insight as to the major water management issues for the SCCA region as a whole. Moreover, while there is a growing body of literature on water management issues in the SCCA region, relatively few in-depth analyses of specific issues are available. As such, publication of the findings from Armenia and Kazakhstan by researchers from the region represents an important contribution to our understanding of current water reforms and their wider implication. To view the reports on the countries not represented in this publication, please visit LGI's web site at http://lgi.osi.hu.

In her detailed overview of the situation in Armenia, Lilit Melikyan analyzes the economic aspects in the reform of water resource management in Armenia, focusing on economic tools (such as water tariffs), regulatory reform and the potential impact of such reforms on poor and vulnerable households. She argues that while reforms are essential to prevent further erosion and the possible collapse of the water management sector, tariff increases and the imposition of a strict payment discipline could damage low-income households and agricultural farms. Thus, it is essential that reforms are carefully designed, that appropriate strategic investments in infrastructure are secured, and that any changes are accompanied by measures to reduce the negative social impact on the poor.

Lada Zimina's paper describes the current state of water management reforms in Kazakhstan and focuses on a case study of the Makhtaaral rayon of Southern Kazakhstan. She argues that the Government of Kazakhstan must undertake a comprehensive reform of irrigation water management, and that the current strategy for irrigation management transfer should involve legislative reform, redistribution of responsibilities among the state water management bodies, and the empowerment of farmers and WUAs. The steps necessary for successful transfer include: adoption of a new Water Code; reorganization of the governmental wa-

ter management institutional makeup; clarification of irrigation infrastructure ownership issues; and increased government and international donor investment.

## CASE STUDIES IN CONTEXT: WATER RESOURCES OF THE SOUTHERN CAUCASUS AND CENTRAL ASIA

### The Southern Caucasus

The Southern Caucasus encompasses a wide range of ecological environments, from cool, humid conditions in the mountains of Georgia to the arid/semi-arid dryland scrub of Azerbaijan. Precipitation varies enormously across the region, with considerably higher levels in the highlands than the low-lying valleys. The climate is markedly seasonal, with most precipitation falling as snow in the winter months. The region contains dense network of rivers and streams, many of which flow into the region two main rivers the Kura and the Araks (Figure 1). The largest river in the southern Caucasus is the Kura, which rises in the Pontic mountains of northeastern Turkey and flows through Georgia and Azerbaijan before discharging in to the Caspian Sea. Its main tributary is the Araks, which also originates in Turkey. The Araks flows to the east, and for much of its length forms a border river between Turkey and Armenia before continuing along the shared border of Iran and Azerbaijan. The rivers are largely fed by snowmelt; consequently, peak discharge occurs during late April–June, at which time 58–65% of the annual flow occurs. Approximately 60% of the discharge is via the Kura River, with the remaining 40% attributed to the Araks. Huge inter-annual

*Figure 1*
The Kura-Araks Drainage Basin

variations in discharge occur; while the mean discharge of the Kura-Araks Basin is an estimated 32 km$^3$ per year, in low snowfall years water availability can drop significantly.

Unlike the Kura and the Araks, with only two major reservoirs on the main system, many of the rivers' tributaries are heavily regulated. There is a total of 130 reservoirs throughout the Southern Caucasus, storing water for irrigation, industrial and domestic use. A number of larger storage facilities are also used for the production of HEP.

The Kura-Araks Basin is shared by five states, the three countries of the Southern Caucasus; Armenia, Azerbaijan and Georgia, as well as Turkey and Iran. Significantly, Armenia lies entirely within this basin (Table 1.). During the Soviet period, the USSR signed number of transboundary agreements with Turkey and Iran pertaining to the Kura and Araks rivers. In 1927, for example, Turkey and the USSR signed the "Treaty on the Beneficial Uses of Boundary Waters," in which they agreed to share water on a fifty-fifty basis and organize a Joint Boundary Water Commission to control the use of the frontier water (however, this lacked a legal basis). The USSR also signed an agreement with Iran in 1957, which covered the joint utilization of the frontier parts of the river Araks for irrigation and power. Under the agreement, the two states were allocated 50% of all potential water and power resources on the shared portions of the river.

In terms of absolute water availability, Georgia is endowed with the greatest water wealth and only experiences water shortages in summer or exceptionally dry years. Although water distribution is rather uneven, it is estimated that, on a per capita basis, Georgians have more than four times the amount of water available to Armenia and Azerbaijan.[2] Armenia experiences water shortages on a regular basis, but has significant groundwater reserves of a relatively high quality which are extremely important—particularly as a source of drinking water. At the downstream end of the system, Azerbaijan not only has the highest negative water balance, but also experiences problems with water quality. Furthermore, its groundwater resources are limited. Hence, the country is the most vulnerable in terms of absolute quantity and quality of accessible water.

## Central Asia

With the exception of Kazakhstan, the Central Asian Republics (CARs) lie almost entirely within the Aral Sea Basin, a large internal drainage system with its terminus at the Aral Sea (Figure 2). The region is dominated by low-lying deserts, flanked by extensive mountain ranges to the south and southeast and has a marked continental climate with long hot summers and cool moist winters. Annual precipitation is generally less than 200 mm in the desert lowlands, reaching a maximum of 800–1600 mm in the high mountain areas of the Pamirs and the Tien Shan. Evaporation varies accordingly, from over 2250 mm in the most arid region, to less than 500 mm in the mountainous zones. Thus, while the deserts experience a significant moisture deficit, the highland regions have a surplus of moisture and form the flow generation zone for Central Asia's main rivers.

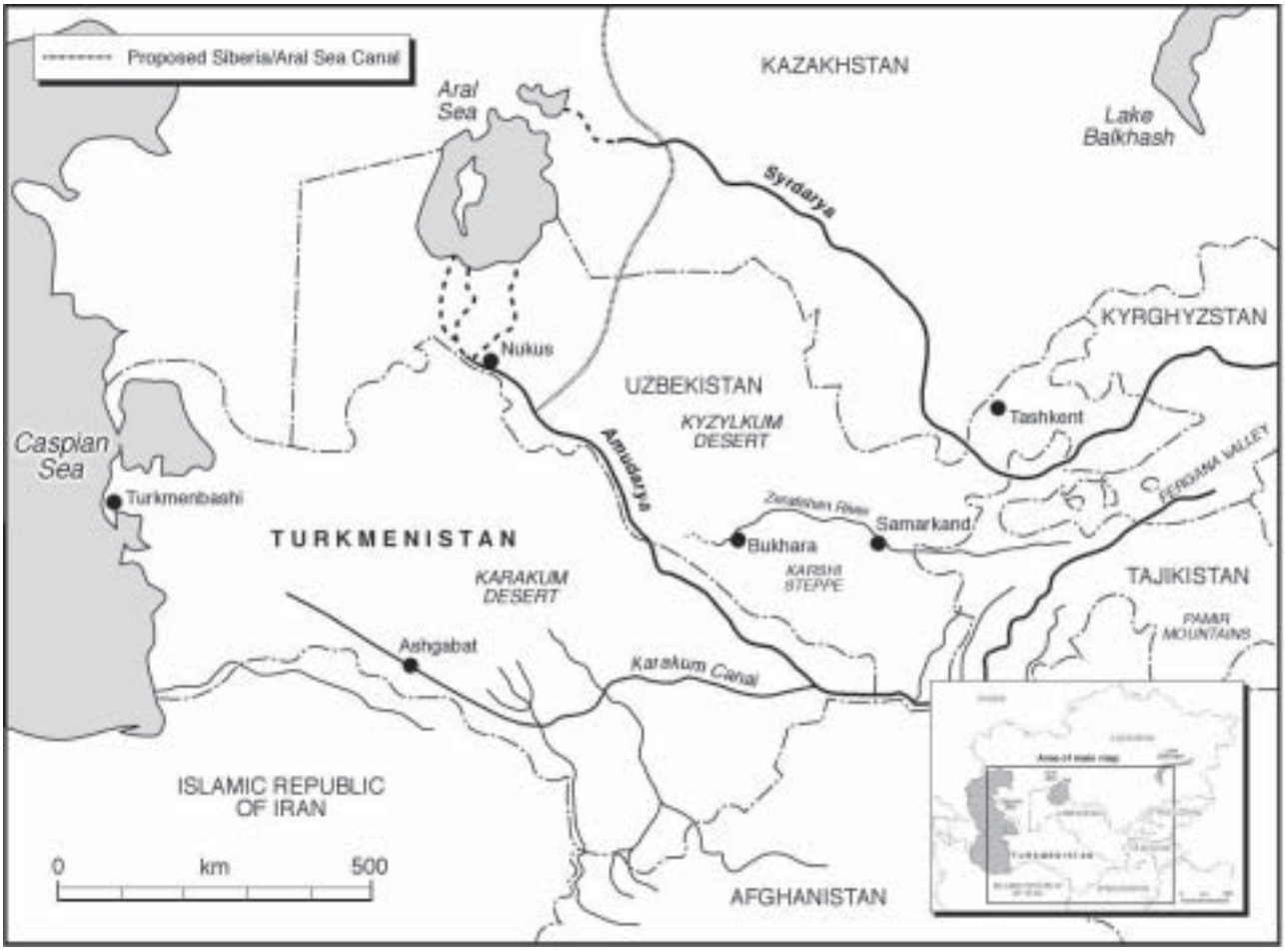
Draining an area of 534,939 km$^2$ the Amudarya is Central Asia's largest river in terms of discharge. The river rises as the Pamir in Tajikistan and the Bakhandarya in Afghanistan which join to form the Pyandzh at the Tajik-Afghan border. At Termez, in

*Table 1*
Background Details for the Kura-Araks Basin

| | % of Country | % of Total Basin | Area [km$^2$] | Population [millions] |
|---|---|---|---|---|
| Armenia | 100.0 | 15.35 | 29,741 | 3.0 |
| Azerbaijan | 79.8 | 30.87 | 57,800 | 6.8 |
| Georgia | 52.4 | 18.53 | 34,700 | 3.0 |
| Turkey and Iran | — | 35.25 | 66,000 | — |
| Total | — | — | 188,241 | c. 20.0 |

*Source:* Israfilov, 2002; Mott MacDonald, 2003.

*Figure 2*
The Major Rivers of the Aral Sea Basin, Central Asia




Uzbekistan, the Pyandzh is joined by the Sukhandarya to form the Amudarya proper. From its headwaters, the Amudarya flows around 2500 km across Tajikistan, Uzbekistan (where it forms the border with Afghanistan) and Turkmenistan and finally back into Uzbekistan before discharging into the southern Aral Sea. The river displays two close—but distinct—peaks in discharge: the first, in April–May, is associated with snowmelt; the second, in June–July, occurs during the period of maximum glacial melt. Discharge is thus closely related to the amount of snowfall and summer temperatures, with mean annual flow varying from 46.9 to 108.4 km$^3$ per year, with an average of 78.5 cubic kilometers.[3] A large number of structures are used to control flows in the Amudarya basin, particularly on some of the smaller tributaries. The largest is the Nurek Dam located on the Vakhsh River in Tajikistan. The Nurek is a multi-purpose facility used for irrigation water storage, flow regulation, flood control and HEP. Significantly, the largest river in the upper Amudarya Basin, the Pyandzh, is entirely unregulated, as is the Amudarya proper from Temez to the Tyuyamuyun Reservoir at the head of the Amudarya delta.

Central Asia's second major river, the Syrdarya, rises in the mountains of Kyrgyzstan. It has two main tributaries: the Naryn, which is fed by over 700 glaciers high in the Tien Shan; and the Karadarya, which sources in the Fergansky and Alaysky Mountains. The two rivers merge in eastern Uzbekistan to form the Syrdarya; from there, the river flows into Tajikistan before re-entering Uzbekistan and finally flowing in to Kazakhstan where it discharges into the northern Aral Sea. The Syrdarya drains a catchment of 782,617 square kilometers. Although similar in length, its discharge is approximately half that of the Amudarya—ranging from 21.4 to 54.1 km$^3$ per year (37.2 km$^3$ on average).[4]

The period of maximum discharge occurs in June–July. The Syrdarya river is regulated through the Naryn-Syrdarya Reservoir Cascade, which incorporates five major reservoirs: Toktogul (Kyrgyzstan), Charvak (Uzbekistan), Andijan (Uzbekistan), Kairakum (Tajikistan) and Shardara (Kazakhstan). The largest structure in terms of storage volume is the Toktogul Reservoir in Kyrgyzstan, which regulates the Naryn River.

The Amudarya and Syrdarya account for nearly 90% of the usable water in of the Aral Sea Basin, which on average is approximately 125 km$^3$ per year. The remaining ten percent is derived from the region's numerous smaller rivers and streams such as the Murgap, Tejen and Zarafshen Rivers (Figure 2.). Tajikistan forms the main flow generation zone for the Amudarya, and is by far the most important source of water in the Aral Sea Basin—accounting for over 55% of the region's water resources. A further 25% (approximately) of the basin's flows are generated on the territory of Kyrgyzstan. Consequently, these two countries account for more than 80% of all water available for use in Central Asia (Table 2).

## WATER USE IN THE SOUTHERN CAUCASUS AND CENTRAL ASIA

The main user of water in the Kura-Araks Basin is agriculture, which accounts for over 55% of water use in the basin. An additional 30% of water is used in industry, with the remainder used for domestic purposes. In terms of overall use, Azerbaijan is by far the greatest consumer of water in the region, accounting for 75% of consumption in the Kura-Araks basin. Georgia consumes the least amount, using some six to seven percent of available water resources (Figure 3).

Water use in the CARs is considerably greater than in the Southern Caucasus. Uzbekistan, the single largest user, consumes almost ten times the amount of water as Azerbaijan. The vast majority (90–96%) of water is used by the agricultural sector, with most of the CARs using less than two percent of their available water resource for domestic purpose (Figure 4).

## PRE-SOVIET WATER MANAGEMENT

Central Asia and the Caucasus have a long history of agriculture and settlement, boasting some of the oldest known sites of irrigation in the world. In Central Asia, for example, the earliest know sites of irrigation date back some 7000-8000 years. By 2000 years ago, large tracts of land were irrigated in the region's better-watered locales. Our understanding of how the region's earliest irrigation networks were managed is extremely limited, although it is likely that sophisticated organizational structures were in place at a very early stage. What we do know is that traditional systems were generally localized and often dependent on a single water supply that was not only limited, but also fluctuated considerably from year to year. As a result, water management required considerable skill. The

*Table 2*
Flow Generation and Population Figures for the Aral Sea Basin

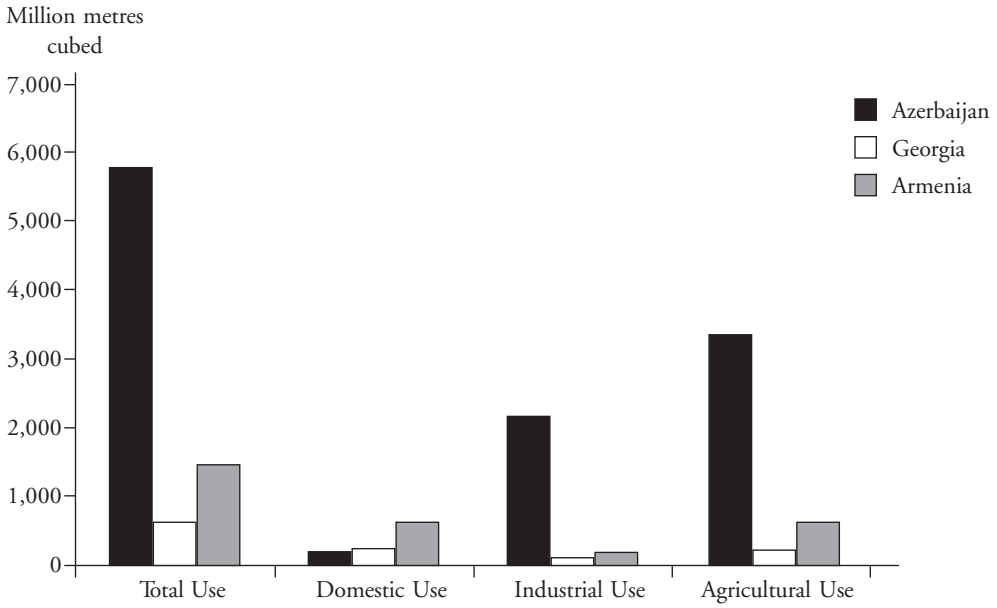
| Country | Amudarya Basin | Syrdarya Basin | Aral Sea Basin |
|---|---|---|---|
| | Flow generation [km$^3$/year] | Flow generation [km$^3$/year] | Population |
| Afghanistan | 6.18 | 0 | — |
| Kazakhstan* | 0 | 4.5 | 2.6 |
| Kyrgyzstan | 1.9 | 27.4 | 2.2 |
| Tajikistan | 62.9 | 1.1 | 6.1 |
| Turkmenistan** | 2.78 | 0 | 5.4 |
| Uzbekistan | 4.7 | 4.14 | 24.3 |

* Data only for the two southern provinces.

** Includes flows from Iran.

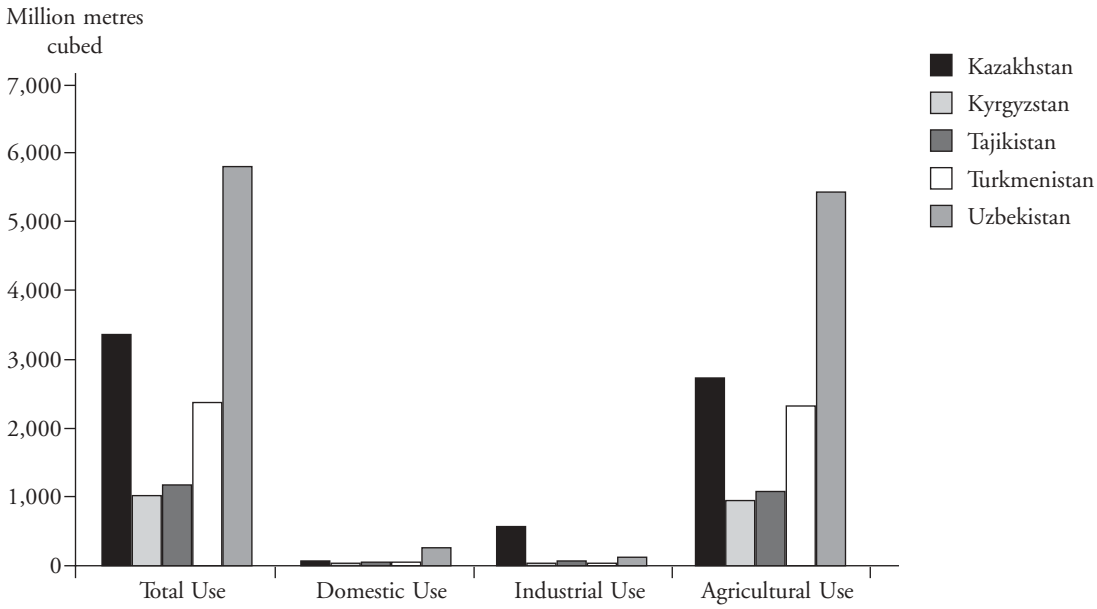
*Source*: WARMAP, 1996; GEF Reports, 2002.

*Figure 3*
Water Use by Sector in the Southern Caucasus




*Source*: Mott MacDonald, 2003.

*Figure 4*
Water Use by Sector in Central Asia



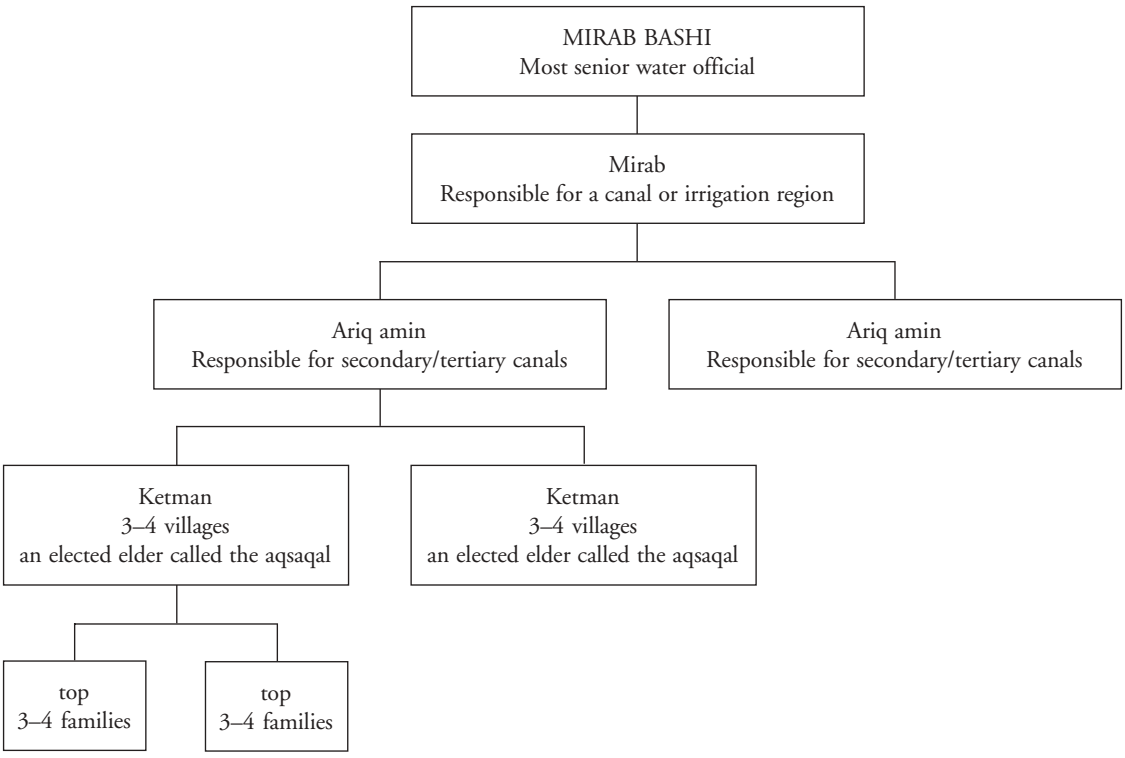

*Source*: FAO (1997).

individual who was responsible for the highly important and often contentious decisions on water allocation and distribution was one of the most senior officials in the central government.

One of the most detailed descriptions of traditional water management in Central Asia is provided by Von Middendorf (1882), who gives an excellent overview of how water was managed in the Kokand (Qoqand) Khanate of the Fergana Valley shortly after Tsarist forces had annexed the region.[5] He noted that, as with other Central Asian Khanates, the Khan acted as the steward of water rights for Allah, which meant that the state effectively retained the right of ownership. The *mirab bashi* was the most senior water official and was responsible for water allocation and distribution. He was elected by the water user communities and paid in kind (usually by a proportion of the grain harvest) by the *deqhans*.[6] This payment, known as *Kipsen*, was never a consistent percentage of the crop, as the farmer paid depending on how satisfied he was with the job that the mirab bashi was doing. Thus, the mirab bashi was both elected and sanctioned by water users. Local *mirabs* were responsible for secondary canals and, according to Von Middendorf, "knew his district in minute detail."[7] In many cases, the mirab was assisted by the *Ariq amin*, who was responsible for smaller water supply canals know as *ariqs*. Like the mirab bashi, mirabs were also elected and paid by the deqhans. The construction and maintenance of the irrigation system as well as the distribution of water at the village level was the responsibility of the *ketman*, essentially a water user association comprising of three to four villages. Each village elected an elder (*aqsaqal*), who made decisions based on discussions with other village elders. Ketman were further divided into smaller units, known as a *top,* which consisted of a few streets or a family unit (Figure 5).

When it was necessary to undertake construction work, the mirab bashi and mirabs would conscript water users. Villages at the head of a planned new ariq, which would receive more and fresher water, were expected to contribute more to the project in terms of time and resources. If a major project was proposed, however, it was necessary to call in help from other

*Figure 5*
The Traditional Water Management Structure in the Kokand Khanate of the Ferghana Valley during the 1880s



communities. While the construction of new canals and other irrigation infrastructure was a one-off job, maintaining the system and keeping the ariq and drains free of silt and vegetation was a continual undertaking. It was obligatory for all water users to take part in the annual maintenance of the network. *Hashar*, as it was known, was the most important affair in the village administration and individuals who refused to take part in it were fined or denied access to communally allocated land and water.

People were even assigned communal lands based on contributions of labor to hashar. It was, according to Von Middendorf, a "tax which was understood, and developed within local conditions; the population has become accustomed to its fulfillment since childhood." Thus, in effect, hashar was a system which linked benefits to duty.

## MODERNIZATION: THE SOVIET PERIOD

Following the 1917 Bolshevik Revolution and subsequent emergence of the Soviet Union, the management of water was taken out of the hands of the elders and councils with whom it had traditionally resided and was developed as common resource for the benefit of all. There emerged instead several government bodies which were responsible for the development of a regional water management strategy that would allow centrally determined production targets to be met. Foremost among these agencies were the Ministry for Land Reclamation and Water Resources, the Ministry of Agriculture and the Ministry of Energy. Soviet planners based in Moscow developed comprehensive plans aimed at maximizing output, which were then passed down to republican level organizations to implement. For much of the Soviet period, the plans appeared to work. Output from agriculture rose substantially and the landscape of the SCCA region was transformed by large-scale water diversion and irrigation schemes that took water from areas of surplus to those of deficit. Vast tracts of the desert steppe were transformed, and by the 1980s the Soviet Union (specifically the Republics of Uzbekistan and Turkmenistan), ranked among the most important cotton growing areas of the world. But the cost of making the deserts bloom was immense. Huge amounts of water were wasted, through evaporation, seepage from unlined canals, and wasteful irrigation practices. The net result was a huge increase in the amount of water used, widespread water logging of fields and consequently secondary salinization of the soils,[8] and most significantly the dramatic decline of Aral Sea.[9] By the 1970s, the Soviet authorities were waking up to the fact that water was being managed in a wasteful and unsustainable manner, and that Republics on the lower reaches of the region's major rivers were receiving insufficient water.[10] The situation was especially problematic in Central Asia. In the mid-1980s, the Soviet authorities established two river basin authorities (BVOs), one for the Amudarya and the other for the Syrdarya. The aim of the BVOs was to improve the management of water resources within the two basins, mainly to ensure that centrally determined production targets were met, but also to increase flows to the Aral Sea. Although the measures introduced by the Soviet administration may have improved water management in Central Asia and the SCCA region as a whole, the collapse of the Soviet Union brought a halt to plans aimed at improving the management and use of water. Thus, at independence, the countries of the SCCA inherited a system already in crisis.

## COLLAPSE AND REFORM: THE POST-SOVIET PERIOD

Independence had enormous implications for water management in the SCCA region, although these have differed in the two major sub-regions and for each of the eight countries. In some countries, there have been few changes in water management, while elsewhere, significant efforts to reorganize and redefine the way in which water is managed are underway.

### The Southern Caucasus

Following the collapse of the Soviet Union, the Southern Caucasus descended into chaos as age-old conflicts re-emerged and threatened to engulf the region. By early 1992, Armenia and Azerbaijan were at war: Armenian-backed Karabakh militiamen had effectively taken control of the largely Armenian autonomous oblast of Nagorno-Karakakh in Azerbaijan. Although a cease-fire was brokered in 1994,

periodic outbreaks of violence continue and a final peace settlement has yet to be agreed. Similar ethnic related conflicts flared up elsewhere in the Southern Caucasus and the region has suffered widespread civil unrest with outbreaks of violence—most notably between Georgia and South Ossetia, and Georgia and Abkhazia. The current status of these conflicts varies, but as yet there has not been a single peace agreement between any of the warring factions and the situation throughout large parts of the Caucasus remains extremely tense.

The highly volatile situation throughout the Southern Caucasus has had immense implications for water management at both the regional and national level. At independence, for example, over 40 river segments and tributaries in the region became transboundary, either by crossing a border, being a border river or ending up as a major tributary at a border.[11] Thus, the three former Soviet Republics of the Southern Caucasus have failed to develop a legal basis for the management of the water resources that they share. Indeed, how these rivers are managed has barely been discussed. Although Georgia and Azerbaijan have signed a number of agreements and memorandums, and have made provisions to share data, the lack of equipment and funds to undertake systematic monitoring of water availability and quality means that little data exchange has occurred. There are, however, various issues that need to be addressed. Officials in Azerbaijan, for example, frequently voice their concerns about the quantity and quality of the water they received from the upstream countries, and complain that discharges from industrial complexes are polluting the region's water bodies.[12] Although the marked decline in industrial output has resulted in a significant decrease in pollution, the virtual collapse of the sewage and wastewater treatment system throughout the region has increased the amount of organic waste in the rivers. In Armenia, for example, sewage treatment has dropped dramatically: whereas in 1990, over 500 million cubic meters (MCM) of sewage was collected and approximately 315 MCM were purified by 1999, this had fallen to 160 MCM and approximately 105 MCM respectively.[13] The main rivers are thus heavily polluted with municipal, industrial and medical waste, and concentrations of heavy metals, phenols and nitrogen are considerably higher than the national and international standards. Given that Azerbaijan is largely dependent on these surface water bodies for drinking water, it is not surprising that Azeri water officials are concerned about water quality. It is thus significant that only Azerbaijan has signed the UN Convention on the Protection and Use of Transboundary Water Courses and International Lakes.[14]

As in the Soviet period, water management is spread amongst a range of institutions and agencies. The highly

*Table 3*

Where responsibilities lies for elements of water management in Azerbaijan, Armenia and Georgia.

| Water Management Issue | Armenia | Azerbaijan | Georgia |
|---|---|---|---|
| **Ownership of Water** | **State** | **State/Municipality/Private** | **State** |
| River Basin Management | Ministry of Natural Protection | — | Ministry of Environment |
| Water management legislation | Ministry of Natural Protection | Ministry of Justice;<br>Ministry of Ecology | Ministry of Environment |
| Water quality monitoring | Ministry of Natural Protection;<br>Ministry of Health | Ministry of Health;<br>JSC AzerEnergy;<br>Ministry of Ecology | Hyrdromet,<br>Ministry of Health |
| Water quantity monitoring | Committee for Water Resources;<br>Ministry of Natural Protection | Ministry of Ecology;<br>JSC AzerEnergy;<br>Committee of Amelioration | Hydromet |
| Monitoring of water use | Committee for water resources | Committee of Amelioration (irrigation);<br>Ministry of Energy (HEP);<br>Users | Department of Amelioration (irrigation) |

*Source*: Mott MacDonald, 2003.

fragmented nature of water resource management means that conflicts of interests are inevitable. Moreover, there are considerable differences in the water management structures between the three countries, which makes the management of transboundary water resources more difficult. For example, reservoir management is the responsibility of the user in Georgia and Azerbaijan, but of the Committee of Water Resources in Armenia—with seven separate agencies responsible for water quality (Table 3).

## Central Asia

The Central Asia Republics took a somewhat different approach to water management following independence. From the outset, the need for regional cooperation was recognized by the emerging Central Asian leadership, and the Water Resource Ministers from all five countries met in September 1991—before the dissolution of the Soviet Union—and announced that from hence forth "joint water resources management would be established on the basis of equity and mutual benefit."[15] The interstate Almaty Agreement on Water Resources, signed in February 1992 by all the CARs, established joint ownership and management of the region's water resources—along with the retention of sovereign control over crops, industrial goods and electric power obtained from them. The agreement further reiterated the need for cooperation, stating that "only unification and joint coordination of action" would help improve economic and environmental conditions in the region. Furthermore, member states agreed to adhere to existing Soviet determined water allocations, to refrain from projects infringing on other states and to the free exchange of information. The agreement provided for the establishment of the Interstate Commission for Water Management (ICWM), which meets five times a year and is responsible for allocating water resources based on the 1992 treaty—although actual allocations are implemented by the Syrdarya and Amudarya River Basin Authorities (BVOs).

A number of subsequent agreements have been signed by the five CARs, including the 1993 Agreement on Joint Actions to Solve the Aral Sea Crisis' (adopted on the March 26, 1993 Heads of State Meeting in Kyzyl Orda). A framework for the management of Central Asia's water emerged from these agreements. This framework consisted of environmental and water management agencies, headed by the Interstate Council for the Aral Sea (ICAS), and financial organizations, such as the International Fund for Saving the Aral Sea (IFAS). At the Heads of State/ICAS meeting of February 27, 1997, ICAS and IFAS merged into a new IFAS, with President Karimov of Uzbekistan elected as the first president on a two-year rotating term.[16] The current president of IFAS is President Rahmonov of Tajikistan. The Central Asian Presidents have reiterated their commitment to cooperative water management via the IFAS, other regional organizations and regional summits.

The Almaty agreement signifies that the lion's share of Central Asia's water is allocated to the three downstream countries of Uzbekistan, Turkmenistan and Kazakhstan, which together receive 86% of withdrawals from the Amudarya and 89.6% from the Syrdarya (Table 4). Uzbekistan is by far the single biggest user, with access to just over 52% of the flows of the Syrdarya and 43% of the flow of the Amudarya. At the

*Table 4*
Water Allocations from the Amudarya and Syrdarya as Agreed at the April 6, 1992 Meeting of the ICWC

| | Percent of Flows of the Syrdarya | Percent of Flows of the Amudarya |
|---|---|---|
| Kazakstan | 38.1 | 0 |
| Turkmenistan | 0 | 43.0 |
| Uzbekistan | 51.7 | 43.0 |
| Tajikistan | 9.2 | 13.6 |
| Kyrgyzstan | 1.0 | 0.4 |
| Total | 100.0 | 100.0 |

other end of the spectrum, Kyrgyzstan is allocated less than ten percent of the basin's water resources. Significantly, the Almaty agreement makes no provision for Afghanistan, despite the fact that around six percent of flows within the Aral Sea Basin are generated on Afghan territory.

Despite considerable talk of cooperation and the need for a unified approach to water management in reality the situation has been very different, and many of the issues that have proved problematic in the Southern Caucasus have also emerged in Central Asia. Lack of funds, loss of key personnel, poor maintenance, and a failure to exchange information by institutions both within and between countries have had a deleterious impact on the water management sector. The BVOs, for example, are interstate organizations, both based in Uzbekistan. They do not, however, rotate the management of the BVOs between the five states, nor do they employ specialists from other states.[17] Thus while the BVOs are a central component of the overall water management system, they have no real power and are not recognized by individual state legislatures and thus have no real authority. They are chronically under funded because the countries are unable or unwilling to fulfil their financial commitments to them. Thus, while on paper the BVOs have considerable power in practice, they are incapable of genuine basin wide management. Organizations responsible for water management within the Republics are equally strapped for cash and officials throughout the region constantly bemoan the fact that they are unable to fulfil their commitments because of the lack of resources and personnel.[18] Since 1991, for example, there has been a dramatic decline in the number of people employed in the water management sector because of financial constraints and changing social and political conditions within the Republics.

It is not only a question of managing the system, but maintaining it as well. The maintenance requirements are enormous and even at the best of times would be a huge financial undertaking for the Republics. The virtual collapse of the region's economy, however, has made it an almost impossible task. Dams and reservoirs are in urgent need of repair, irrigation canals are silting up, much of the drainage system is so choked with weeds that it no longer works and equipment for maintaining the system is largely defunct.[19] Kyrgyzstan, for example, has been very vocal on this point and it resents the fact that waters generated on its territory and stored in reservoirs—waters for which it is responsible—benefit the downstream countries of Uzbekistan and Kazakhstan. It has repeatedly argued that the downstream countries should be partly responsible for maintenance costs and have gone as far as stating that water is a commodity for which Uzbekistan and Kazakhstan should pay. After a decade of wrangling, during which time Kyrgyzstan has repeatedly cut flows to the downstream countries, there is some indication that the three countries are beginning to find solutions to the issue of shared responsibility. Kyrgyzstan and Kazakhstan, for example have recently signed agreements on the joint usage of facilities on the rivers Chu and Talas.[20] Under the agreement, Kazakhstan will participate in the exploitation, repair, and reconstruction of the dams, channels and pumping plants in return for water free of charge. Such an agreement could provide the basis for agreements on other shared rivers and facilities that benefit more than one country, and thus represents an important step forward in water relations in the region as a whole.

There are a number of other factors that complicate water management at the regional level. A major issue is the fact that most of the water storage facilities in the region are located in the upstream states. These facilities, like those of the Southern Caucasus, are multipurpose. This has resulted in intense competition for water between the upstream states who want to use their resources to generate much needed HEP, particularly during the winter months, and the downstream users who want water to be released in the summer for irrigation purposes. Although the CARs, and especially those that share the Syrdarya basin, have been relatively successful in negotiating agreements on how the system should be managed, the situation is likely to be complicated by changing land and agricultural policies and increasing demand for water. This is exacerbated by population growth and changes in the climate which are expected to result in a significant decrease in total water availability.[21] As a result, the management of the region's unevenly distributed water resources will become even more complex. It is therefore essential that the CARs develop water management strategies that are able to cope with this increased complexity while at the same remain sensitive to the needs of both the local and regional population.

## DECENTRALIZED WATER MANAGEMENT IN ARMENIA AND KAZAKHSTAN

### Irrigation Sector

Given that the agricultural sector is the main user of water in the SCCA region it is not surprising that most attention has focused on this sector. Many observers, for example, have noted that the often massive water diversion and irrigation schemes built during the Soviet period are highly inflexible, difficult and expensive to manage and extremely wasteful of water. However, large-scale irrigation schemes elsewhere have experienced similar problems and in recent years much attention has focused on how the efficiency (both in terms of water use and cost) of such schemes can be improved. The transfer of irrigation schemes from government control to the user is increasingly viewed as an important step forward. It is argued that by making water users responsible for the irrigation system, at least at the local level, improvements may result. Irrigation transfer also has the benefit of reduce pressures on thinly stretched government finances and may be central to ensuring the long-term sustainability of irrigation systems.[22] Significantly, decentralized water services should allow for better assessment of user charges, which in turn should create incentives for efficient water use as well as finance improved service delivery.[23] Moreover, by bringing management issues closer to the beneficiary population, greater flexibility in the system can be achieved, thereby creating conditions that are more in keeping with the requirements of the user at the local level. It is thus unsurprising that irrigation management transfer in the SCCA region is viewed as a major component for the restructuring of the water sector. Significantly, irrigation transfer schemes that have been successful have often been tailor-made in that the organizational structures have been set up to suit a particular scheme rather than "a one-set of rules suits all" approach. Moreover, they have been established following participation from a range of stakeholders, have benefited from appropriate financing both during and after implementation, have included appropriate training and have been established taking into account cultural and historical context factors. It is thus unsurprising that irrigation management transfer in the SCCA region is viewed as a major component of the restructuring of the water sector and has been forcefully promoted in protects funded by major international donors. Interestingly, the traditional form of water management in the region has many similarities to the new forms of management being promoted by such agencies.

Decentralization in itself, however, does not necessarily result in improvements and there are many examples where irrigation management transfer (IMT) has failed.[24] Reasons cited for such failures include a reluctance of the national administration to the transfer of power, unclear ownership of infrastructure, poor training, transferring poorly designed irrigation schemes that are difficult and costly to manage and a failure to take into account historical, cultural and socials issues. Many of these and related issues are highlighted by Lada Zimina in her critique of water management in southern Kazakhstan. Irrigation Management Transfer via the establishment of WUOs began in 1993 but as Zimina highlights such organizations were not established in a considered way following discussions with potential users and beneficiaries but in essence forced on the population by a government unsure what to do with its new found role of water manager. The failure of many of these organizations was, she argues, due to a combination of inconsistent policies at the national level, the lack of a coherent and robust legal framework, the failure of the authorities to engage with water uses to determine their real needs and requirements, a lack of education and training and a chronic lack of funding. In sum, Kazakhstan, while quick to embrace the idea of decentralization of irrigation water management, failed to ensure that the necessary pre-requisites were in place. Moreover, unless appropriate reforms are introduced the chances of successful transfer of irrigation management are minimal.

Irrigation Management Transfer in Armenia began in 1996, and there are currently 600 WUO in the country. Like Kazakhstan, the majority of water user groups were imposed from above and suffered many of the same problems–poor legislation, lack of finance and lack of training. Here, too few WUOs have survived and the Government of Armenia recognizing the importance of this sector has put in place significant reforms aimed at supporting irrigation management transfer. Although it is still too early to assess how successful these changes will be, the very fact that the problems have been recognized and reforms put in place to

try an address them is a promising start. But, as Melikyan stresses, it is essential that reforms are implemented in such away that the poorer sectors of society are not disadvantaged and that Armenia takes this opportunity to instigate policies that will serve as the foundations for future sustainable economic growth.

### Municipal Water Sector

Like the irrigation sector there has been a marked decline in water provision at the municipal level throughout the SCCA region as a whole. However, the nature and scale of these changes as well as the responses to them have varied significantly. Recent reforms in Armenia have shifted the burden of responsibility away from the central government. Communities, for example, are now responsible for providing drinking water and wastewater services within a given geographical area, setting tariffs for municipal water and wastewater and increasing user involvement in decision making processes. All households are to be metered either on a communal or individual basis and customers are responsible for installing a meter although the more vulnerable sectors of society will be provided with them. New legislation that has been passed in recent years represents a fundamental shift in the way municipal water is managed and has the potential to bring marked improvements in service provision. But the challenges for the various organizations responsible for municipal water supply are immense. A huge investment in infrastructure is needed, water quality must be improved, a significant reduction in losses from the system are needed and most significantly the population remains to be convinced that they should pay for municipal supply, particularly given the current poor level of provision. The issues highlighted as problematic by Melikyan regarding Armenia are virtually identical to those highlighted by a recent survey of rural and urban water supply in Central Kazakhstan,[25] where it was found that most individuals were reluctant to pay more for water and felt that they were in fact charged too much for this service. This study, however, revealed that people who did not have access to a central water system were prepared to pay as they are already paying for water in other ways, either because they have to bore wells themselves, which can be expensive, or they have to buy water from water sellers. As Melikyan points out, the challenges of decentralizing municipal water supplies are very different from those experienced in the decentralization of irrigation water supply.

## SUMMARY AND CONCLUSION

The countries of the SCCA region experienced a prolonged period of political, social and economic upheaval following independence. In some respects the collapse of the Soviet Union could not have come at a worse time. Occurring as it did, just at the point when Soviet officials were beginning to recognize the importance of a basin wide and an integrated approach to water management, independence meant that the region lost funding aimed at improving water use. Moreover, the emergence of eight independent states, each with their own agendas for reform and development precluded efforts to manage water in an integrated way. In other respects, however, the virtual collapse of the water management system has allowed for a much needed reappraisal of the water sector. It has precipitated a wide ranging evaluation and review of institutional arrangements and management procedures resulting in the development of a more comprehensive and holistic picture of the needs and requirements for sustainable water management. Importantly, it should be remembered that the region has a long history of irrigation and water management and there is much evidence to suggest that traditional systems were extremely well managed, successful and sustainable over the long term.[26]

Although the SCCA states have a shared history in terms of water management and many of the problems they currently face are common to them all, their experiences and expectations since independence have differed. Programs such as the LGI fellowship provide an important means by which the "new" regional experts in the field of water management can come together and share information, ideas and lessons learned. Such information is essential if the countries of the SCCA region are to improve water management at both the regional and local level. Given that improved water management will be a key component of the region's future economic development, programs promoting cooperation rather than confrontation are invaluable.

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## ENDNOTES

1 O'Hara, 2000.

2 UN Economic and Social Council, 2003.

3 WARMAP, 1996.

4 Ibid.

5 For an excellent description and analysis of the irrigation system in the Kokand (Qoqand) Khanate from the 1870s to the 1990s see Thurman, 1999.

6 Dehqans are peasant farmers. This term has recently been re-introduced to the region.

7 Von Middendorf, 1882.

8 Smith, 1997.

9 Micklin, 1998.

10 McKinney, 2003a.

11 Mott MacDonald, 2003.

12 Israfilov, 2002.

13 MacDonald, 2003.

14 Azerbaijan signed the convention in March 1992.

15 Dukhovny and Sokolov, 2001, p.19.

16 In 1999 the Presidency moved to Ashgabat. The current president is Emomaly Sharipovich Rakhmonov, the President of the Republic of Tajikistan. For more detailed information and analysis regarding institutional arrangements, see Micklin, 1998; Weinthal, 2001.

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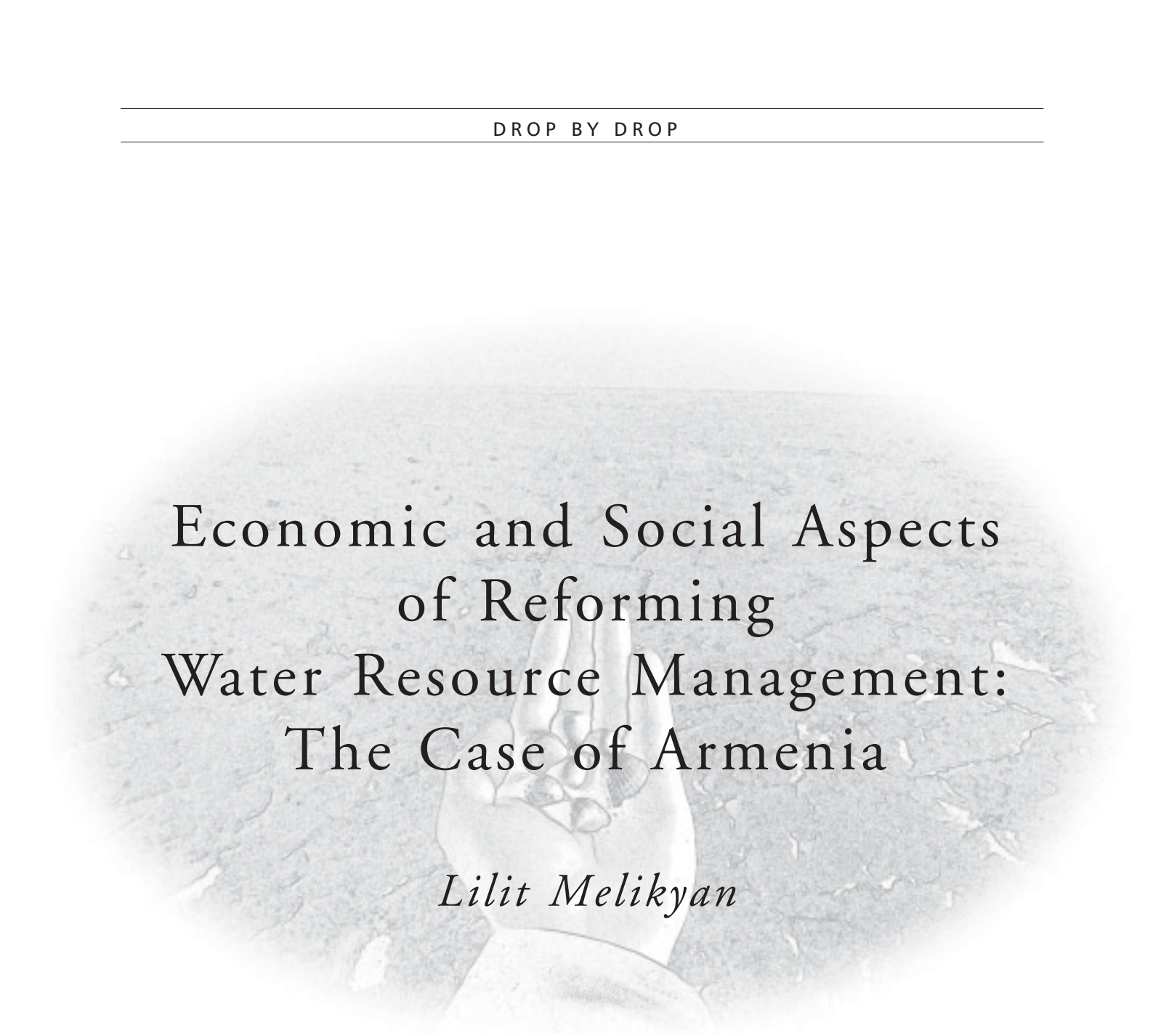

# Economic and Social Aspects of Reforming Water Resource Management: The Case of Armenia

*Lilit Melikyan*

## CURRENCY AND EQUIVALENT UNITS

| | Currency Unit = Armenian Drams (Dram, AMD) | | | | |
|---|---|---|---|---|---|
| | 1998 | 1999 | 2000 | 2001 | 2002 |
| Dram/USD | 500 | 536 | 540 | 555 | 580 |

## ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| AMD | Armenian Dram |
| AWSC | Armenian Water and Sewerage Company |
| CIS | Commonwealth of Independent States |
| DIMA | Drainage and irrigation Management Agencies |
| EBRD | European Bank for Reconstruction and Development |
| EU | European Union |
| FAO | Food and Agriculture Organization of the United Nations |
| FDI | Foreign direct investment |
| FSU | Former Soviet Union |
| GDP | Gross Domestic Product |
| GNP | Gross National Product |
| GoA | Government of Armenia |
| HIES | Household Income and Expenditure Survey |
| IDA | International Development Association |
| IDP | Irrigation Development Project |
| IFAD | International Fund for Agriculture Development |
| IFI | International Financial Institution |
| IWRM | Integrated Water Resources Management |
| JSC | Joint Stock Company |
| NGO | Non-governmental organization |
| OME | Operation and Maintenance Enterprise |
| PCE | Monthly Per Capita Expenditure |
| PFBP | Poverty Family Benefit Program |
| RSSC | Regional Social Security Centre |
| SME | Small and medium size enterprise |
| SCWR | State Committee of Water Resources |
| SIF | Social Investment Fund |
| USA | United States of America |
| USAID | United States Agency for International Development |
| USSR | Union of the Soviet Socialist Republic |
| USD | United States Dollars ($) |
| VAT | Value added tax |
| WBI | World Bank Institute |
| WDI | Water Development Institute |
| WRC | Water Resources Council |
| WRMB | Water Resources Management Board |
| WS&S | Water Supply and Sanitation |
| WUCCs | Water User Consumer Cooperatives |
| WUAs | Water Users Associations |
| WUFs | Water Users Federations |
| WWTP | Waste Water Treatment Plant |
| WTO | World Trade Organization |
| YWSC | Yerevan Water and Sewerage Company |

## WEIGHTS AND MEASURES

| | |
|---|---|
| BCM | Billion Cubic Meter |
| G | gram |
| g/l | gram per liter |
| GWh | Gigawatt hour |
| ha | Hectare |
| $km^2$ | square kilometer |
| KWh | Kilowatt hour |
| l | liter |
| lcd | liters per capita per day |
| m | meter |
| $m^3$ | cubic meter |
| $m^3$/sec | cubic meter per second |
| masl | meters above sea level |
| MCM | Million Cubic Meter |
| mm | millimeter |
| MW | megawatt |

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- National Environmental Action Program
- Sustainable Water Resources Management Project funded by USAID
- Irrigation Rehabilitation Project
- Irrigation Development Project
- Dam Safety Project
- Natural Resources Management and Poverty Alleviation Project
- FAO and Ministry of Agriculture
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# Economic and Social Aspects of Water Resource Management: Case of Armenia

*Lilit Melikyan*

## EXECUTIVE SUMMARY

The aim of this research is to investigate the economic aspects in the reform of water resource management (WRM) in Armenia, focusing on: economic tools (such as water tariffs, fees for water use and fines for ecological damage, tradable water rights, and state subsidies); regulatory reform; and the potential impact of WRM reform on poor and vulnerable households (as well as ways to mitigate possible negative results of reform). Because of the complexity of water management, we review Armenia's economic history in order to draw a framework for the analysis ahead. This demonstrates that society must apply different value judgements for different categories of water users, ensuring access to water for all.

Armenia—a small, mountainous, semi-arid country—is historically not water stressed. However, with significant seasonal and annual variability in river runoff and risk of droughts with low overall river flow, and flooding in the spring, it is water-scarce, particularly in densely populated areas. Many factors are behind the current crisis in the country's water resources, including:

- The *overall economic situation.* Despite the steady growth of the economy since 1994 (with an average GDP growth rate of 5.9%), per capita GDP was 683 USD in 2001 and 740 USD per capita in 2002 with 50.9% of the population living below the poverty line.[1] As a result, the population relies increasingly on natural resources, including water, for both agriculture and electricity generation.
- Ongoing *massive price distortions* and *direct state control over resource allocation decisions* inherited from the central planning framework continue to bog down public service management.
- *Heavy dependence on energy imports crippled by utilities.* This results from increased market prices for energy inputs (in accordance with world prices in the mid-1990s), delays in adjusting consumer prices to reflect hyperinflation, and failures to cover internal costs such as current maintenance and capital repayment.

The state of the water sector currently could be described as a low-level equilibrium trap, with decreasing service quality and revenue, and increasing operating expenses (partly due to increasing water losses in aging and poorly maintained distribution systems). For example:

- according to GoA estimates, several hundred million USD in investments are needed to rehabilitate the water infrastructure;[2]
- low collection rates predominate; and
- GoA budget subsidies to utilities have increased substantially in the last few years, reaching two percent of the GDP.

Thus, reforming water sector management is an essential task at hand. Failure to carry out reforms effectively and efficiently will lead the sector closer to collapse, and the interests and needs of consumers will continue to be neglected. At the same time, however, tariff increases and the imposition of a strict payment discipline—one of the main components of the reform program—could damage low-income households and agricultural farms. As such, it appears as though GoA has a window of opportunity to contribute to the foundation for sustainable economic growth with WRM reform, provided that: (a) reforms are carefully designed; (b) parallel reform measures are in place; (c) strategic investments in infrastructure are secured; and (d) reforms are accompanied by measures to reduce the negative social impact on poor (while maintaining cost-recovery efforts). Moreover, reforms must be politically deliverable. Achieving this is the key policy issue under analysis in this paper.

Since the late 1990s, much has been achieved by GoA on its way of reforming water sector, including:

- a study on Integrated Water Resources Management Planning (IWRMP, 1999);
- the separation of regulatory, standard setting and operational functions into independent roles with the adoption of a program for the reform of the water management system (2001);
- the adoption of a reform program to improve the financial sustainability of the companies responsible for the provision of drinking water supply/wastewater and irrigation/drainage services (05/2001);
- the passing of a New Water Code (2002), and laws on Water User Federations, Condominium Associations, and Management of Multi-apartment buildings; and
- the formation of a Water Resource Management Board and a National Council on WRM, chaired by the Prime-Minister, and so on.

The current GoA WRM reform program includes:

- achieving an integrated approach to WRM;
- transferring the operation of main water operators on a commercial basis;
- incorporating participatory water management practices;
- engaging in financial reform (gradually removing state budget subsidies by 2007);
- continuing capital investments in the infrastructure (mainly with long-term loans on favorable terms) to ensure sustainable operation of the system;
- initiating a wide scale program on the sustainable use of water resources, including a water preservation program;
- adopting a gradual approach to private sector participation in WRM;
- introducing tradability of water rights and water markets;
- gradually shifting (within eight to ten years) to water-scheme based management; and
- increasing the involvement and strengthening the capacity of *marz* (administrative regions) and community levels in formulating and implementation of WRM strategies in view of decentralization and the devolution of responsibilities.

We review separately municipal and irrigation sectors, describing the situation, government reform agenda, and potential impacts on the poor and possible ways to mitigate these impacts. In particular, we describe the institutional framework and government agenda for development for both the municipal and irrigation sectors. We show that while in the irrigation sector, enabling legislation to ensure the sustainable operation of water user groups supports a tendency toward an increase in participatory irrigation management, for the municipal water sector, there are many more problematic issues to resolve. In particular, the role of local self-government bodies in ensuring municipal water supply is unclear. Currently, these bodies are essentially excluded from the process, while at the same time, according to the Law on Self-Government, they are ultimately responsible water management.

We contend that it is essential that any government reform program—and especially one of such scale—should be proceeded by an *ex ante* analysis of the potential outcomes and impact, short-and long term gains and losses, and welfare distribution effects. We show that, surprisingly, the approaches taken in regard to municipal and irrigation sector reforms widely differ.

Finally, we argue for strengthened fiscal decentralization (and, hence, financially stronger local communities) as a critical prerequisite for a successful water sector reform program. Additionally, we demonstrate the drawbacks in the current fiscal legislation, and the need for revision.

Throughout the paper we identify further research needs, namely:

- a conceptual base for the regulatory (price and quality) framework of water sector;
- (for municipal water) an analysis of consumption patterns once water meters are widely installed to suggest an optimal water tariff (which necessitates a social assessment of population ability and willingness to pay); and
- (for irrigation) further research (involving surveys) into the impacts of economic and social reforms to determine the efficiency of the proposed social assistance to poor and vulnerable households (taking into account the regional variations among rural households).

# 1. INTRODUCTION

Water sector reform holds a prominent position on the agenda of the Government of Armenia (GoA), and increasingly so. Many factors fuel interest in water management, including the financial crisis of water utilities, poor reliability and quality of delivery, degraded infrastructure (with the cost of repairs and upgrades estimated in hundreds of millions of USD), and the heavy burden of water subsidies on the state budget. At the same time, however, tariff increases—central to the reform program—could be detrimental to low income households and agricultural farms, increasing regional inequalities and even decreasing economic activity in some parts of the country. Thus, any reform program must be designed in a way to effectively reform water utilities, while mitigating the negative impact on the poor.

The aim of this research is to investigate the economic and social aspects in the reform of water resource management (WRM) in Armenia. We address:

- economic tools, such as water tariffs, fees for water use, fines for ecological damage, tradable water rights, and state subsidies, all of which signal to users that water has an economic value and encourage a change in users' behavior;
- regulatory reform, as economic tools work efficiently when strong and appropriate for a particular setting regulatory and institutional base is present; and
- the potential impact of the WRM reform on poor households, and ways to mitigate the most negative impacts.

In analyzing the economic aspects of water sector reform in Armenia, we concentrate on: (a) municipal and irrigation water (vs. water for industrial use); and (b) decentralization efforts at the community level (rather than the central government level). After describing the municipal and irrigation water sectors in Chapter 2, we proceed in Chapter 3 to outline the main components of the Government Reform Program in WRM. In Chapter 4, we provide a brief update on the poverty situation in the country. Chapter 5 serves as an introduction to the basic economic concepts which frame the analysis throughout the rest of the paper. Chapter 6 presents the main focus of the paper: policy options for tariff and billing reform in both municipal and irrigation water sectors, including an analytical rationale for the argument that a consensus must met between the need for rather drastic economic measures and possible negative social consequences of reform. We offer suggestions in response to the latter. Finally, we conclude with a summary and policy-related recommendations.

# 2. DESCRIPTION OF THE WATER SECTOR IN ARMENIA

## 2.1 Background

Armenia, home to around three million people, is a mountainous, semi-arid country—75% of its 29,800 $km^2$ land area reaches 1500 m above sea level. While historically not water stressed, Armenia, with total water use at 3.9 BCM and 2,800 $m^3$ per capita (1988 data), it is water-scarce, particularly in densely populated areas such as Yerevan and in the south and northwest of the country. Across the country, there is significant seasonal and annual variability in river run-off, risk of droughts with low overall river flow, and flooding in spring. Hydropower accounts for 23% of electricity generation. Due to the huge withdrawal of water between 1947–1967 and 1992–1995 (the latter due to an energy crisis), Lake Sevan, the major natural multipurpose reservoir in the country, is a major environmental disaster. These basic parameters shape water resource use, which plays a key role in the economic development of Armenia. Figure 1 illustrates the decline in water use during the last decade.[3]

In addition, despite the steady growth of the economy since 1994 (with an average GDP growth rate 5.9%) per capita GDP is only 706.3 USD; 50.9% of the population lives below the poverty line.[4] Citizens rely increasingly on natural resources, including water, for both agriculture and electricity generation. Meanwhile, ongoing massive price distortions and direct state control over resource allocation decisions inherited from the central planning framework continue to bog down public service management. Likewise, heavy dependence on energy imports and the high costs of managing an inefficient utility sector negatively impact the economy. This is exacerbated by increased market prices for energy inputs (in accordance with world

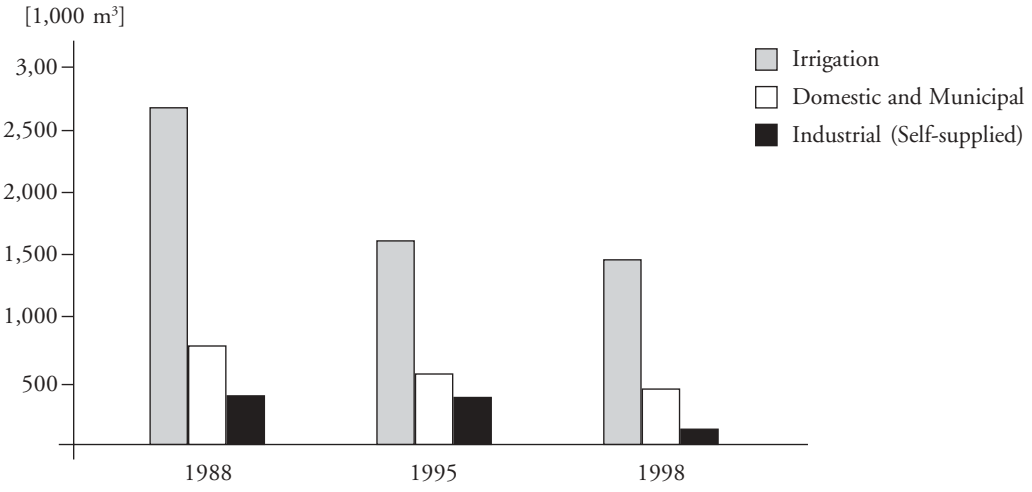
prices in the mid-1990s), delays in adjusting consumer prices to reflect hyperinflation, and failures to cover internal costs such as current maintenance and capital repayment. All this has brought water utilities sector close to collapse, with decreasing service quality and revenue, and increasing operating expenses (partly due to increasing water losses in aging and poorly maintained distribution systems). For example:

- According to GoA estimates, several hundred million USD in investments are needed to rehabilitate the water infrastructure.[5]
- Collection rates are very low: 20% for Yerevan Water and Sewerage Company (YWSC), 50% for Armenian Water and Sewerage Company (AWSC), and between 35–50% for Irrigation JSC.[6] Water billings hover around 0.9% of the GDP, and collections—not more than 0.2%.[7]
- GoA budget subsidies to utilities have increased substantially in the last few years, reaching two percent of the GDP. In 2001, budget subsidizing amounted to 4.7 million AMD or 8.1 million USD at the current exchange rate. Around 12% of this amount was allocated to municipal water systems, with the remaining 88.1% to irrigation. Even in the presence of four to five billion AMD annual subsidies, arrears are accumulated according to salaries, social security payments, payments for electricity and other supplies (17.2 billion AMD) as well as arrears towards the state budget (24.4. billion AMD). This total exceeds the annual planned revenues of the utility companies 2.9 times, and factual revenues—11.9 times.[8]

In contrast to the energy sector, where reforms had a significant effect in the mid-1990s, major reforms in the water sector started much later, toward the end of the decade. There are indeed a few objective reasons behind this: potential high political costs of tariff increases and stringent payment discipline; high marginal cost of rehabilitating water networks; and concern over the potential heavy impact of the water sector reform program on living standards of the population, (increasingly so if coupled with the energy sector reform). It is, however, also true that necessary care was not taken in reforming the water sector institutions to meet the requirements of the emerging market oriented environment. For example, the transformation of water operators into joint stock companies took the form of a mere formal exercise.

Providing more detailed arguments about the need to reform the water sector and a background for the justifications of policy alternatives requires an examination of municipal and irrigation water sectors and their key institutional characteristics.

*Figure 1*
Historical Trends of Water Withdrawal




*Source:* WB "Armenia: Towards Integrated Water Resource Management," ECSSD Environmentally and Socially Sustainable Development, Working Paper No. 35, 2002, p.6.

## 2.2 Description of the Sectors

### *2.2.1 Municipal Water Sector*

The municipal water sector is the second largest water user after irrigation, covering the demands of households, institutions, commercial enterprises and in some cases industries. Approximately 80% of the population has access to piped water supply networks; the rest receive water from an irrigation company or from local, and often unprotected, water sources (such as private or public wells, springs, open sources). Indoor water taps are available to 71% of the population (87% urban, 47% rural). With input prices nearing international levels, including those for energy, chlorine, and spare parts, service providers find it difficult to pay increased operation and maintenance costs. Energy, in particular, presents a heavy financial burden on water suppliers, causing frequent service interruption to conserve energy consumption and when electricity supply is shutoff due to non-payment.[9] The system is characterized by:

- decline in industrial and commercial activity, deterioration of infrastructure, and significant reduction of allocations from the state since independence; and
- low revenues, due to tariffs below maintenance costs and non-payment by consumers, which are insufficient to maintain the system adequately.

*Infrastructure and investment needs.* Supply networks are in a state of extreme disrepair, requiring major capital investment estimated at 600 million USD—of which 150 million USD has been designated for priority needs (independent experts suggest an estimate of one billion USD in overall investment needs). Around 55% of the existing pipelines were built more than 20 years ago. Under the WB funded Municipal Development Project, 35 supply network systems were selected for upgrading—15 for the first stage (40 million USD) and 20 for the next (48 million USD). The overall amount of 88 million USD is—again, according to expert estimates—just a portion of the overall need for AWSC (350-400 million USD). Ten million USD will be added to the previous five million USD under the Capital Investment Program for the rehabilitation of the most destitute networks.

*Water quality.* The quality of municipal water has deteriorated in the last decade, often failing to meet hygienic standards. This stems from: (a) an insufficient amount of chlorine used due to increased cost of operating the chlorination systems, and (b) the poor condition of the networks, resulting in intrusion of raw wastewater into the pipelines. Particularly poor is the quality of water supplied by systems managed by local communities: 60% of the 883 rural systems do not have any facility for disinfection. Poor water quality leads to the increase of water-borne diseases.[10]

*Production and consumption levels.* Although Armenia's water resource balance has improved since the 1980s, drinking water supply to consumers has deteriorated. Since the metering of water flows is practically non-existent, average production and consumption levels are not known with accuracy. The theoretical norms assume 250 lcd of drinking water use by consumers in Yerevan and 200 lcd nation-wide (net of leakage prior to delivery). Despite this high figure, consumers suffer from limited and irregular water service—sometimes a few hours a day. Only 20% of consumers are supplied water more than 12 hours a day on average (eight hours per day in urban areas, 14 in rural areas). Only 50% of the population received water every day during the past year, with the rest experiencing waiting periods up to 40 days. Meanwhile, evidence indicates that water consumption is much lower than theoretical norms—ranging from 40 to 180 lcd, far lower than billing. Due to low water pressure higher floors of apartment buildings have especially poor and irregular service (with interruptions in water supply often lasting a few days).[11]

*Water wastage.* The economic costs of a deficient water supply can be enormous. Unmetered household water use is inevitably wasteful, as a result of intermittent supply and zero marginal cost. Unaccounted-for water, prevalent in all stages of the hydrological cycle, could represent between 55–65% of the total water supplied—mostly due to the poor condition of the infrastructure.[12]

*Willingness to pay and affordability.* Opinions about the affordability of current tariffs by the population at large vary. Some consider tariffs to be affordable, since there are large unofficial transfers from abroad and GDP figures are underestimated, while others are not convinced. Overall, however, the current system is

perceived by consumers as unfair. That is, most feel obliged to pay for something they have not received. We examine the burden of current tariffs on different social groups in Section 6. At present, regular payers comprise three times less than the national percent of non-poor in terms of shares; meanwhile, with respect to paying and not paying for water, the poor and non-poor do not differ qualitatively. This suggests that Armenian society "refuses" to carry the current "burden" of water payment due to more than mere "heaviness" or insolvency. In addition to widespread poverty, 20–50% of the low collection rate could be explained by:

- the resistance to accept water as an ordinary commodity;
- a deeply rooted atmosphere of social mistrust;
- the absence of mechanisms linking the amount and quality of delivered water and price;[13] and
- the lack of adequate technical capacities to combat non-payments.

### *2.2.2 Irrigation Water Sector*

*Infrastructure.* Eight major and a large number of smaller conveyance systems are served by about 21,300 km of main, branch and secondary canals, 75% of which are lined with concrete or consist of pipes built in the Soviet era.[14] The conveyance systems no longer fit the current needs for two reasons:

- *A reliance on mechanical irrigation with pumping stations* to consume 600–800 million KW/h of energy per year. Irrigation schemes that depend on pumping account for about 42% of the total equipped area. The share of electricity in the total costs of irrigation is about 70%, which without state subsidy becomes unprofitable. The energy shortage and sharp increases in its prices have created serious difficulties in using mechanical irrigation, making about 10%–15% of the total area economically impractical.
- *The design for extensive farming* to serve farms of 50–400 ha, from a single head gate or canal outlet with no consideration of costs. With a lengthy and unwieldy canal network and large pumping stations, the system has deteriorated due to lack of maintenance and excess leakage. Now, it is uneconomical, incurs high trans-mission losses (800 million $m^3$), and in turn causes damage to the environment. With an average farms size as small as 1.37 ha, no formal network of autho-rity to implement on-farm infrastructure has formed and the result is an uncoordinated installation of earthen delivery ditches.[15] Water delivery units are too large to be operated efficiently or to support the formation of water users groups and do not account for private farm infrastructure. In many areas, secondary and tertiary canals need to be installed to deliver water to groups of farms with earth ditches or directly to individual farm plots.[16]

While much has been done through WB and IFAD financing, further heavy investment is required. Independent experts estimate need to be around one billion USD. For now, a brief inventory of projects completed, underway or committed includes the following:[17]

- the WB funded Irrigation Rehabilitation Project (55 million USD, completed in 2001), rehabilitated 92.6 km of primary and 163.3 km of inter-farm channels, water metering points, 236 deep wells, water reservoirs, pumping stations, 391 km farm irrigation channels in 93 commu-nities on 26,720 hectares of land;
- the WB funded Dam Safety Project invested 30.3 million USD in the sector;
- IFAD provided 6.3 million USD for irrigation system rehabilitation and water management, covering 310 km of farm irrigation systems in 54 communities on 19,800 hectares of land; and
- several credit projects will further support the rehabilitation of the irrigation systems, including the new 64 million USD WB funded Irrigation Development Project, 31 million USD of which is already approved (see Section 6).

These investments will indeed improve the situation in irrigation, but still represent only a fraction of the efforts needed.

*Irrigation water supply.* The main water resource for irrigation is surface water, including a share of water from border rivers, amounting to 7.4 billion cubic meters; the underground flow is 0.6 billion cubic meters. During the growing season, only 15–20% of the water resources can be used, the rest flows out of the country. Thus, one task for rehabilitating the sector is to re-distribute river flows from water-abundant

regions to water-shortage areas. Most of the cropped area depends on water from irrigation schemes, and nearly 80% of total crop production is produced with irrigation. About 60% of farmers have access to irrigation, covering about 0.7 hectare of their holding. Following land privatization, and the accompanying widespread deterioration of irrigation infrastructure, potentially irrigated area declined from 340,000 ha to 275,000 ha between 1988 and 1998—of which some 222,000 hectares were managed by the Operation and Maintenance Enterprises (OME) of Irrigation JSC (Vorogum), and the remaining 51,000 hectares (mostly small schemes) were operated and maintained by the private sector. Some 18,000 km of tertiary canals are operated by communities or by water users associations. Area actually irrigated accounted for only for 187,000 ha in 1998—thus the utilization ratio was around 70%. About 90,000 ha were not irrigated because of a combination of factors, mentioned above.[18]

*Benefits and efficiency of irrigation.* There are significant benefits of irrigation in Armenia, which are clearly observed in the financial performance of farms. The 1998 Survey of Family Farms[19] reveals that farms with irrigation generated net returns of about 370 USD per ha compared to 40 USD for farms without irrigation Irrigated farms were able to irrigate only half of their land: the other half was under rain fed agriculture. In 1998, the difference in productivity between irrigated and rain fed agriculture was about 330 USD per hectare. The difference in productivity has almost doubled during the past few years as a result of higher yields obtained in vegetables and fruits, and a slightly increasing preference for vegetables, potatoes, and fruits. While the current weighted average return to water in the irrigation sector has been estimated at about eleven US cents per $m^3$ of water at the farm gate, this figure substantially varies across the four zones:

- valley zones, where no cropping is possible without irrigation;
- pre-mountainous zones, where low-yield wheat and alfalfa can be grown under rain-fed conditions;
- mountain zones, similar to the previous but with lower yields; and
- sub-tropical zones, where no rain-fed cropping is possible, but where optimum conditions exist for growing high value crops (such as fruits and wine grapes) with supplementary irrigation.

The availability and efficiency of irrigation between marzes varies significantly as well:[20]

- Armavir, Vayots Dzor, Ararat and Kotayk marzes contain the best water resources. The cropping mix in the main irrigated areas is changing rapidly, affecting the overall demand on water and the return per $m^3$ of water. Low value water uses (i.e., fodder) is declining, and high value uses (vegetable and potato) are increasing.
- The current average overall irrigation efficiency from the source to field countrywide is about 48%. This indicator is higher in places where some improvements in irrigation efficiency have been achieved as a result of programs to rehabilitate water conveyance infrastructure. (The high rate of water loss generally results from the deterioration of water conveyance infrastructure.)

## 3. REFORMS IN THE WATER SECTOR: AN OVERVIEW OF MAIN COMPONENTS

Armenia embarked on large-scale water sector reforms in 1999, when GoA, with WB support, launched the Integrated Water Resources Management (IWRM) Planning Study. IWRM serves to develop a comprehensive policy framework to ensure a sustainable management and use of water resources, taking into account economic, financial, environmental, social and institutional considerations. The reform program encompasses the following main components:[21]

- transfer of the operation of the main water operators on commercial basis;
- wide application of participatory water management practices;
- financial reforms in the sector involving the gradual removal of state budget subsidies;
- continued capital investments in the infrastructure (mainly with long-term loans on favorable terms) to ensure sustainable operation of the system; and
- a shift to sustainable use of water resources, including a water preservation program.

Below follows a brief description of these main reform components.

## 3.1 Regulatory Reform

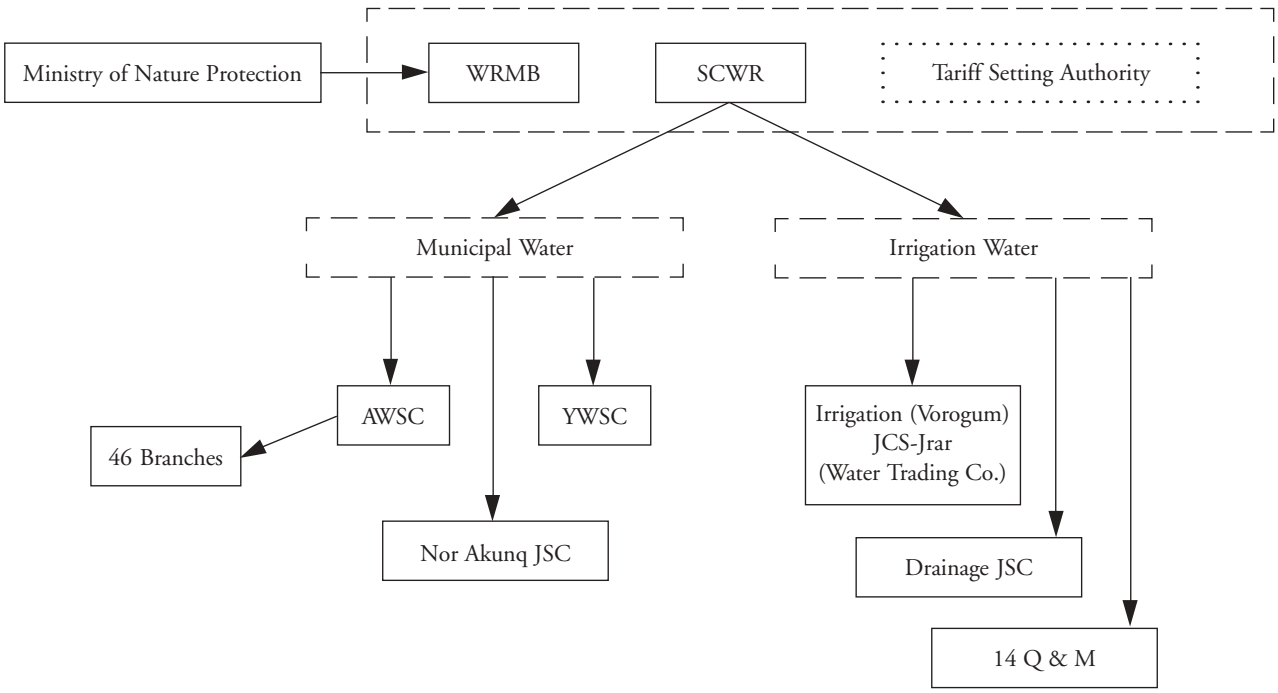
Separation of regulatory, standard setting and operational functions into independent roles began with GoA Decree No.92 (02/2001), which provided a basis for a program for the reform of the water management system. The decree stipulated:

- *A State Committee of Water Resources (SCWR)* under GoA. SCWR took over responsibilities for the financial and operational tasks related to providing commercially-oriented water services (e.g. bulk water supply, sanitation, irrigation, drainage), gradually devolving responsibilities for service delivery to water user groups, and applying integrated planning to maximize the use of the resources at the macro (national) and micro (sectoral) levels. The companies which fall under the control of SCWR (with a few other agencies) are described in Figure 2. (see Sections 3.1.1 and 3.1.2 for details).
- *An independent body to deal with water pricing*. Until its establishment, SCWR has been charged with this function.[22]
- *A Water Resource Management Board*, established in GoA Decree No.82 (01/2002) under the auspices of the Ministry of Nature Protection.
- *A National Water Resource Council* (created in autumn 2002).

In addition, the following bodies have parts to play in WRM:

- the Cabinet (overall water policy);
- the Ministry of Agriculture (irrigation and drainage policies, norms for crops, records on irrigation lands and inventory of irrigation systems; regulations with regards to land contamination);
- the Ministry of Energy (water releases from Lake Sevan);
- the Ministry of Health (quality standards for drinking water, other health related issues);
- the Ministry of Urban Development (water supply design standards);
- the Ministry of Economy and Finance (responsible for public finance matters);
- the Ministry of Nature Protection (formally in charge of the overall management of water resources, including the development of a National Water Program, environmental policies, proposing water extraction fees and pollution charges, maintaining of the Water Cadaster, and monitoring of water flow and water balance);

*Figure 2*
Schematic Chart of the Main WRM Agencies in Armenia



- marz administrations (territorial administrative divisions of the country);[23] and
- local government units/municipalities and communities (hamaink).

The role of local government is examined in detail throughout the text.

The Water Code of 1992 was replaced in 2002, entailing numerous significant improvements:

- regulating the state's management and control of water use, water consumer rights and duties, water protection, and prevention of water deterioration;
- requiring permits to use water and discharge pollution;
- stipulating that water user fees are charged to water utilities, industry, agriculture and irrigation water users;
- describing the main functions in integrated water resources management and the institutional arrangements (partly it stated, *de facto*, the importance of some institutions which were established after the Water Code 1992 by GoA decrees);
- proposing that tariffs should be realistic, justified and fair, allowing for (a) provider companies to receive realistic revenues to maintain the financial integrity and covering all the expenses, and (b) preservation of resources, quality of services, productivity, management (without actually defining tariffs as such);
- maintaining that water is a finite and vulnerable resource, with an economic as well as social and environmental value;
- asserting that sustainable management of water resources is in the interest of society and requires a balance between present and future users;
- recognizing the priority of water requirements for basic human needs, while affirming that it has an economic value;
- acknowledging the intersectoral nature of water, the role of the state in water resources management, the importance of all stakeholder participation, and the role of the private sector and cost recovery in efficient water use;
- stipulating the introduction of a number of new concepts, like water rights and water markets; and
- stating that GoA will continue to promote participatory management both in municipal and irrigation water sectors (see relevant sections), by empowering water users groups to increase their influence in the decision-making process.

### *3.1.1 Institutional Reforms in the Municipal Water Sector*

There are two major wholesale providers for drinking water:

1) YWSC[24] serves Yerevan and surrounding communities with more than one million inhabitants. Currently an international operator (Italian "Acer & Company Armenian Utility SCARL") is implementing a management contract with YWSC worth of 35.5 million USD (with IDA funding).[25] Responsibilities include: providing overall utility management and advice; directing operations; and planning investment allocations and overseeing their implementation. On November 11, 2001 a Memorandum of Understanding was signed by the WB, GoA and international operators, whereby the scope of responsibilities was clarified from 2002 to 2005.
2) AWSC serves about 43 cities and 290 villages elsewhere, or a total of approximately 1.4 million users.[26] GoA's efforts to seek private sector participation in the operation, management and usage of credit funds for its water supply and wastewater services outside Yerevan are already underway. Additionally, it intends to transform the 46 district branches of AWSC into legally independent entities that can jointly or independently contract with the private sector through, for example, manage-ment contracts, franchises, and concessions. Studies into the feasibility of this program are in progress.

GoA Decree No. 149 (03/1999A) recently established a third operator, Nor Akunq (New Source), to operate in 12 cities and villages with a total population of 100,000 in Armavir marz. Supported by the German KfW, Nor Akunq is planned to replicate the model used in two marzes, Lori and Shirak. Nor Akunq JSC is a shareholding company with a share distribution of the following structure: Government (34%);

six municipalities (46%); and villages (20%). The foundation capital is ten million AMD.[27]

Communities are (or will be) responsible for:

- providing drinking water and wastewater services within specified geographic boundaries, making use of internal (inter-community) water canals (to which they have rights). At the moment, 44 of the 48 urban or semi-urban communities (cities) and more than 300 of the 950 villages have transferred their O&M to YWSC and AWSC (GoA decree No. 149, 03/1999). This is intended to hold until the branches of AWSC are separated as legally independent entities, after which, it is assumed, they will take over the O&M.
- defining retail prices for municipal water and wastewater. Currently, this is not the case, as the contracts (mentioned above) are in force: AWSC and YWSC establish retail tariffs, but are subject to approval by local *avagani* (elected bodies at municipalities). It is envisioned that this function will be transferred to condominiums—the role of which is supposed to increase significantly.
- organizing water users groups and mobilizing condominiums.[28]

Recently, with the initiation of several important measures, GoA gave new life to the reforms. In particular, GoA Decree No 55 (01/2002), supported by two new laws, On the Management of Multi-Apartment Buildings and On Condominiums, stipulate:

- a shift to charging for municipal water as of January 2003, based on metering household consumption. For multi-apartment buildings, meters will be installed by the operator of the main pipeline supplying the building. Then, households with meters installed will pay according to the metered consumption. As far as the remaining cost is concerned, households without meters in a particular building will need to divide usage and costs among themselves. Meters are to be purchased by the households themselves and only the poor and vulnerable households are assisted (this process is now underway). The Government has clarified the details for such assistance:
  - Households receiving Poverty Family Benefit will be provided with meters, with a repayment period of five years. It is possible that meters will be supplied free of charge (depending on donor financing).
  - Vulnerable households not included in the Poverty Family Benefit Program will receive meters if they pay 50% of the cost as an advance payment and the remaining 50% over the two upcoming years.

  This scheme started to operate on June 10, 2003.
- A law from November 2002 stipulated a partial write-off of the arrears accumulated by the population, provided that households sign contracts with the water operator. The process started in January 2003 and finished on June 10, 2003. Through a massive PR campaign, citizens were informed that, according to the Law mentioned, arrears will not be forgiven and will be subject to collection in full —by court order, if necessary—if the contract signing deadline of mid-April 2003 passes without action. The contract oblige households to pay for water regularly according to according to their own consumption (if they have installed individual meters) or by sharing the remaining costs according meters on the main pipelines supplying the buildings (as described above). Importantly, the contracts between the water operators and households have a number of deficiencies, including:
- stipulating that the water company is obligated to supply water according to an agreed regime, though no regime exists in writing (one would imagine that an attachment to the contracts would stipulate a defined time-period);
- describing actions that need to be taken in case of an unsatisfactory service, yet criteria for service quality is not defined; and
- the viability of the enforceability of the contracts that are now being signed between water companies and households.

The central problem behind the contracts mentioned above is ultimately more fundamental and multifaceted.

- While (a) the Law on Local Self Government stipulates that ensuring drink water for the population is the responsibility of local self-government bodies, and (b) the key GoA Decrees (No. 92 and 440) underline the role of communities, reforms

have not progressed as planned. In light of the transfer of internal water canals to water operators, the latter (and not the local government bodies, as one would expect) are now actively involved in mobilizing condominiums. Local self-government bodies are essentially excluded from the picture. Only when neither condominiums nor other forms of management of multi-apartment buildings (licensed or entrusted management)[29] are present should local self-government bodies (as specified by the Law on the Management of Multi-Apartment Buildings), temporarily manage the water supply (see below) until effective management is organized.

- Condominiums (as well as licensed or entrusted management bodies of multi-apartment buildings) are charged with collecting water user fees (and repair and maintenance of intra-building pipelines —see below), and taking over the responsibility for managing municipal water use within apartment buildings. From this arises a critical problem. The operator, as a result of the management transfer contract between with local self-government bodies, has taken over the O&M of internal pipelines only up to the entry point into the building. Intra-building pipelines are, according to the Civil Code from 1999, under a shared ownership of the households. Thus, in case of a problem with intra-building pipelines (such as insufficient water pressure, or motor installation *inside* a building), a household faces a dilemma linked to legislative/ regulatory flux. Water operators sign (or will sign) contracts with condominiums (or licensed or entrusted management). At present, a form of contract between operators and condominiums is already being signed in a number of communities. This process is proceeding with difficulties, however, because of problems with the contracts—largely resembling those listed above (the contracts specify that condominiums hold responsibility for the maintenance of intra-building pipelines, while the financial and technical base for these are not clear).[30] Again, no role is stipulated for the local government bodies—or, at least, their role (or lack thereof) has been left unclear.
- The issue of the condominiums requires special emphasis. Presently, they exist almost exclusively in Yerevan, and until very recently were not involved in water provision or wastewater services.[31] Moreover, after the "give-away" privatization of apartments to individual tenants (established in the 1996 law), and despite massive donor assistance, the experience with condominiums has generally proved unsuccessful. Coverage of the privatized stock is estimated at around 40–45%, with only about five percent of the condominium associations deemed able to undertake major investments. Many objective (like the inadequate legislative base[32]) and subjective reasons underlie this. While the most recent law on condominiums offers numerous improvements beyond its 1996 predecessor (e.g. it allows for the built up of cash reserve funds to be used as equity fund for investments, collateral), some problems remain. Namely, membership in the condominium association is voluntary, while the Law on Management of Multi-Story Buildings specifies that all the households are obliged to pay the dues according to the list of the priority services (to be developed). A natural question follows concerning the feasibility and operational efficiency of the coexistence of parallel payment schemes for members and non-members of condominiums, as well as details which define responsibilities.

GoA now places major emphasis on condominiums, which are intended to become the main vehicle between municipal water operators and households. A grant largely covered by from the Government of Japan worth 2.9 million USD now aims at covering a program for strengthening condominiums. Yet, is such a program capable of strengthening condominiums to the extent that they can fulfill their intended role? At the moment, opinions differ. In our view, there is good chance it might be, since significant assistance will be rendered to condominiums and they will have more responsibilities to perform, thus encouraging their growth and development. The problems, discussed above, add certain pessimism to this conclusion, however, keeping in mind that condominiums are almost non-existent outside Yerevan. Thus, from careful analysis of the failures of the present condominium projects, as well as the ineffectual application of the Law on the Management of multi-apartment buildings, other options that could ensure water delivery to households deserve closer attention. In this regard, we support development of the Nor Akunq model, which brings together the interests of the government, utility opera-

tors and local communities. While it is too early to judge, Nor Akunq appears to be a viable option in cases which employ local water operators (see Section 3.5). Furthermore, as intra-building pipelines are under the joint ownership of two or more households, contractual arrangements must be development (along with the law on the management of multi-apartment buildings). While such a contract could indeed involve condominiums, it also might be formulated as a contract of an entrusted management, thereby securing the involvement of local self-government bodies.

### *3.1.2 Institutional Reforms in Irrigation*

Lessons learned from the international experience underscore the importance of institutional structures as a prerequisite for achieving efficiency and sustainability in irrigation. Until 1999–2000, the institutional framework of irrigation was characterized by weak public sector agencies with inadequate resources, failing to manage effectively the irrigation system, as well as water users with no capability and legal authority to influence the actions of public agencies, resigning themselves to accept whatever public agencies managed to deliver in an atmosphere of mistrust.

As a result of regulatory reform (since 2001), the overall coordinating role of irrigation was transferred from the Ministry of Agriculture to SCWR, which now controls the two main irrigation organizations, namely "Irrigation" (Vorogum-Jrar) and "Drainage". Irrigation JSC was formed recently through the merger of the former Irrigation, Jrambar (responsible for the main water reservoirs), and Jrar (responsible for keeping records on water deals). Irrigation JSC is now responsible for water trading and for the delivery of water to the second and third-tier agricultural users. The third tier apparently disappeared once newly-created water-user groups subsumed all responsibilities—including the maintenance of lower level irrigation channels.

Experience in many countries has also demonstrated that, under improved institutional circumstances, the Participatory Irrigation Management approach can enhance the efficiency and sustainability of irrigation systems. Since 1996, GoA has promoted participatory irrigation management in order to enhance accountability and reliability of services by encouraging the establishment of water users groups—which now number 600. Until very recently, two types of groups existed: Water Users Consumer Cooperatives (created along with hydrological borders and village basins[33]) and Water Users Associations (based on rural communities). These water users groups served to:

- operate and maintain lower level irrigation channels and collect irrigation services fees for operation and maintenance (O&M) of both lower level and higher level system facilities; and
- support and advise the related government agencies in the preparation and implementation of water resource management plans for their respective areas, operational management of the supply of water resources in the concerned areas, and monitoring of water use by different user groups.

The experience worldwide has demonstrated that in order for water user groups to be successful:

- they must be truly elective;
- O&M responsibilities should be clearly allocated between the Government and water users;
- the legal framework should provide full protection of the right of water users to organize into autonomous, self-managing water user groups, fully accountable to their members, with full authority to act on behalf of the membership vis-a-vis the Government; and
- relations with all stakeholders should be based strictly on contractual and transparent relations, thus allowing water user groups to exercise the rights to distribute water as agreed and punish for violations, define their own budgets and membership fees, hire and fire personnel, define the scope of maintenance jobs and implementation schemes, and so on.

The majority of water user groups in Armenia were mostly imposed without consideration of any of the following factors:

- many of were formed quickly, under Government pressure or directly by it, without active involvement on the part of farmers themselves;
- farmers receive little or no technical or financial support, meanwhile managing the existing tertiary

irrigation systems that are in a state of disrepair and often not functional;
- often the village councils/heads select group leaders rather than the farmers themselves;
- many groups do not succeed in collecting membership fees and payments for water;
- contractual relations with the water suppliers lack strict enforcement, resulting, at times, in corrupt behavior on behalf of the water user group leaders; and
- the nonexistence of proper legislation to govern the operations of water user groups (including a system of appeals for farmers).

As a result, the experience to date with water user groups in Armenia has been mixed, with only one-fourth proving successful (around 110 out of 455). Meanwhile, water user groups are seen as panacea for improving water efficiency; the arguments for ownership by farmers of the water resources cannot be disputed. Also, the fraction of existing water users groups which are strong demonstrates that there is indeed a potential for water users to successfully operate and maintain the tertiary level of the irrigation system. Realizing that the situation with water user groups needs reform, GoA adopted (06/2002) the Law on Water User Federations (WUF). According to this law, all existing water user groups need to reregister to obtain legal status; to do so, they must meet certain criteria. For example, they will need to have a substantial base. The experience thus far, that is, has indicated that small-base water user groups experience many more difficulties in trying to achieve financial sustainability. As well, such arrangements allow much room for corruptive practices.[34]

GoA realizes the need to create conditions to enable water user groups to become independent and effective partners in the management of the irrigation system at all levels, through:
- ensuring a reliable water source at their outlet, a fair price (seen against the benefits they could achieve) and technical assistance in drawing up their water use plans; and
- increasing empowerment of water user groups to acquire a sense of ownership, modifying groups' responsibility in the management of tertiary rehabilitation activities, contracting out rehabilitation works, and determining priorities to be undertaken in conformity with the resources available to them from their membership and from Government grants.

GoA plans to assist water user groups to acquire the capacity (technical and human) to take over full responsibility for O&M beyond the tertiary canals, and to participate more effectively in the management of the irrigation and drainage system. This might involve providing a high and sustainable level of institutional support aimed at both confidence-building and skill-development among water users. With WB support, GoA will pilot sub-scheme-based WUFs which will gain full responsibility for O&M of sub-schemes or entire schemes; this represents an intermediate step toward the over-all establishment of scheme-based unions of WUFs. To that end, qualifying WUFs will be given partial grants to acquire O&M equipment and to finance construction works to be performed under contract by private contractors. They will furthermore receive technical assistance and construction materials necessary for carrying out eligible tertiary (and possibly secondary) canal rehabilitation "in-house" through the mobilization of their own labor force.

As in the case of the municipal water sector, GoA recently gave new life to irrigation reforms by a passing a law in late 2002, which stipulated a partial write-off of the arrears accumulated by the farmers, provided that they pay the remaining costs, and contracts on water supply are signed. As opposed to the municipal water sector, in the case of irrigation, contracts are signed mostly between Irrigation JSC and the WUFs—if they exist—or between Irrigation JSC and individual farmers if the latter are not mature. Also, naturally, in contrast to the municipal water sector, this process is not linked to the installation of meters; problems will be addressed in greater detail in Section 6.3.2.

## 3.2 Financial Reform

GoA Decree No.440 (05/2001) laid the groundwork for a comprehensive reform program to improve the financial sustainability of the companies responsible for the provision of drinking water supply and waste-

water, as well as irrigation and drainage services. Implementation of the program was the responsibility of SCWR. Ultimately, the decree serves to introduce a commercial base for the operations of all water supply companies from 2001 to 2008. The final goal is to eliminate budget subsidies (covering both the subsidies for O&M and capital expenses), which is necessary to continue to undertake capital investments—estimated for the first five years at 200 million USD. It is stipulated that to achieve this, it is necessary to review and modernize the existing legal and normative fields regulating WRM, while implementing significant tariff, institutional and administrative reforms.

The program also envisages restructuring arrears accumulated by water operators through: rescheduling (beyond 2006); partial write-offs; buying off bank credits by the budget and reformulating these credits as GoA shareholdings; and canceling cross-indebtedness of water utilities to energy companies and ultimately to the state budget (the main idea being that debts to energy companies are not passed all the way to consumers). Priority is given to paying off the debts in salary (889.8 million AMD) to water companies' employees.[35]

Through these reforms, GoA expects to achieve the following (Table 1).

## 3.3 Private Sector Participation in WRM

GoA has taken a gradual, moderate view on private sector participation in WRM, seeing privatization as a final solution in, perhaps, ten years time. Initial steps include transforming Irrigation JSC, YWSC and AWSC into full commercial entities, achieving cost-recovery at a minimum in the coming three to five years, and introducing management changes using contracts, concessions, and so on. This is a positive sign, in line with lessons learned elsewhere in the international community. Economists tend to agree that competitive market pressures—and, for the case of natural monopolies like the water sector, an effective regulatory framework—are far more important than ownership types. There are numerous examples of both public and market failures in history to support this. Success or failure in privatizing WRM depends more on the quality and commitment of the implementing agencies, the accompanying environment and timing than on the nature of turnover itself. The most difficult issue is measuring the marginal benefits and costs of privatization. If a decision is made to privatize, the chosen route should optimize economic returns to water only after ensuring that basic needs are satisfied, and fit the concrete case. Complex institutional

*Table 1*
Water Sector Reform Targets

| Irrigation Sector | Municipal Sector | |
|---|---|---|
| | YWSC | AWSC |
| • increase the volume of supplied irrigation water by 32.3%, possibly increasing irrigatable land by 19.0 thousand ha. The surface of self-flow irrigatable land will increase by 36 thousand ha;<br>• increase tariffs 2.4. times and collection rates 2.2 times, (increasing revenues 7.4 times).<br>• decrease water losses by 7.6%, with water savings reaching 35 million $m^3$;<br>• decrease energy costs by 31.2%; and<br>• finish 2005 with a profit of 178.million AMD. | • ensure 24-hours service;<br>• decrease losses by 55% from 71.7%, saving around 165 million $m^3$;<br>• increase collection rates by about 62%, (increasing revenues 3.3 times).<br>• decrease energy costs by about 25%; and<br>• increase O&M company around 1,200 million AMD. | • reduce drinking water losses by 24.3%, saving 17.1 $m^3$ water;<br>• increase drinking water tariffs by 29.1% and increase collections rates 2.6 times are (increasing utility revenues 3.3. times);<br>• decrease costs of electrical energy by 36.3%; and<br>• achieve282 million AMD in profits by 2005. |

arrangements must be in place before a decision on turnover is implemented. This is perhaps most important if a transition from a centralized bureaucracy to a market-based economy involves fragmented WRM divided among different agencies with overlapping functions, an inadequate legal base with weak mechanisms for dispute resolution, and insufficient involvement of communities in the process of planning resource allocation. In such an environment (which is the case in Armenia), while necessary components of sustainable, productive water resource management are still evolving, more extreme variants of privatization such as unregulated market allocations are likely to do more harm than good. Necessary preconditions for the introduction of market forces into water allocation include:[36]

- well-defined entitlements of all users under all levels of resource availability (including various social and environmental uses) and infrastructure in place to deliver the defined entitlements;
- effective recourse available to those who do not receive their entitlements as well as to third parties affected by changes in use;
- the possibility to measure reallocations of water and third-party impacts (in quality, quantity, time, and place);
- effective legal procedures ensuring that users pay for the water consumed combined with measures (e.g. some degree of subsidy) to ensure that the poor are not priced out of the market;
- subjecting large-scale water transfers with and between sectors to approval and relevant charges by regulatory agencies;
- analysis of transaction costs, prior to making changes in the design, construction, or management of water systems;
- laws assigning rights, operations, enforcement; and
- physical infrastructure and management systems capable of allocating water in accordance with water markets.

While privatization may be a promising development, these preconditions are essential to its success. Meanwhile, efficient use of water will be better served by the widespread introduction of the necessary underpinnings and prerequisites to good water management (improved legislation, assigned water rights, delivery of a defined service). Only then will the pursuit of market forces in the allocation of water entail significant benefits.[37]

## 3.4 Water Rights, Water Markets and Water Planning

Effective water pricing depends on secure and effective property rights to water. A water right, that is, is a legal guarantee (individual or collective), given for the extraction of surface water or groundwater. It defines: the quantity of water to be extracted or transported; the source; the use; and the timeframe during which water can be extracted or transported. Any individual or group extracting or transporting a quantity that exceeds the legally predefined amount must apply to obtain a water right. A system of water rights is efficient if it defines clearly all the above. In many developing and transition countries, water rights are insecure and ineffective.[38] In such cases (or when regulations are not observed), there is no immediate scope for improving water distribution through pricing; in irrigation, for example, problems would involve farmers taking water at will, manipulating gate settings, not paying assessed charges and so on. Hence, attention should first be given to clarifying and enforcing water rights and the rules of water distribution, including introducing the notion of "tradable water rights" which allow formal transfer of water entitlements among users in line with the "efficient markets" paradigm. This paradigm acknowledges the economic value of water and sectoral differences among water users; thus, GoA is to allocate water in a way to maximize its overall economic value.[39]

Developing a comprehensive water rights system is crucial in Armenia—until very recently water rights (called water permits) were not transferable, and only with the adoption of the New Water Code did the situation change. Water permits (rights) are now tradable.[40] This is, however, only a first step; much has yet to change. For example:

- water permits are perceived mostly as a means to protect the environment, rather than a means to regulate water use ubiquitously;
- as water permits originally were instituted to regulate water withdrawals, they are silent in terms of consumptive use and return flows, which limit the

capacity of the system to be used as a tool to make decisions on water allocation;

- consistency with water quality norms and with the "assigned" functions of rivers and lakes is not always ensured when issuing a water permit; and
- aggregate information on water use permits, known as the Water Cadaster (under the Ministry of Nature Protection), is incomplete and must be improved and expanded to include secondary users, pollution discharge permits and information on water sources in order to become an effective tool to administer resource use.

Water markets, already thriving in most irrigation systems worldwide, are yet another mechanism to be developed. They most commonly operate locally (but also in larger transfers, within or among sectors, provided that suitable regulation is in place), and involve trading water for similar uses. This includes, for example, the sale or exchange of irrigation "turns" in a rotational system, or the sale of water by the owner of a tube well to nearby farmers. While water markets can function in the absence of formal water rights, tradable water rights require a much more specific definition of the entitlement. It also must be recognized that there are significant costs associated with water markets in terms of transaction costs and physical system costs.[41] The new Water Code is unclear about the prospects for developing water markets; as such, Armenia should first ensure that the necessary prerequisites are in place (clear juridical base, regulatory framework, transparency in operations, and so on) and that, for the purpose of regulation, economic rather than financial valuation of water projects serves as the basis for public intervention (i.e. looking at the benefit for society as a whole). Needless to say, this all should be clearly defined in the Water Code.

## 3.5 Next Key Steps in GOA Reform Agenda

The next key steps in the GoA reform agenda and WRM will be described in the relevant sections. Some general notes on both programs deserve attention.

- Recognizing that an unclear separation of functions over the integrated WRM has resulted from the creation of quite a number of new institutions in a short time frame (a situation that can create powerful vested interests for and against change), GoA, along with strengthening the policy functions of new and existing public institutions, will continue the improvement of the institutional framework for IWRM. As envisioned by the new Water Code, more institutions will be created, including the Dispute Resolution Committee (more to be discussed in relevant sections).
- In the coming eight years, GoA intends to shift gradually to water-basin (scheme) based management[42] by (a) separating the branches of Irrigation JSC and AWSC accordingly; and (b) developing (unions of) scheme-based Water User Federations (see Irrigation Sector Reform) in order to give users greater responsibility in the management of the irrigation system below the primary outlet and to progressively commercialize the sector. GoA plans to establish Local Water Authorities under the authority of the WRM Board, charged with the operational management of primary water bodies. These are envisioned to cooperate closely with Water Users Federations and other stakeholders in a particular water-basin.
- A consensus must be reached regarding options for managing of Armenia's water resources over the longer term—thus far, there is only an agreement between different stakeholders to adopt some strategic guidelines.
- The Armenian WRM system lacks a regular exercise for water resource planning (the Integrated WRM Planning study was the only one in the past ten years). Allocation of water from existing reservoirs is based on obsolete norms set by the Ministry of Agriculture, without consultation with stakeholders regularly in the allocation process. There is an urgent need to improve the current system so that proper and informed decisions on water allocation can be made and an effective regulatory and administrative framework for WRM established.
- The involvement and capacity of marz and community levels in formulating and implementation of WRM strategies in view of decentralization and the devolution of responsibilities must be increased and strengthened.

Questions remain which are relevant to designing a complete picture of future regulatory regimes for the water sector. Although GoA Decree No.440 has stated that the coming eight years will bring about a gradual shift to water-basin (scheme) based management via separating the branches of Irrigation JSC and AWSC and establishing Local Water Authorities under the authority of the WRM Board, charged with the operational management of primary water bodies, this plan looks rather vague. Moreover, on close examination, it appears unfounded, not based on solid research into its feasibility and creditworthiness, and lacking serious research into possible alternatives. The questions left to consider include:

1) For municipal water:
   - Which is more reasonable: a national regulator for the water sector, or a multi-sector regulator, covering energy, water and telecommunications? Should the regulation be conducted by a central government agency, national economic regulatory agency or local governments?
   - Should regulation be done through contracts (management or concession) or by a regulator (through a license)?
   - Can AWSC and YWSC be merged or must AWSC be split into regionally-based, small but viable companies?

All answers have both advantages and disadvantages. For example, having a multi-sector regulator could save resources due to the advantages of resource sharing, but might lose on non-specialization. Regulation by local governments has the advantage of taking into account local knowledge and interests, but does not allow for a systemic set of national standards or methods for pricing. Splitting AWSC would allow for using benchmark competition methods, but this is valuable only if there is significant room for the application of these methods, or if the advantages of cost-subsidization across the regions within one company do not outweigh the disadvantages.

The ECA suggests a mixed strategy:[43]

- establish an independent regulatory agency;
- allow for the existence of both local and multi-area water companies;
- permit local governments to contract with local water operators, specifying one of the following: (a) no role for the national regulatory agency; (b) full regulation of prices and service standards; (c) regulation of prices but not service standards;
- encourage the national regulator to approve all contracts between local governments and water operators; and
- push the national regulator to regulate prices charged by large or multi-area utilities to local governments. Local governments may delegate full responsibility to AWSC or YWSC (as an obligatory procedure for smaller communities).

2) For irrigation:
   - Should the operations of WUFs be overseen at a central level? If so, should the oversight body be an economic regulator or a public body, such as a Ministry?
   - Should a central or a national regulatory authority regulate the primary irrigation infrastructure?

Indeed, both for municipal water and irrigation, in-depth research is needed to finalize the recommendations. Follow-up research is proposed by the author of this paper. Additionally, in the spring of 2003, a WB sponsored project (through Public-Private Infrastructure Facility) has commenced with the aim of addressing these issues and legislative needs.

## 4. THE NEED FOR PRO-POOR POLICIES IN WATER SECTOR REFORMS

Numerous social problems need to be addressed while designing and implementing reform programs in the water sector. Water sector tariff reform has already resulted in a rapid increase in real water prices, outpacing the growth of real wages by a factor of almost seven. This places a huge burden on household budgets, adding to real electricity prices which already outpace increases in real wages.[44] If the poor are unable to maintain (or gain) access to the public service network, and per unit costs of substitute services are higher than those from the network, then social policy must effectively protect the poor from tariff increases. Table 2 (below) shows that widespread poverty and extreme inequality remain major issues for Armenia.

In turn, WRM reform (like any other reform program) should be designed in a way sensitive to the needs and abilities of the poor.

## 5. WATER AS AN ECONOMIC GOOD: THEORETICAL PERSPECTIVE

Reforming utilities presents a challenging task to any country, involving numerous conflicting interests. Parsing out this predicament requires an understanding of economic fundamentals.

What is water? An *economic good*, or a *basic human need* to be largely exempted from the competitive market pricing and allocation? To date, there is no widely accepted agreement on how water should be treated, although the view of water as an economic good increasingly gains acceptance. Partly, this results from growing appreciation of the scarcity of water problem, and the role of water pricing as a means to ensure its efficient allocation.[45] Even the most radical supporters of this point of view, however, accept that there is still a role for water as a basic need, a merit good, or a social, economic, financial, and environmental resource, thus complicating price determination. The pursuit of economic approaches in the absence of such important preconditions as well defined water rights, mechanisms to ensure access of water for poor, and so on may have unpredictable—and possibly negative—effects, linking water supply and poverty, water-born diseases and mortality.

The two schools agree that effective distribution and management of water comprises the main concept. Disagreements, however, also exist among the proponents of water as an economic good. Specifically, advocates debate whether water is a private good, that can be left entirely to market forces, or a public good, which requires some amount of extra-market management to effectively and efficiently serve social objectives. The latter involves, for example, making water available at reasonable levels to everyone, or subsidizing irrigation to reduce food costs to poor people. Following Perry *et al.*[46] we propose that water is both a public *and* a private good (Figure 3).[47]

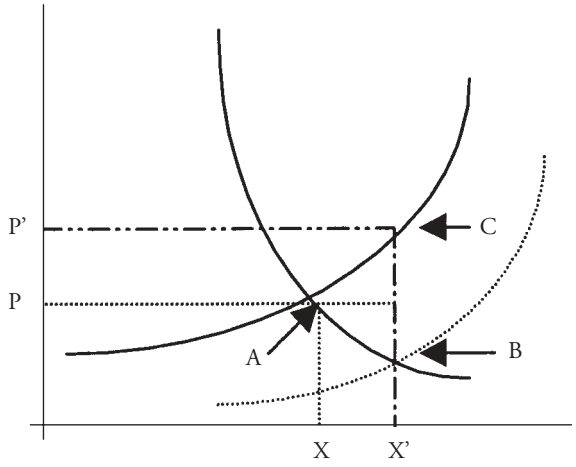
*Table 2*
Results of Household Living Standards Survey (HIES) 2001

| | RoA | Rural | Urban | Yerevan | Other cities |
|---|---|---|---|---|---|
| Non-poor | 49.1 | 49.9 | 48.7 | 53.5 | 44.3 |
| Poor | 35.0 | 38.9 | 33.1 | 29.8 | 36.2 |
| Extremely poor | 15.9 | 11.1 | 18.2 | 16.7 | 19.5 |

*Table 3*
Poverty Indicators

| | 1996 | 1999 | 2001 |
|---|---|---|---|
| Ratio of poor population (% in the overall population) | 54.73 | 55.05 | 50.9 |
| Ratio of extremely poor population (5 in the overal population) | 27.67 | 22.91 | 15.9 |
| Severety of poverty | 11.1 | 9.0 | 15.0 |
| Depth of poverty | 21.5 | 19.0 | 6.1 |
| Income based Gini coefficient | 0.653 | 0.570 | 0.538 |
| Expenditure based Gini coefficient | 0.602 | 0.372 | 0.377 |

*Figure 3*
Water as an Economic Good




*Source:* Adapted from Briscoe, J., 1996.

Water has an economic value to users who are willing to pay for it; consumers will use water so long as the benefits from the use of an additional cubic meter exceed the costs so incurred—the optimal consumption is X. If a consumer is charged P', he/she will consume X'. The increase in costs (the area under the cost curve) exceeds the increase in benefits (the area under the benefit curve). The loss of net benefits is called "dead-weight loss" (ABC). For society, the welfare is maximized when: (a) water is priced at its marginal cost; and (b) water is used until the marginal cost is equal to the marginal benefit. Even with the same basic need for or value of water, the rich will get more and the poor less. Thus, the people between $X^*$ and $X^1$ are priced out of the market for water—in terms of marginal reductions in the amount they can afford. Hence, the higher the price, the greater the incidence of poverty in X.

Countering social demand by reducing water availability from $X^1$ to $X^*$ through competitive prices would pose a loss for society. There is a slight disagreement whether a *social* society should:

- ensure that reasonable levels of water for basic human needs are met by the wealthy subsidizing water (see Figure 3: shifting the supply curve down to where it intersects the demand curve at $P^1$, $X^1$); or
- switch governing value judgements once the margin of basic needs has been satisfied (lower on the marginal utility curve), i.e. not assist individuals or families in the acquisition of goods beyond this level.

These options imply, at least to some degree, that water is a *social good; society as a whole will benefit if it is made available to* certain groups or for certain purposes below the market price. Almost all proponents of both views share this view. Disagreements usually concern: (a) the extent to which *social* societies can achieve these goals and (b) types and levels of government involvement and intervention to correct for public or private failures. In post-Communist countries, including Armenia, the argument around water as a private or public good is perhaps more severe than in other countries. During Soviet rule, citizens grew accustom to free water, paid for by the State. Changing this understanding of public utilities requires devotion, involving altering core values, mentality and behavior. Partially, this perception affects the low compliance with payment discipline in all the segments of water use, to be described later in the text. Furthermore, water is also *a merit good*: access to clean water has health benefits (reduced incapacity for work; reduced medical costs) that generally compensate for providing the water.

In summary, depending on the *quantities* supplied to individuals, water can be either a basic human need, a merit good, public good or an ordinary private good. Even this brief introduction into economic concepts shows that policy formulation for water requires a sophisticated form of management, with multi-objective decision making, recognizing the relevance and importance of various values and facts over different conditions of time and place. This is particularly relevant when water allocation and management are passed from a centralized bureaucracy to local entities, such as in transition countries like Armenia.

Further discussion requires a theoretical understanding of tariffs. Setting appropriate tariffs is a complex task—both from the perspective of estimating the financial needs of utility enterprises and from the perspective of assuring customers that the prices they pay for services are reasonable. A part of the problem is that water utilities are, essentially, monopolies which prevent setting tariffs through competitive tender. Tariffs should encourage consumers to use services efficiently. Tariffs should also be set at a level that requires providers to seek the most efficient means of producing and delivering services. However, tariffs must be

set in a way that the poor are not priced out of the market. To ensure that tariffs are politically acceptable, citizens must participate in the tariff setting process and authorities and utility companies must fully disclose financial information to the public. Since tariff setting is a challenging task, it is useful to look at water pricing theory and what it implies in terms of water tariffs. Economic theory holds that:

- Water tariffs should be based on the following main principles:
  - — *Economic Efficiency:* (a) marginal cost should be more then zero in order to reflect the resource scarcity; (b) prices should reflect marginal costs; (c) tariffs should include economic rent,[48] implying that: tariffs based on uniform fixed payments are not acceptable and water bills should be based on the water actually consumed;
  - — *Social justice*: while pricing should be based on the actual consumption levels, sufficient quantity of water should be available on very low prices (or subsidized), through (a) adopting increasing block tariffs; or (b) assisting the poor with cash transfers in case of uniform prices;
  - — *Ecological preservation*: applying a unit for pollution with a fine linked to it; and
  - — *Cost-recovery*.
- Water tariffs should include:
  - — *Resource fee*: to reflect the alternative value of water or economic rent, implying that it should be used for every $m^3$ of water received by the consumer or every $m^3$ water extracted;[49] and
  - — *Expenses*: usually water provision deals with two types of expenses:
    - – overall expenses, equal to the sum of fixed expenses (e.g. providing water meters, bills' collection, administration, etc) and variable expenses; and
    - – wastewater cleaning expenses or ecological fees.
- In sum:

$$\text{Tariff} = \underbrace{\text{Fixed amount}}_{\text{Fixed amount}} + \underbrace{R_{cm} \times Q_{cm}}_{\text{Resource fee}} + \underbrace{P_{cm} \times Q_{cm}}_{\text{Variable amount}} + \underbrace{V_{cm} \times Q_{cm}}_{\text{Ecological fee}}$$

To reflect the principle of social justice:

- *the fixed amount* could be designed in two possible ways: (a) equally for all users (among the same group of category/households); or (b) depending on the income/wealth (value for property; production volume; square meters of house); and
- *the variable amount* could be designed in two possible ways: (a) equally for all users; or (b) designed as block tariff (very low price for the first block and increased for the second block).

# 6. POLICY OPTIONS IN WATER TARIFF AND BILLING REFORM: BALANCING ECONOMIC NEED AND NEGATIVE IMPACT ON THE POOR

## 6.1 Theoretical Rationale

Increasing cost recovery of the water sector through increased tariffs comprises the cornerstone of GoA's economic reform program.[50] Understanding the logic behind the tariff policy of GoA requires an overview of the tariff structure in Armenia now.

- *Resource fees* are reflected in GoA Decree No 864 (12/1988), requiring commercial water users to pay an extraction fee (or water resources tax) equivalent to 0.2 US cents per $m^3$ for the use of surface or groundwater for any commercial purpose, as well as a special fee for the use of Lake Sevan's waters. In addition, water users must pay a fee for the discharge of wastewater. At present, agricultural water users are exempted from the extraction fee. If they use water from Lake Sevan, however, they must pay a fee of 0.4 US cents per cubic meter.[51] These fees are too low to encourage reduction of consumption or the preservation of water resources. As well, they hardly reflect the value of water use.
- *Ecological fees and fines*. Based on 13 criteria, these fees are currently paid only by industrial users and wastewater companies—estimated per ton of pollution above the established limit. The system has numerous drawbacks driven by the low level of fines, poor financial situation of inspectorates (both central and local), and the lack of metering, as a result of which fees are most often based on

reports by *theoretical* calculations of the enterprises themselves. Moreover, pollution is calculated at the end of every year; if a company pollutes more in one quarter, and less in another, it might not pay at all. Thus, the system does not encourage environmental protection.

- *Capital and operational expenses*. Tariffs do not fully include capital expenses, and in case of irrigation—around 50% of operational expenses.

It could be concluded that for both municipal and irrigation water, the tariff structure is far from being an instrument of affecting demand and inducing efficiency. Perhaps this poses the next task to confront, as addressed below. A more immediate task concerns the design of tariffs and a billing/collection system in a way that achieves cost recovery. This involves gradually improving the tariff structure in accordance with the Water Tariff Policy outlined in GoA Decree No.440 to cover the following expenses at full: operational exploitation and preservation; depreciation; servicing loans; insurance; ecological norms; unavoidable losses due to technical and commercial reasons; and minimum profit. The key question concerns the pace of such a reform. GoA Tariff Policy proposes achieving full cost recovery by 2005; in our view, this appears too drastic, and a more gradual process and longer time frame are recommended (as outlined in the following sections).

## 6.2 Municipal Water Tariff and Billing Reform

### *6.2.1 Current Municipal Water Tariff*

Armenia has adopted a *volumetric pricing* system for municipal water.

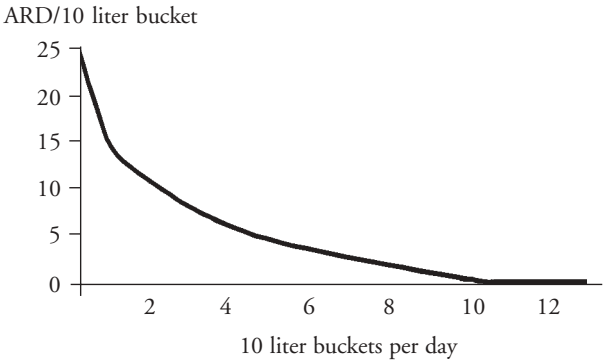
- *Wholesale tariffs* in municipal water are: 30 AMD per $m^3$ for drinking water (including VAT) and 7.46 AMD for wastewater (including VAT) per cubic meter. This equals approximately 5.3 US cents for drinking water and 1.3 US cents for wastewater.[52]
- *Retail tariffs* differ from community to community. In Ashtarak, for example, retail price for water is 60 AMD (10.6 cents) per $m^3$ for drinking water and 20 AMD (3.6 cents) per $m^3$ for wastewater. Retail prices in any given location differ also by consumer type (population, industry, budgetary and commercial entities) according to meter presence. In case of meter presence, the specified prices apply. When no meters are present, prices are set assuming normative consumption. Due to the fact that currently (and until the institutional changes are operational) operators deliver water to consumers, there remains one fixed price—the retail price. This ranges between 50–60 ARD per cubic meter, set at 56 ARD (0.098 USD) per $m^3$) in Yerevan.[53] As described in Chapter 2, prices for water are based on assumed per capita daily consumption of 250 lcd (or 0.25 $m^3$ per capita per day) in Yerevan and 200 lcd (0.2 $m^3$ per capita per day) in other urban areas—though the volume actually consumed by the population is a fraction of this. It should also be remembered that despite a large increase during the last decade, the utility water prices for domestic consumers are still a fraction (around 50–60%) of the O&M.[54]

### *6.2.2 Affordability of Higher Taxes*

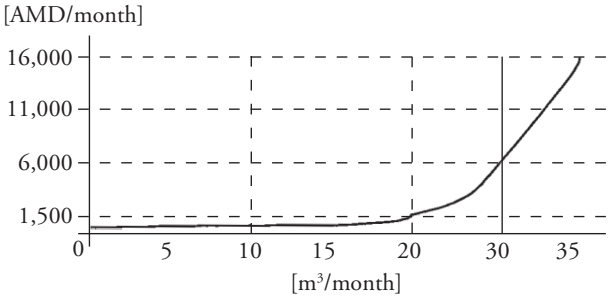
There have been a number of studies which have examined the feasibility of introducing higher tariffs in municipal water. We should mention only a few and only the most important results:

1) *WB funded "Utility Pricing and the Poor" (2001)*: Studying the demand for better water service using a multivariate response model revealed that almost all respondents choose the hypothetical improved system at a price of 0.5. AMD per ten liters (50 ARD per $m^3$)—close to the current tariff—consuming about 130 liters per household daily. Almost none choose it at 25 ARD per ten liters. At five ARD per ten liters (or about one USD per $m^3$), price suddenly becomes the most important consideration in selecting the improved system (consuming around 40 liters per household daily), as well as the determinant for the decision on the quantity to be consumed (see Box 1.).
2) *KfW funded MACS*: GmbH initially proposed adopting a block tariff structure—a mechanism used worldwide to regulate natural monopolies, water utilities in particular.[55] As described in

*Box 1*
Household Water Demand for Improved System




*Box 2*
Consumption Behavior/Proposed Tariff Structure in Armavir




*Source:* Project Document on Nor Akunq JSC KfW/MACS, 2000.

Chapter 5, in international practice, often block tariff most effectively achieves several simultaneous tasks. In the absence of trustworthy data on monthly quantitative consumption, KfW experts made their own estimates based on a small scale survey in Armavir (see Box 2.). KfW experts contend that the pattern revealed suggests a cascade tariff structure in order to curb excessive water consumption. A tariff structure is proposed with:

- a flat rate for the first five cubic meters;
- a low-end (seven percent of average domestic consumption)—five to ten $m^3$ (around 70 ARD per $m^3$), covering only the operating costs;
- a normal tariff (52% of average domestic consumption)—ten to 20 $m^3$ (around 100 ARD per $m^3$), covering full O&M costs;[56]
- an average tariff (nine percent of average domestic consumption)—20 to 25 $m^3$ (around 300 AMD for $m^3$);
- a high-end (27% of average domestic consumption)—above 25 $m^3$ (more than 500 AMD for $m^3$), above the full costs to compensate for the financial losses at the low-end side); and
- and an additional five percent consumed by industry, commercial and public consumers.

At least two more studies recommended a two part block tariff for Armenia, introducing a "lifeline" tariff to assure the necessary consumption of water at an affordable.[57] GoA, however, does not support black tariffs; Nor Akunq has also abandoned the idea. (Presently, a uniform of 100 AMD per cubic meter in under consideration.) In our view, a block tariff structure will be increasingly more relevant as reforms advance (starting with the introduction of a lifeline tariff, perhaps). Thus, this approach deserves further attention (see Section 6.2.5).

To summarize, almost all previous studies concluded that GoA should not raise tariffs at this stage; rather, it should try to increase collections first, to start with the non-paying households with reliable service (20 to 25%). It should proceed with capturing the demand for improved service by increased reliability of service and meter-based billing. This has been advised in consideration of economics (see above), the poor, and public health.

### *6.2.3 GoA Plans for Municipal Water Tariffs*

To some degree, GoA policy concurs with the above recommendations: from 2001 to 2005, no tariff increase is envisioned for Yerevan. Meanwhile, a special emphasis is placed on increased collections—with the following exceptions:

- GoA plans to increase average tariffs outside Yerevan much sooner; and
- tariff raises begin only after increases service reliability. It is also recognized, however, that increased collections are necessary to finance (along with credits) the costs of rehabilitating the network.[58]

It should also be noted that while there was no tariff increase for Yerevan since January 1998—one year

earlier for AWSC—as domestic water tariffs have already increased by almost 100% since 1995 (while the non-domestic tariffs have actually decreased by 36%).

Table 4. indicates that:

- until 2005, no tariff increase is planned for Yerevan (the focus is rather on increased collection of water bills);
- for territories outside Yerevan, an increase in *average* tariffs is planned (Table 4 displays averages), meaning that current tariffs will not be increased everywhere; and
- there is a tendency to differentiate between "outside Yerevan tariffs" and "Yerevan tariffs" to diminish by 2005.

GoA plans to introduce zone tariffs for municipal use gradually (we shall return to this issue later in the text). The increase by 2005 of the water tariff up to 65 AMD per $m^3$ would represent a 16% increase compared to current the tariff in Yerevan, and 23% increase compared to the current average tariff across Armenia. By 2007, the tariff may reach 75 AMD per $m^3$ or higher.

Partially, the rationale for not drastically increasing water tariffs now (apart from the social considerations) is as follows:

- The current tariff, *if* high collections rate were assured, should cover a large fraction of the O&M costs of water utility—approximately 14–20 US cents per cubic meter (around 100 AMD).[59] The same is true in regard to GoA subsidies. The overall amount of subsidies today is around 560 million AMD, or one million USD (almost twice as much if accounted for accumulated debt). According to our estimates, if the share of drinking water payments were only five percent higher (and, indeed, if high collection rates were assured), then this sector of the system would need no subsidies. Since the amount of subsidy accounts for only four percent of the arrears of the population and legal entities to the system (without Yerevan), and if only the latter (again, without Yerevan) paid their debts, then this amount could be reduced by over 60% (indeed, these are very rough calculations, and very conditional).
- According to "Utility Pricing and the Poor," revenue is maximized at a price of five ARD per ten liters (one USD per $m^3$) with about 100,000 ARD (180 USD) a month collected from the rural community and about 160 thousand ARD a month (290 USD) from the urban community. But at this price, only about 40% of rural households and 65% in the urban community would purchase water from the improved system. At prices above five ARD, total revenue from the improved system and the number of households using the system both decrease. At prices below five ARD, the number of households benefiting from the improved system increases—but revenue decreases. Because price enters in linear form, the price elasticity of demand is not constant over the

*Table 4*

GoA Scenario (Tariffs and Collection Rates) for Municipal Water and Wastewater

| Tariff | Years | | | | | | |
|---|---|---|---|---|---|---|---|
| AMD per $m^3$/Collection rate [%] | | 2000 factual | 2001 factual | 2002 | 2003 | 2004 | 2005 |
| **Yerevan,** including | | **56** | **56** | **56** | **56** | **56** | **65** |
| Drinking water | | 46 | 46 | 46 | 46 | 46 | 55 |
| Wastewater | | 10 | 10 | 10 | 10 | 10 | 10 |
| Collection rate | | 18.7 | 26.7 | 40.7 | 62.6 | 85.1 | 88 |
| | 1999 factual | 2000 factual | 2001 | 2002 | 2003 | 2004 | 2005 |
| **Nationwide**, including | **49.52** | **53.3** | **53.7** | **53.7** | **65.7** | **65.7** | **65.7** |
| Drinking water | 38.4 | 42.6 | 42.6 | 42.6 | 55 | 55 | 55 |
| Wastewater | 11.12 | 10.7 | 10.7 | 10.7 | 10.7 | 10.7 | 10.7 |
| Collection rate | 30 | 30.6 | 40 | 54 | 66 | 72 | 82 |

*Source:* GoA Decree No.440 and 690 (a).

function. Thus, no one price appears to solve all problems.

### 6.2.4 *Impact of Planned Tariff and Billing Reforms in Municipal Water on the Poor*

"Utility Pricing and the Poor," the first study of its kind, concluded that:

- if fully enforced, the burden of existing tariffs would be almost three times higher for the poor (8% of monthly expenditure) than the non-poor (3% of monthly expenditure); and
- the quantity consumed is negatively correlated with price, and positively correlated with income and household size.

As household incomes and the composition of expenditures have changed in recent years, HIES 2001 serves as a more pertinent source of information. In particular, the 2001 study offers new insights into the possible impacts on current tariff levels if a stringent collection discipline is introduced. Current norms imply that monthly payments for water in the absence of meters are (or are to be) for each household: (a) in Yerevan 420 AMD (about 72 US cents); (b) 325–340 AMD (around 58 US cents) nationwide. These amounts account for 1.5–1.8% of the average RA salary, 8.5–10.6% of an average monthly pension, and 4.2–5.3% of the family allowance assigned to vulnerable households. If fully enforced, tariffs could represent approximately 2.6 USD per month per household or around 5% of current average monthly expenditure. These estimates, as well as the fact that almost 51% of the population lives below the poverty level,[60] indicate that households must pay for water. Yet many households will find it hard to regularly pay a water fee. This is likely to exacerbate the poverty picture in the country by increasing the number of very poor—and possibly driving many on the edge into poverty. While the situation will be qualitatively the same both for urban and rural areas, some groups or regions will be particularly affected, such as provinces with large refugee populations.

Thus, reforms in the water sector, if not mitigated, will have an even more negative impact on the poor and vulnerable. A UNDP Report (2001), "Humanitarian Assistance and Community Development needs," concludes that about 17.3% of Armenia's population belongs to one of the seven vulnerable groups (internally displaced people, refugees, single elderly, disabled, large families, families of perished soldiers, and orphans). The bulk of the vulnerable are large families, refugees and the disabled: 45.25%, 16.7% and 16.15% respectively. The report establishes that these groups lack adequate access to water. In "Poverty of Vulnerable Groups in Armenia" (1999),[61] the UNDP offers the following conclusions:

- 71% of local households have indoor taps in their dwellings, while the corresponding figure for refugee households is 52% (and much worse for refugees in temporary shelters); and
- in villages where refugees live, the water supply infrastructure is worse (by 1.5 to 2.5 times) than other villages surveyed. Seventy percent of their dwellings, that is, lack water taps, or the outdoor tap is located at a significant distance from their homes.

In conclusion, vulnerable populations deserve close attention in terms of mitigating the negative impact of water sector reform.

### 6.2.5 *Municipal Water Tariff and Billing Reform: Conclusions and Recommendations*

While recognizing that the reforms in municipal water sector are necessary—including gradual tariff increases and stringent rules in collecting bills—we assert that reforms must be designed in consideration of possible poverty and social impacts.

**Tariffs.** Numerous conclusions and recommendations can be made with respect to municipal water tariffs.

- Increasing water tariffs should be frozen until 2005 not only in Yerevan, but also across the country. Better service might entice consumer to pay earlier—yet this might entail negative psychological effects. If tariff increase is indeed implemented nationwide, it should be accompanied by clear signals that those who pay more get better and more reliable service.
- We agree with some of the above-mentioned studies that a lifeline tariff for the minimum consumption is worth particular attention.

- In regard to zone tariffs, it is too early to make comments, as GoA design plans are still in the process of elaboration. It is important that the principles of social justice are respected in any design.
- We encourage public reporting of existing tariffs for communal services enterprises, as well as informed public participation in the tariff setting process.
- Ideally, tariffs should be adjusted for service quality. Residential customers who do not receive 24-hour water services should not pay the same as customers who do receive full service.
- Indeed, a more representative sample of households must be surveyed beyond Armavir (by KfW)—preferably after meter-based billing is underway—with the aim to analyze consumption behavior and preferences, and to design an optimal water tariff. This is particularly important if a block tariff is introduced. However, the findings of the KfW study (above) are worth attention. We understand the difficulty of introducing a block tariff nationwide (especially now), when no reliable information is available concerning patterns of consumption and what they might be when meter-based collection is introduced widely. This system does have advantages:
  - — It allows the poor to pay below the costs, while the rich/high consumers pay above the costs. This generates incentives to save water—an important issue for a country where water resources are not abundant.
  - — It considers the needs of the poor more effectively than a contrived "poverty" list (which always risks "exclusion" and missing those near the edge).

**Impact on the poor.** Perhaps inevitably, the vulnerable will find themselves in a particularly difficult situation with the imposition of stringent tariff and billing regimes. After the installation of meters, households will pay not by the above-mentioned norms, but for actually consumed amounts. To some extent, this will mitigate the negative impact on the poor. However, consumption will likely decrease. Unfortunately, there is no reliable information concerning the actual deviation of these two values, thereby preventing a comprehensive evaluation of both the further limitations of consumption amounts considering the economic effects on the affecting the poor and vulnerable households), and the consequences, (especially in healthcare). Most probably, the future increases in tariffs, coupled with the likely reduction in consumption levels, will lead to the outcomes described above. This presents an important subject for continued research.

**Social assistance for the poor.** It is somewhat artificial to separate municipal water from other communal services. Thus, we suggest providing assistance to poor households in the form of an entire communal services basket.[62] Offering low income families with assistance for paying for basic services—water and waste water treatment (and presumably for the entire communal services including also electricity, gas, and heat)—would improve the compliance rate in payments and the quality of communal services. GoA does not yet have a concrete program for mitigating the impact of reforms in municipal water sector on the poor except for in the bordering and mountainous regions, where the Government plans to implement a system of supporting transfers to community budgets aimed at smoothing their socio-economic development. Basically, the following alternatives to assist the poor in coping with municipal water (communal) charges include:

1) *The Russian and Ukrainian example*: administer a separate housing allowance program through municipalities as a cash transfer program or a voucher scheme. In August 1997, Charentsavan City Municipality (the only in Armenia) implemented a Housing Allowance Program, in line with the Russian model: municipality officials claim that the introduction of this system has resulted in the increased collection of bills.
2) *Incorporate water utility allowance (or perhaps a housing allowance) in the basic Poverty Family Benefit Program (PFBP) formula and administer it through Regional Social Security Centers.*[63] This alternative establishes a central role for the Ministry of Social Security. Duebel and Freinkman (1999), who suggest this approach, argue that Armenia does not necessarily need a separate housing allowance program: "…in the long run, Armenia could follow the Western European model-permanent subsidization of current housing costs of low income households transfer."

3) *The Central European model*: providing subsidies indirectly to condominiums with a matching principle. Duebel and Freinkman (1999) suggest testing this method in Armenia with respect to housing allowances.[64] Condominium members pay a certain portion of costs through either condominium fees or rents. Poor households (e.g. recipients of Poverty Family Benefit), unable to afford increases in condominium fees, might be eligible for additional income support within the PBFP—a combination of the matching grant system for condominium associations with targeted income support for the most affected residents.

The ultimate choice (be it a cash transfer program or a voucher scheme) concerns whether the program is administered by local communities (hamainqs) or through Regional Social Security Centers. Arguments over the mechanisms of assisting the poor in affording the increasing utility and housing bills in Armenia continue. The WB favors the latter, (possibly) incorporating assistance (if any) into the basic poverty benefit formula. Key arguments for this administration strategy include (a) the small size of the country and the expensiveness of administering the assistance schemes in hamainqs, and (b) uneven financial condition of municipalities. (In fact, one of the SAC IV conditions prevents Armenia from starting any new separate social assistance program.) Here, we choose not to recommend any concrete mechanism; this would entail a detailed discussion of the pros and cons of the alternatives (which is not exactly the task at hand). We rather offer a few general recommendations:

- *Design a housing rather than water-fees only assistance program*. Perhaps, in the first stage of the program implementation, benefits will include only water supply and housing maintenance, such basic needs, accessible to all citizens. This can later be extended to heating and electricity, using acquired experience.
- *Involve hamainqs as much as possible*. In the case of water supply, this would be particularly useful as water delivery varies considerably from place to place.
- *Design and implement a program for effective monitoring of the social security system designed for low income families.*

**Installation of meters.** As mentioned in Section 3.1.2, recent GoA decrees stipulate that as of 2003, charging for municipal water will begin only on the basis of metering of household water consumption. For multi-story buildings, meters will be installed by the operator on the main pipeline supplying the building, after which households with meters will pay according to the metered consumption. Households without meters in a particular building will need to divide the remaining costs among themselves. Surveys indicate that the population almost unanimously prefers the initial cost of installing water meters to be financed by the water utility for all households, amortized (at least) for five years in the price of water. This approach falls in keeping with the successful introduction of meter-based billing in other countries.

GoA Decree 690a (05/2002) supports this by contending that (a) the GoA budget lacks the resources to purchase and install meters for all, and (b) operators (international, in particular) do not find it to be an attractive option, given the overall high uncertainty with respect to its outcome. We, however, disagree. The total price of a water meter amounts to on average 30 USD, including the installation cost. This exceeds the value of the minimal consumer and food baskets 1.5 and 2.4 times, respectively, and hints that GoA's proposal is a rather heavy burden not only for the poor, but also for average households. Those on the edge of poverty will suffer most, since they differ only slightly from the poor, yet are not recipients of family allowances; with monthly increasing 2.5 times, their financial situation will significantly decline. We add that to according the WB Poverty Assessment for Armenia, citizens residing in apartments are found more likely to cross below the poverty line, with a relative poverty risk of 18% on average. Such cases constitute 46.9% percent of the poor. This strengthens, in our view, the arguments above. Thus, we propose that:

- GoA must provide at least those in the PFBP with meters free of charge,[65] and
- GoA (with donor support, perhaps) or water companies should initially finance apartment water meters for all households by installment payments spread over several years. This will mitigate the burden on the poor as well as have a positive psychological effect, since it will (a) signal the

government's goodwill, and (b) eliminate the negative consequences of sharing costs in multi-story buildings among those who will not have meters.

**The issue of sanctions.** There are several laws and regulations (which we chose not to address in great detail in this study) as well as technical problems that make it difficult for water companies to stop services for non-payment. Meanwhile, contracts between water operators and condominiums currently specify that in the case of non-payment by households, and provided that it is technically feasible to do so, water supply is to be limited to one hour a day. The question, therefore, is whether or not water should be stopped completely in case of non-payment.[66] GoA plans and documents provide no clear response to this. In our view, cutting the water supply entirely is unacceptable. Yet we contend that GoA should be forthright in its policies to eliminate cases when decisions on non-payment are left to a particular "entity". The development of a system of sanctions for Armenia should begin with an analysis of the differences in compliance rates among communities. Such an analysis might insight into the various approaches to collecting bad debts—with an emphasis on identifying "best practices". In any case, such a decision must be linked to a program of targeted assistance that protects the poor from the full impacts of a tariff and billing reform.

*The role of local self-government bodies.* As described in Section 3.1.2, in the current circumstances, local self-government bodies are essentially excluded from the process of municipal water supply (except for certain and temporary administrative functions), while at the same time, according to the Law on Local Self Government, ensuring such a supply is their responsibility. This situation must find its regulatory solution; we promote more and active involvement, starting with the role of local municipalities in the overall regulatory regime of water sector in Armenia. Hopefully, this question will be resolved when a water regulator is established and the concept of a regulatory regime is developed.

**Collections: the role of condominiums.** We argue that in addition to a careful analysis as to why condominiums have not proven successfully even after modification, and what the Law on the Management of multi-apartment buildings requires to work effectively, other alternative options that could ensure water delivery to households deserve a closer attention. In this regard, we support the Nor Akunq model. While it is to early to judge, Nor Akunq can likely provide numerous insights into effective management. It seems to be a viable option for the Armenian context, as it brings together the interests of the government, utility operators and local communities. However, it is a viable option only when local water operator are efficient to maintain (for more on this, see Section 3.5) and when a well-functioning contracts among operators exist. This indeed might involve condominiums, but could also include a contract of an entrusted management, thus securing the close involvement of local self-government bodies.

## 6.3 Irrigation Water Tariff and Billing Reform

### *6.3.1 Theoretical Rationale*

There is little disagreement over whether or not to charge for irrigation water. Experiences worldwide indicate that without charges (or with a mere symbolic charge), a "vicious downward spiral of performance" unfolds. If public subsidy is not forth-coming, that is, productivity falls, and the scope for charging is reduced by the low quality of the service. Three common reasons for recommending economically justified water charges are:[67]

- Recovering the cost of providing the service. This requires a politically sensitive choice as to the extent of cost recovery: full recovery of capital and O&M costs at realistic interest rates, or partial recovery at subsidized rates. The assessed total cost of water supply (and drainage) services must then be distributed among various beneficiaries—farmers, villages, flood control downstream, and sometimes hydropower. This is a complex task, especially given that the costs of O&M vary over time, requiring political debate and decisions, planning, predictions, and financial management if a reasonably uniform pattern of charging is to be maintained.
- Providing an incentive for the efficient use of scarce water resources, implying that the price of water

must be directly related to the volume delivered. As will be discussed, this is a complicated task.

- Providing potential resources for further investment for the benefit of the society. In this capacity, water prices act as benefit taxes on those receiving water services.[68]

However, the task of achieving increased tariffs to cover the costs of system operation, and for pricing mechanisms to play a prominent role in encouraging more efficient resource use is not easy to implement, since:

- water is a complicated natural, economic and political resource, and farmers are often an important political constituency who strongly resist increases in the price of irrigation services; and
- tariffs and pricing mechanisms should take into account the need to mitigate negative impacts on poor rural households.

### *6.3.2 Current Irrigation Water Tariffs*

Armenia has adopted a *volumetric* pricing system in irrigation, with both benefits and costs.

- *Benefits:* Volumetric pricing is the most forthright way to link water use benefits with costs and the value of services provided. By setting volumetric prices equal to opportunity costs, water is efficiently allocated, static allocative efficiency gains are reaped, and deadweight losses and losses associated with rent-seeking are avoided.
- *Costs:* Particularly in developing countries like Armenia, costs are numerous, including heavy capital, administrative, and institutional costs associated with volumetric metering, billing, and collections of water charges at the farm level, where operations must permit differentiated deliveries.[69]

As in many developing countries, the facilities (meters) required for measured and controlled delivery of irrigation are rarely in place: they are expensive and in many cases do not satisfy the technological requirements of the existing irrigation infrastructure. The dilemma at hand concerns whether or not it is feasible to have a working infrastructure—meters for each farmer. Putting a *working* infrastructure in place requires massive investments in any country, and particularly so in Armenia, as the average farm size is very small. Perry,[70] in reference to Iran, argues that even if providing such infrastructure was feasible, it would not involve effectively reconstructing the system, as the international experience indicates.[71] To avoid the "small farm" problem (above) in some countries, water is delivered to an intermediate point—a farmer organization, a village—on the basis of volumetric pricing; from this point, farmers are allowed to distribute the water "internally." This is often the case for Armenia, but not officially; while within a water user group, water is paid for per ha and according to the crop type, the paperwork is completed in terms of the volumetric principle. Perry[72] contends that even when the procedure is official, the actual interface between "supply" and "demand" is devolved. Water companies and the overall management task of delivering differentiated supplies to individual farms remains, along with the required regulatory framework, the need to measure and bill, and so on. Hence, the direct link between service and payment is lost, and the efficiency incentive that pricing is designed to produce is neutralized.

In Armenia, this is particularly prevalent, as the solution "found" is unofficial, leading to corruption. A natural question follows: what are the alternative mechanisms?[73] In general, there are many ways to price irrigation water, the costs and benefits of which must be considered (though, to date, have not been in Armenia).[74] Perry proposes that for countries with an underdeveloped irrigation infrastructure, the best option is physical rationing water—in the form of uniform allocations per hectare.[75] This is also the opinion expressed during many of the interviews with specialists of the field in Armenia, though most advocate a slightly modified version, whereby allocations differ according to cropping mix. Interestingly, this now occurs in Armenia *de facto* in the face of non-functioning meters (allocations are calculated according to existing estimates on the need for irrigation, depending on the type of commodity).

Thus, might it be worthwhile to integrate practice with formal, legal measures? The essence of the argument is that, if water *supplied* is a proper measure of service in domestic and industrial uses, then in irrigation, and especially as the water resource itself subsides, *consumption* is the appropriate unit for water accounting (yet, this is exceptionally difficult to mea-

sure). The proposed alternative approach to irrigation, water pricing (assigning volumes to specific uses), effectively rations water where demand exceeds supply. This approach entails many advantages: simplicity and transparency; the potential to tailor allocations specifically to hydrological situations (such as rising or falling groundwater conditions); the reallocation of water from upstream areas to downstream areas; and political ease in explaining "below-value" water charges.[76] Important to note, a strong argument in favor of continued efforts to pursue an efficient system of volumetric pricing for irrigation results from the occurrence of significant (30–40%) water losses; in such circumstances, the described alternative system brings its own problems, by disadvantaging the end-users.

Finally, it is clear that a comprehensive and honest analysis is required of all the possible mechanisms and their combinations. While we refrain from making specific policy recommendations here, we do promote installing a system of efficient cost-recovery. Section 6.3.5 continues with a few additional recommendations.

### *6.3.3 GoA Plans for Irrigation Water Tariff Reform*

Initially, in decision No.440, GoA proposed a policy to ensure full cost recovery of O&M costs of irrigation services by 2005, receiving criticism from many sides. The initial draft of this paper was also based on that assumption. In December 2002, a new GoA Decision introduced modifications: achieving full cost recovery is now scheduled by 2007 and not 2005.

By 2007, it is envisioned that the irrigation water tariff would increase around 2.5 times. The figures Table 5 are wholesale tariffs.

**Wholesale Tariffs.** As stipulated by GoA Decree No.741 (11/1998), wholesale tariffs, according to which irrigation water is sold by Irrigation JSC, are defined before February 1 annually, according to the targeted criteria (percentage of cost recovery) defined in GoA Decree No 440. Wholesale tariffs are adopted by GoA decrees. There are two types of wholesale tariffs: 0.7 AMD for self flow water (in bulk) from the source; and 1.2. AMD for water generated with mechanical pumping. Jrar sells water according to these prices to O&M enterprises of Irrigation. They in turn sell water to water user groups at an average price 4.2 AMD per cubic meter (0.7 US cents/$m^3$). There are different estimates on the ratio of these tariffs to real costs, in relation to:

- *production costs*: if estimated at around 12.7 AMD for $m^3$ or 2.2 US cents per cubic meter, then the tariff covers only 30% (this estimate was proposed by the WB as the economic cost of water for 2005);[78] and
- *financial costs*: if estimated at around eight AMD (see GoA Decree 440) or 1.3 US cents per cubic meter, then the tariff covers around 60% of the real cost.

Table 5 requires some explanation:

- Tariffs listed are (a) between mechanical and self-flow; and (b) between zones. GoA Decree No 95 (02/2001) introduced two types of zonings for irrigation water tariffs, which differ slightly from

*Table 5*
Irrigation Tariff Change

| | 1999 actual | 2000 actual | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|---|
| **Tariff** [AMD/$m^3$] (GoA Decree No.440, 2001) | 2.31 | 3.37 | 3.93 | 4.93[77] | 5.93 | 7.80 | 8.40 | | |
| **Tariff** [AMD/$m^3$] (GoA Decree 12/2002) | | | | 4.93/ **4.20** | **4.20** | **5.20** | **6.20** | **7.50** | **8.80** |
| **Collection** [%] | 51.2 | 37.8 | 55 | 65 | 75 | 81 | 85 | | |
| **Cost** [AMD/$m^3$] | 8.8 | 8.2 | 7.4 | 7.8 | 6.7 | 6.5 | 7.0 | | |
| **Wastage** [%] | 31.4 | 30.3 | 29.3 | 29 | 29 | 28 | 28 | | |

*Source:* GoA Decree 440 (modified by a GoA Decree from 13/11/2002)

the average (the difference being around 20-40 luma, 0.05 US cents). GoA intends to introduce more zoning in the tariffs according to the gradual shift to water basin-based management. Currently the concept is under discussion.

- Note that the planned tariff in 2007 is 8.80 AMD and not 12.7 AMD, according to the estimate from WB Project Appraisal Documents. This might become reality; if the price by which water reaches water user groups latter reaches nine to ten AMD per cubic meter, another two to three AMD will be added to reach the farmer.

**Retail tariffs** are (or are *to be*) defined by the water users groups (or, in their absence, the contracted local operator). Their margin ranges between 0.5 and 2.0 AMF per cubic meter. Hence, there are places now where the tariff for farmers is around six AMD per cubic meter.

**Subsidies.** Until full O&M cost recovery is achieved by 2005, Irrigation will have a guaranteed budget, consisting of the resources collected from water users and a Government subsidy. The latter represents, essentially, the cost of running the pump stations. Once (and if) full cost recovery for O&M is achieved in 2005, these agencies are planned to become financially self-sufficient. This financial gap is currently estimated at 9.2 million USD for 2002, 7.8 million USD for 2003, 6.1 million USD for 2004, 4.2 million USD for 2005, and 2.1 million USD for 2006. These estimates will change if the Government cost recovery policy changes. Importantly, when speaking about removing irrigation subsidies, both O&M and capital expenditure subsidies are considered.

### *6.3.4 Assessing the Potential Negative Impact of GoA Plans for Irrigation Water Tariff Reform on the Poor*

In contrast to the municipal water sector, no evaluation of the social impact of irrigation sector reform has been conducted;[79] however, such an impact can be multifold and significant. There are several channels by which the elimination of irrigation subsidies may have both a negative social and poverty impact. These include: an impact on agricultural farms (and hence the viability of their operations); increased unemployment in rural areas and movement of rural households to the city and emigration; increased polarization in rural areas with consequent social problems; an environ-mental impact; and an impact on the food security of the poor part of population.[80] Analyzing the whole spectrum of these impacts warrants a multi-year project. A recent pilot study by the Economic Research Institute[81] (with a funding from DFID) on Poverty and Social Impact Assessment (PSIA-henceforth) of water sector reform in Armenia provided a preliminary estimation of the potential impact on agricultural farms.

Below, we provide a brief summary of this assessment.[82]

Any increase in water tariffs *will not* be accompanied by a counterbalancing and equivalent increase in the efficiency of agriculture. Factors behind this include: (a) farms will lack the resources to invest; (b) the system suffers from inertia which will not allow a sharp rise in efficiency; (c) raising efficiency has theoretical limits. Studies suggest that exceeding 80% efficiency even in the most developed countries is unlikely. Currently agriculture is operating below 40% of its potential efficiency.[83] FAO estimates for Armenia suggest around five percent on average increase per annum[84] of the gross agricultural product, which implies an even lower increase in efficiency. An attempt is made to assess how reforms would affect the profitability of farming operations in different regions, giving broad estimates of possible farm closures associated with this change.

Some rather strong assumptions were made. The extent to which irrigation would decrease; the impact of the prices of imported goods, the impact of the upcoming zoning of tariffs (although in our view, the introduction of zone tariffs will only partly mitigate the negative impacts), and the. impact of different weights of crop mixes by marzes were ignored. It was assumed that other costs will not change fundamentally. The impact of the Irrigation Development Project is analyzed separately, in Section 6.3.5.

To evaluate the possible impact of the reforms in marzes and to make conclusions about the impact on various socio-economic groups, we have utilized 1995-2000 data on ratios of total costs and irrigation costs spent on agricultural crops, as well as profits by province and product, provided by the Ministry of Agriculture (see Annex).[85] The comparison reveals that in

Shirak, Gegharkunik, Armavir and Ararat marzes agriculture is profitable. In Aragatsotn, Kotaik and Sunik marzes, the situation is comparatively worse. Market prices for fruits, grapes and vegetables are low, and losses are high. Therefore, agriculture is much more vulnerable in Tavush, Lori and Vayots-Dzor marzes. In Lori and Shirak only grain and fodder are profitable, while in Vayots-Dzor, only vegetables.

Furthermore, the outcome of doubling the water price by 2005 is considered through the analysis of two potential scenarios.

**Scenario 1.**
*The prices of agricultural commodities will not change*

Based solely on data provided by the Ministry of Agriculture (see Annex), potential profits/losses P = p X Output – K (costs) were calculated. The outcome of the analysis is depicted in Table 6.

- Shirak data indicates that a higher irrigation water price will have little impact on the profitability of main crops, except fodder, where 42% of expenses are irrigation costs. But if fodder is unprofitable, livestock will be affected in turn. The same situation occurs in Armavir and Ararat provinces, where the costs for fodder account for 54% and 68% of total costs, respectively. The profit generated from fodder in Geghar-kunik province is rather low, while irrigation costs account for 57% of the total. A two-fold increase in the price of irrigation water will endanger both fodder and livestock.
- The situation will also deteriorate in Aragatsotn, Kotaik and Sunik provinces, as there will be no profit from fodder.
- The poor situation in Tavush and Lori will further deteriorate. There will be no profit from fodder, and the only profit generated from grain will decrease. The main source of income for Vayots-Dzor agriculture is potatoes, vegetables and melons; profit from the two latter crops is not high, whereas irrigation costs account for 52% and 61% respectively. The plots of agricultural land are not very large, so there are no economies of scale and the doubling of irrigation water price will cause the situation to deteriorate.

**Scenario 2.**
*Increase in the prices of agricultural goods.*

To assume that the prices of the main agricultural commodities will increase seems plausible, particularly for those crops which require more watering. Table 3 lists estimates on price increases for some agricultural goods, showing how the increase in irrigation water prices will force farmers to increase the prices of their goods. This will negatively impact the food security of the poor. Again, Tavush, Vayots Dzor and Lori marzes appear to be in a tentative position (see Table 6). But

*Table 6*
Scenario 1[86]

| Marz/ Crops | Grain Crops | Potatoes | Vegetables | Gourds | Fruit | Grapes | Perennial Fodder |
|---|---|---|---|---|---|---|---|
| Shirak | + + | + + | + + | x | + + | x | + + |
| Gegharkuniq | + + | + + | + + | x | + + | x | + _ |
| Tavush | + + | _ _ | _ _ | _ _ | _ _ | _ _ | + 0 |
| Vayots Dzor | _ _ | + + | + _ | + _ | _ _ | _ _ | _ _ |
| Syuniq | + + | + + | + + | + + | _ _ | _ _ | + _ |
| Lori | + + | _ + | _ _ | x | _ _ | _ _ | + _ |
| Kotaiq | + _ | + + | + + | x | _ + | _ _ | + - |
| Armavir | + + | + + | + + | + + | + _ | + _ | + _ |
| Ararat | + + | + + | + + | + + | + + | + + | + _ |
| Aragatsotn | + + | + + | ++ | + + | + + | _ _ | + + |

can the market bear such a price increase? A few observations:

- The market will be open for cheaper products from neighboring countries, which will limit the scope for price increases
- Farming will become more efficient, although it is hard to calculate the extent of this improvement. Now agriculture operates at around 40% of its potential efficiency.[87] Through increasing efficiency (at about 4–5% a year), five to 20% increases in profits are possible. Realistic expectations fall at the lower end for the following reasons: (a) this will require significant investments, which the farmers will not have due to decreasing profits; and (b) costs of other inputs will rise in parallel. Indications are that even better-off farms will find it difficult to make the investments necessary to substantially increase efficiency.
- If there is a substantial increase in the purchasing power of the population, price increases will be feasible, with the farmers operating within the reasonable profit margin even to the cost of reducing the production levels. Data from 2001 HIES indicates that 15% of farmers are currently unable to ensure their own food security.
- Export opportunities are still limited and no major change is likely in the near future. The main constraints on exports at the level of the food industry include:[88]
  - — small export surplus for bulk products, which does not always to respond to the needs of large buyers (this also concerns several niche market products, the export surplus of which must be developed to supply sizeable quantities);
  - — reliability of deliveries (in quantities, quality, and timely delivery);
  - — lack of acceptable quality assurance and standards of hygiene;
  - — price policies and competitiveness (for bulk products, Armenia is a "price taker" and therefore must adjust to international price levels); and
  - — fresh products, particularly fruit, are in high demand in several markets, particularly the EU. However, fragile, perishable products from Armenia may not survive long transit times or conditions. In addition, there is an increasing tendency that a number of functions for fresh products in Western European markets (e.g. ripening, quality control, packing and re-packaging, pre-packing and labeling) are done by the exporter in the country of origin.

For Scenario 2, a PSIA team has utilized a simple Cobb-Douglas production function.

$$\mathbf{Y = A K^m L^n},$$

where $Y$ is income, $K$ is costs, $L$ is work force, and $A$, $m$, $n$ are unknown parameters evaluated, based on the sampling experiment data (m = 0.31; n = 0,08 and ln A = 8.42. $R^2$=0.35).[89] The value of $A$ depends on the degree of mechanization in agriculture. Changing the costs

$$\mathbf{K = K_{inputs} + K_{labor}}$$

and keeping the labor constant expected profit/loss could be estimated:

$$P = Y - K.$$

The outcome is presented in Table 7.

**Probable Scenario**

Likely, the actual outcome will fall somewhere in-between; the prices of agricultural goods will increase, but to a lesser extent than described above. Thus, the overall picture will be close to the description in Scenario 1. If we consider an optimistic scenario of reducing poverty at the rate of three percent per year, then from 2003 to 2007, poverty will be reduced by 15% (i.e., a 35% level). However, the portion of extremely poor will not change significantly. Therefore, the impacts of increasing irrigation tariff are not like to be reduced to any great extent.

Small farms and the vulnerable rural population will suffer most. In poorer regions, this is likely to lead to the closure of some farms and further out-migration. Over the long term, some rationalization of agriculture is probably unavoidable. The central debate concerns the sequencing and the speed of change and the measures required to make the change bearable. Empirical evidence and research indicates the complicated interrelationships between policy change and livelihoods. It is quite clear that there is still not enough information available on the interchange between economic and social relations. Additionally, making conclusions about what crops should be grown

*Table 7*
Scenario 2[90]

| Marz/ Crops | Grain Crops | Potatoes | Vegetables | Gourds | Fruit | Grapes | Perennial Fodder |
|---|---|---|---|---|---|---|---|
| Shirak | + + | + + | + + | x | + + | x | + + |
| Gegharkuniq | + + | + + | + + | x | + + | x | + _ |
| Tavush | + _ | _ _ | _ _ | _ _ | _ _ | _ _ | + _ |
| Vayots Dzor | _ _ | + _ | + _ | + _ | _ _ | _ _ | _ _ |
| Syuniq | + _ | + + | + _ | + _ | _ _ | _ _ | + _ |
| Lori | + + | _ _ | _ _ | x | _ _ | _ _ | + _ |
| Kotaiq | + _ | + + | + + | x | _ _ | _ _ | + 0 |
| Armavir | + + | + + | + + | + + | + + | + + | + + |
| Ararat | + + | + + | + + | + + | + + | + + | + _ |
| Aragatsotn | + + | + + | ++ | + _ | + + | _ _ | + + |

and where is difficult, because of the implications for the sector and beyond, such as balancing trade. For instance, we have made some strong assumptions, not fully allowing for the impact of different cropping mixes[91] and the decrease in irrigation. Thus, these conclusions are to be treated with caution.

There are additional considerations to take into account. Armenia possesses three categories of ecological vulnerability: the earthquake zone, mountainous regions and border regions. Thus, prioritizing candidates for support is exceedingly complicated, be they vulnerable households, farms, communities or whole villages.

As such, this level of policy-making cannot be driven solely by fiscal considerations. First, if the long term objective is economic recovery, then not enough is known about the dynamics of the rural economy to design and track a robust reform program which will move from the old habits of collectivized agriculture in an integrated system to a more flexible commercial approach appropriate for a small conflict-affected state. If the long-term objectives are more holistic and entail policies for a more equitable society trading with its near neighbors and beyond, then again not enough data exists. All evidence indicates that any policy on irrigation has the potential to notably impact rural life and agriculture.

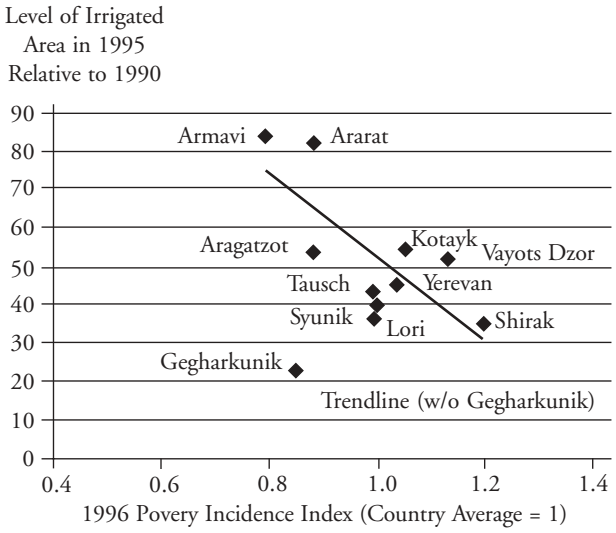
Thus, to summarize, if not mitigated, doubling irrigation tariffs by 2007 would significantly (and negatively) impact society—particularly in the water-scarce, mountainous and poor regions. This would ultimately result in the closure of small farms and movement of the population from affected areas. Likely, these results would hold even in an optimistic scenario of reducing poverty at the rate of three percent per year. Regardless, small farms as well as vulnerable rural population are at risk. Indeed, a much more detailed and thorough assessment of the potential impact of irrigation reform is needed to make concrete conclusions with better grounded arguments. However, the results cited above do provide some useful insights into possible outcomes—in terms of the magnitude and side-effects of reform.

While GoA's present program to achieve cost-recovery is not too drastic (prolonged from 2005 to 2007), the question remains as to whether or not it is safe to pursue reforms as planned. To answer this, we examine first the poverty picture in rural areas of the country.

Often, it is argued that the rural population in Armenia is less vulnerable than elsewhere because of its capacity to provide for basic foodstuffs on a more or less stable basis. However, the living standards of the rural population appear to be correlated with their location, particularly altitude above sea level, earthquake area, border regions or in regions with a low level of economic activity. In rural communities, the incidence of vulnerability is higher than in urban communities by a factor of 2.5. According to the HIES 2001 Survey, almost 50% of the rural population is

poor, with 11% in extreme poverty. It is expected that the decline in irrigation does, in fact, affect these numbers (see Figure 4).[92] A causal relationship between poverty and irrigation has not yet been determined; this comprises an issue worthy of future research.[93]

*Figure 4*
Irrigation Decline and Poverty Incidence




*Source:* WB "Armenia: Towards Integrated Water Resource Management," ECSSD.

Based on the assumption that there is a direct relationship, increased access to irrigation water will contribute to:

- reduce poverty in rural areas. Agriculture is by far the most important activity present in rural areas, engaging 80% of inhabitants; about 31% of the population live in rural areas, but even town dwellers maintain small farms to supplement their incomes.
- agricultural growth (accounting for 33% of GDP).[94] This is not confined, however, to medium-sized or large farms, which are a minority (as has been the case so far). Rather, this refers the majority of the farms, the small included.

As earlier mentioned, there are more than 335,000 family-owned farms (currently producing about 98% of the total agricultural product), with an average size of 1.37 ha (consisting of three parcels of land, one irrigated and two not). Around 30% of farmers do not cultivate all their land, leaving around 15% uncultivated. This is due, mainly, to poor land quality, as well as to difficulties in affording inputs, lack of water, or distance from the farm.[95]

Table 8 illustrates an important possible negative impact on the poor related to the quick removal of irrigation subsidies. Approximately 25.6% of farmers have no cash income; that is, they produce for their own consumption or barter trade.[96] This group will suffer most from the removal of irrigation subsidies and tariff increases.[97] Table 8 also reveals that the incomes of about 72% of rural households do not exceed the 1,000 USD limit annually. In 1999, "Sociometer" reported that:

- about 60% of rural households' income was generated from farming, and lack of irrigation water is a matter of survival for villagers; and
- 25–30% of rural households cannot not produce sufficient agricultural output, already resulting in high emigration, urbanization, or sale of land or labor to more successful neighbors.

*Table 8*
Economic Condition of Rural Households

| | Cash Income level, US$ | % of families |
|---|---|---|
| 1 | 0 | 25.6 |
| 2 | Under 200 | 11 |
| 3 | Under 500 | 20 |
| 4 | Under 1000 | 14 |
| 5 | Under 2000 | 15 |
| 6 | Under 3000 | 6 |
| 7 | Over 3000 | 7 |

*Source:* "Water sector development program, a report", Sociometer, Yerevan 1999

The conclusion that small farms will suffer the most from tariff increases is supported by some very recent international studies. Several of these[98] conclude that the impact of similar pricing policies may vary widely, according to different conditions and farms. Farms with inelastic demand curves (mostly small farms less capable of adapting by changing their crop mix, increasing efficiency, or changing technology) will be less responsive to price increases in the sense that they will suffer most of the negative burden of augmented irrigation tariffs. Indeed, some of the farm enlargement processes are rational; Armenia has too many too-small farms.

However, GoA must strive to ensure the rational proportions of such a process, thus preventing further polarization of income and social tensions. To achieve this, along with strengthening collective operation mechanisms in rural areas (farmers' groups), it is important to guarantee access to irrigation water.[99] A 1998/99 Household Income and Expenditure Survey reveals that land use increases household consumption, and even more so if land is irrigated. The Farm Households Survey[100] meanwhile shows that access to irrigation increases productivity and profitability of all farm crops; this is reflected in the higher equivalent consumption among households with access.

Studies performed in other countries indicate that improved irrigation access will increase crop yields and production, and in turn result in increased farm income. Bhattarai *et al.* address how this differential access to irrigation affects income inequality and poverty status in an irrigation system. They argue that access to irrigation is a crucial instrument for reducing poverty not so much through direct impacts of increased yield and farm returns *per se*, but more through indirect impacts associated with increased rural employment—particularly through the scale of economic multipliers operating in the economy. Thus, this research proves the importance of pro-poor policies in irrigation—actively increasing the access to irrigation water for poor farmers, smallholders and end-tailers—as a way of stimulating rural development and decreasing rural poverty.

It also must be considered that, as a result of joining the WTO (Winter 2003), the exemption of agriculture from the main taxes must be eliminated by 2009. While small farms are expected to suffer less, the overall impact of this provision has yet to be assessed.

The plan to achieve full cost recovery in irrigation by the year 2007 could be justified if reform programs are accompanied with measures that mitigate their negative impact and ensure increased access to irrigation for poor farmers and smallholders.

### *6.3.5 The GoA Vision to Mitigate the Negative Impacts of Irrigation Reform*

GoA often cites projects by the WB and a few other donor agencies (in particular, the Irrigation Development Project), as well as its own plans, as adequate strategies for mitigating the negative poverty and social impact of the irrigation reform program. The following points illustrate components of this vision.

**Introduction of zone tariffs.** As mentioned, GoA plans to introduce a differentiated tariff system after 2003, coinciding with a change to water basin/scheme management. The first step is already completed: GoA Decree No 95 from 02/2001 introduced two types of zonings for irrigation water tariff. As with the municipal water tariff, it is too early to comment on the zone tariff program, for the mere reason that GoA is still in the process of developing it. Nevertheless, it is difficult to imagine that the effects of introducing zone tariffs would be large enough to absorb the negative poverty and social consequences of removing irrigation subsidies.

**Increasing efficiency in irrigation.** GoA has set the task of increasing efficiency in irrigation as one of its main tasks in order to reduce the negative impact of increased water tariffs. The WB's Irrigation Development Project will serve one of the main vehicles for increasing efficiency, with two main components: (a) enlargement of the Araks River intake; and (b) a program for pump-to-gravity irrigation conversion (where such conversion is feasible and economical). Under the latter component, eight of the most efficient (out of 26 assessed) irrigation systems were chosen for pump-to-gravity conversion during 2001–2005. However, due to severe financial constraints, the project was divided into two parts; only three out of eight systems will be converted initially (31 million USD), while the remaining five must wait until additional financing is approved (34 million USD). Forecasted project impacts at farm level are:

- the average net farm income: 400–1,000 USD per ha in the "with-project" situation, compared to between zero (where no rain-fed cropping is possible) and 200 USD (where rain-fed cropping is possible) in the "without-project" situation; and
- reduction of physical loss rates from current levels of 50% on-farm to only ten percent, yielding net benefits per year of roughly 80 USD per hectare.

The value of one cubic meter of water was estimated at about 19 drams (0.035 USD) on average. The Project Appraisal Document concludes by assuming that eight percent of the gross farm income would be a reasonable price for a typical farmer to pay for water. Analysis shows that, if water is available in time

and in planned quantity, the "affordable" water fee could range between ten and sixteen drams/$m^3$ (0.018 to 0.03 USD).

The analysis by the WB Irrigation Development Project itself (above) is convincing. A broader view, however, raises serious concerns.

- No decision has been made yet on how to manage those situations where such conversion is found to be infeasible or uneconomic.[101] Even if all eight systems are funded, it will cover 40 out of 250 million KWT electricity supply for irrigation purposes.
- Since the project provides for the rehabilitation of the most critical structures only, any delay in the maintenance of the remainder of the system will cause the whole sector to deteriorate further, thus undermining the utility of the sections already rehabilitated. Effective maintenance will require institutions with technical and managerial capabilities, along with adequate financial resources. Importantly, the Irrigation Development Project provides for restructuring and strengthening the irrigation and drainage institutions responsible for the O&M process from the source of water down to farmers' fields, as well as the adoption of arrangements to give those institutions the requisite financial resources to assume their respective responsibilities, and for the whole O&M system to become financially self-sustaining by the time full cost-recovery is achieved (2007). However, there are still significant risks associated with the feasibility of the program.
- The process will take at a minimum ten years to finish, paralleled by on-going tariff increases.

**Increasing efficiency in irrigated agriculture.** Agricultural production in Armenia falls well below its potential, resulting in low farm incomes. Yet even drastic increases in productivity levels, which indeed constitute a national priority (GoA is now implementing a major program to achieve this), cannot counterbalance the negative effects of rapid additions to irrigation tariffs. This is because (a) farms will increasingly lack the resources to make investments; (b) the system has a certain inertia which will not allow sudden rise in efficiency; (c) raising efficiency has theoretical limits. Based on several studies, exceeding 80% efficiency—even in the most developed countries—appears impossible. Currently, the agricultural sector operates below 40% of its potential efficiency.[102] FAO estimates for Armenia suggest a five percent average growth per annum[103] of the gross agricultural product, which implies minimal increases in efficiency.

**Targeted subsidies through community budgets.** GoA Decree No. 440 lays the groundwork for plans to allocate subsidies to water user groups and specific rural farms/households through community budgets. These plans are still in the early stages of design, both in terms of amounts to be allocated, and in terms of targeting mechanisms to be used. For border and mountainous regions, GoA intends to implement a system of donations aimed at reducing national variances in socio-economic development. Indeed, this seems to be a wise road to follow: replacing subsidies to the irrigation system with subsidies to communities and farmers in need. The implementation of such a program requires, however, significant time, financial resources, and collaborative efforts in terms of community economic development.

While the above points help to mitigate the negative poverty and social impact of irrigation sector reform, the extent to which GoA's vision actually results in real change remains unclear. Likely, the possible positive outcomes of these changes would hardly be enough to overcome the significant burden reform brings to the poor.

### *6.3.6 Irrigation Water Tariff Reform: Conclusions and Recommendations*

**Pace of Removing Irrigation Subsidies.** Our main conclusion holds that the planned schedule of removing irrigation subsidies could be feasible (more feasible, in fact, than the initially planned time-frame), if it allows the Government to implement measures that will absorb the massive negative impact on poor, rural households, attract resources to upgrade infrastructure and so on.

**Pricing Mechanisms.** Many specialists in the field (both internationally and locally) contend that volumetric pricing should not be viewed as the only alternative, and other options should be (re)considered—such as the physical rationing of water in the form of uniform (or not) allocations per ha. Others argue that, in the face of significant losses in the system, pursuing efforts to establish a working system which would en-

able volumetric pricing of irrigation water is the only alternative. Refraining from making judgment at this point (yet stressing the need for a comprehensive analysis), we highlight the importance of designing and installing an efficient pricing mechanism that would enable full cost-recovery. Also, based on successful examples from other countries, we also recommend implementing a form of block tariff (but for retail tariffs) within water user groups. In this regard, it seems justifiable that landowners with significantly larger plots pay with a different tariff than smallholders. Relative farm size has been found to be a valid indicator of income in a number of studies, as many features characteristic of farm size influence income. For example, van Koppen *et al.* underscore the necessity of monitoring farm size-related differences as a pre-requisite for ensuring pro-poor irrigation management.[104] In this sense, it is critical that smallholders have an equal say in water user group management structures.

**Impact on the poor and assistance.** While it does appear that the present state of irrigation (as well as agriculture) warrant an increase in irrigation tariffs, the next set of questions (concerning the pace, shape, preconditions and risks associated with these reforms) need more careful analysis. At a minimum, GoA must design and implement comprehensive programs aimed at developing not only irrigation and agriculture,[105] but also community capabilities for mitigating the negative poverty and social impact of the proposed reforms. In particular:

1) The development of the non-farm sector in rural areas must be pursued to absorb, to some extent, the release of farmers from agricultural production. For example, the growth of small-scale food processing in rural areas should be seen as an opportunity yet to be seized. In addition, the prioritizing or sequencing of these measures must strive to avoid any immediate major negative outcomes arising from irrigation tariff increase.
2) Community level assistance should also target infrastructure development.
3) Poor rural households/farmers[106] require assistance through different mechanisms, such as:
    - direct subsidies through communities;
    - targeted additional financial and credit interventions for irrigation equipment, such as soft-loans for "tail-enders";
    - assistance through water users groups, such as allowing poor farmers to contribute their labor as membership fees or part of water use fees; and
    - additional pro-poor targeted policy interventions which aid tail-end farmers
4) Participatory water management receives the maximum support of all the stakeholders. While reforming water user groups, it is necessary to ensure that the voices of tail-enders and smallholders are better-heard. A recommended option is a "one farm, one vote" system. For this system to be effective, major awareness raising efforts are needed.
5) While the Government is now in the process of partially forgiving the accumulated arrears for irrigation bills to rural households, provided that they pay remaining amounts, we argue that the poor should receive a complete write-off, in addition to a specifically designed assistance program. Along these lines, we propose launching pilot projects in two or three key specific water resources management areas with serious problems (i.e., water scarcity, drainage, water pollution). With assistance channeled through water user groups, such projects would serve to develop local programs for addressing problems arising from the increased irrigation tariffs. Undoubtedly, there is no "one-size fits all" irrigation management transfer or institutional reforming policy which can be equally applicable to all parts of the world; specific policy instruments depend largely upon particular contexts and underlying socio-political environments. Similarly, there is no consensus yet in the irrigation literature on how to design a water management policy or framework which might provide increased productivity while simultaneously enhancing the equal distribution of irrigation-induced benefits across locations and sectors.

**Clearer system of water rights.** A clear system of water rights and water entitlements, formalized through the introduction of legal and third party service contracts and consisting of flexible provisions for seasonal water use, plays a central role in avoiding further degeneration. Clearly-defined, separate water entitlement provisions for maximum and average flows (in relation to minimum flow) will reduce the uncertainty

involved in water availability and its variable allocation to farmers' plots. Ultimately, better enforcement of water allocation rules and regulations (such as a wider use of individual farmers' incentive-based water allocation rules) will contribute significantly to the success of irrigation management reforms.

## 7. SUMMARY OF MAIN CONCLUSIONS AND POLICY RECOMMENDATIONS

However challenging, reforming the water sector is a necessary task; ambivalence allows for further deterioration in terms of water supply and provision. At the same time, reforms now proceed during a particularly difficult time, socially, politically, and economically, with widespread poverty and extreme income inequality in the country. In this sense, any changes threaten significant risks, particularly in terms of increased poverty levels, emigration, social tensions, endangered food security, environmental damage and so on. In our view, GoA does have a window of opportunity to promote sustainable economic growth—through carefully designed and coordinated reforms, strategic investments in infrastructure, cost-recovery efforts—provided that the impact on the poor is minimized.[107] To achieve WRM efficacy and efficiency, and to reduce possible negative poverty and social effects, we propose the following measures, listed below.

GoA must coordinate reforms in the water sector with changes in other areas. Among the key steps which are now in progress, planned or necessary, we specifically highlight the following:

- the Complex Program to Support the Bordering Regions of the Republic of Armenia: 2002–2008 (which envisions a wide range of necessary actions to support the bordering regions, including rehabilitating the water service infrastructure);
- projects designed to strengthen farmers' groups parallel to land management reforms (which includes issuing title certificates—particularly important for the development of participatory irrigation management in rural areas—in order for farmer to invest in property); and
- further reforms at the local self-government level, fiscal decentralization in particular. In the last several years, allocations to the communities reached 6.8% of the state budget (against the planned 8.1%). The average amount of budget allocations to a community amounts to 21.6 million AMD for 2000.[108] Such inadequate funding fuels the unsatisfactory performance of local governments with respect to their mandatory and delegated powers.[109] About two-thirds of community budgets are obtained from through taxes, duties and non-tax fees (60–70% of the overall community budget). Along with receiving planned allocations from the State budget, communities must first of all increase their own revenues by allocating a percentage of other State taxes (profit, VAT, excise) to the community budget. Many other countries now practice this strategy. Additionally, the share of local duties and fees must be increased and the property base of communities enlarged, thus taking the decentralization process further. Finally, targeted community development programs need to be improved and implemented.

Before summarizing specific recommendations and conclusions according to municipal and irrigation sectors, some general conclusions can be made.

1) Given the population's negative attitude toward reforms, a well-designed public awareness campaign holds paramount importance in order to: (a) underline the importance of the reforms to the continued functioning of the system; (b) promote the ideas of fairness and transparency which should accompany the reforms; and (c) explain the concept and progress of the reforms.
2) While present GoA efforts must be commended with respect to partially writing off accumulated arrears for both municipal and irrigation water (provided households repay the remaining costs), the poor should be completely forgiven of repayment.
3) More attention must be paid to the development of water rights and water markets to eliminate the ambiguous contractual relations now in place.
4) Better use of economic tools of analysis in decision-making is needed for water planning and allocation.
5) As one of the key avenues in reforming WRM, participatory water management should receive the most attention possible to ensure that water users control decision-making at the community level.

6) A system of regular monitoring of the social situation should be established, given the country's widespread poverty and extreme income inequality as well as the rapidly changing household expenditure structure. Such a system is now in development as part of the Poverty Reduction Strategy Process. One of the key tasks should be to monitor how households cope with water sector reform.
7) More research is needed to evaluate the impacts of different aspects of water sector reform and to design appropriate parallel measures to mitigate possible negative social consequences.

**Municipal Water**

1) The idea of a block tariff (starting with a lifeline tariff) should not be discarded, as it: (a) allows the poor to pay below the costs; (b) encourages the wealthy or high consumers to save water (important for a country where water resources are not abundant); and (c) addresses the needs of the poor effectively. Assisting the vulnerable according to lists—such as the PFBP list—risks disregarding those at-risk. Indeed, the administration of such a program is costly and difficult, and hardly feasible at present. However, as reforms advance, block tariffs are worth consideration.
2) GoA's current plan to install individual meters, with payments spread over several years, deserves attention. This plan eliminates potential negative consequences resulting from sharing the costs in multi-story buildings among those with and without meters. As well, for the extremely poor, (at least for those included in PFBP) the meters are installed free of charge. We also suggest waiving accumulated arrears for this group.
3) Through a specifically designed program, poor households should receive assistance with payments for their water bills—or, if possible, for all communal services.
4) Currently, local governments (according to the Law on Local Self-Government) are responsible for water supply and provision, yet are excluded from high-level decision making in the sector. In response, clarity of roles and duties is needed to involve local governments in water management—as active participants. Likely, the development of a water regulator and regulatory regime with help resolve this dilemma.
5) In addition to a careful analysis of the successes and failures of the condominium strategy and the Law on the Management of multi-apartment buildings, other alternative options for ensuring water delivery to households deserve a closer attention. Nor Akunq presents a viable option for the Armenian context, as it unites interests of the government, utility operators and local communities (see Section 3.5).
6) Research is needed in the following areas:
   - analyzing consumption behavior once the water meters are widely installed in order to suggest an optimal water tariff; and
   - assessing the populations willingness and ability to pay utility fees in a basket, consisting of housing and maintenance costs.

**Irrigation Water**

1) While irrigation development and access to irrigation are highly subsidized almost everywhere in the world (involving state coffers for major components of construction and or service costs) prolonging the subsidization of irrigation appears risky. GoA should strive to remove subsidies in irrigation, which mainly subsidize energy costs, yet continue subsidies for the communities and farmers in need. It is a societal responsibility (a) to design and implement pro-poor policies; (b) to ensure that reform efforts mitigate potential negative impacts on the poor; and (c) to guarantee that all groups benefit from the reform process. Undoubtedly, designing and implementing policies that ensure the above requires time and resources; in this sense, prolonging the achievement of full cost recovery form 2005 to 2007 is a logical decision. Even with the extension, this timeframe is extremely tight, and will only be feasible if GoA is able to implement measures that absorb the massive negative impact on poor rural households, carry out parallel reforms, and attract resources to upgrade existing infrastructure.
2) In order to mitigate the negative poverty and social impact of the proposed reforms, the Government must develop comprehensive programs aimed not only at irrigation and agriculture,[110] but also at

community needs. Moreover, the development of the non-farm sector in rural areas must be pursued to make irrigation sector reforms politically deliverable and successful. Sequencing these measures must strive to avoid significant negative outcomes arising from irrigation tariff increases.

3) Further programs should serve to foster the development of cooperative mechanisms in agriculture (such as using agricultural machinery) and Water User Federations. Participatory water management must receive maximum support of stakeholders, and the voices of all—tail-enders and small-holders—must be heard. A recommended option to promote participation and cooperative is a "one farm, one vote" system, which requires major awareness raising efforts.

4) A comprehensive analysis is needed to assess the merits of the adopted policy of volumetric pricing in irrigation. Alternatives, such as physically rationing of water, or a combination of different mechanisms might present a better approach. Here, we stress that such an analysis is critical to designing and implementing a system of efficient cost-recovery. Additionally, a type of a block tariff (but for retail tariffs) within a water user group presents a viable option for Armenia. Because of the various disparities in the country, it is justified to adjust tariffs to land size and or water consumption; this requires recognizing the needs of small-holders.

5) In terms of research, a comprehensive impact assessment (economic and social) of the proposed program of irrigation reform is needed in order to determine effects on the poor and vulnerable. This could be performed through a targeted survey, taking into consideration the regional features of rural households.

6) To design an effective *for Armenia* assistance program for poor rural households and farmers, we suggest launching pilot projects in two or three key specific water resources management areas with serious problems, such as water scarcity, drainage, or water pollution. Possible mechanisms might (or, perhaps, should) include assistance to poor rural households/farmers[111] by means of:
   - direct subsidies through communities;
   - targeted additional financial and credit interventions in irrigation commands for irrigation equipment;
   - assistance mechanisms through water users groups; and
   - additional pro-poor targeted policy interventions such as targeting tail end farmers

7) Irrigation reforms require a clear system of water rights and entitlements, enforced through legal service contracts, with flexible provisions for seasonal water use.

# ANNEX

## Irrigation Data

| SHIRAK | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **Grain-crops** | **Potatoes** | **Vegetables** | **Fruit** | **Fodder** | | | |
| % of Irrigation expenditures in total expenditures | 15.9 | 4.1 | 13.0 | 13.4 | 41.8 | | | |
| % of Irrigation expenditures intotal expenditures in the case of doubling irrigation tariff | 27.4 | 7.8 | 23.0 | 23.6 | 58.9 | | | |
| price1kg | 90.0 | 80.0 | 50.0 | 115.0 | 25.0 | | | |
| profit before reform 1ha | 68,820.0 | 337,722.0 | 415,005.0 | 128,820.0 | 61,600.0 | | | |
| profit after reform 1ha(sc.1) | 50,764.0 | 311,914.0 | 370,380.0 | 89,223.0 | 18,899.0 | | | |
| price1kg after reform (sc.2) | 99.0 | 88.0 | 55.0 | 149.5 | 27.5 | | | |
| profit after reform 1ha(sc.2) | 78664 | 425434 | 465130 | 284148 | 46399 | | | |
| **GEGHARKUNIK** | | | | | | | | |
| | **Grain-crops** | **Potatoes** | **Vegetables** | **Fruit** | **Fodder** | | | |
| % of Irrigation expenditures in total expenditures | 25.6 | 7.1 | 21.2 | 21.9 | 56.3 | | | |
| % of Irrigation expenditures in total expenditures in the case of doubling irrigation tariff | 40.8 | 13.2 | 35.0 | 35.9 | 72.1 | | | |
| price1kg | 90.0 | 80.0 | 50.0 | 115.0 | 25.0 | | | |
| profit before reform 1ha | 53,320.0 | 214,472.0 | 360,064.0 | 94,021.0 | 22,680.0 | | | |
| profit after reform 1ha(sc.1) | 20,127.0 | 168,393.0 | 277,066.0 | 22574.0 | –55,739.0 | | | |
| price1kg after reform (sc.2) | 99.0 | 88.0 | 55.0 | 149.5 | 27.5 | | | |
| profit after reform 1ha(sc.2) | 48,027 | 271,753 | 369,866 | 216,809 | –28,739 | | | |

| TAVOUSH | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **Grain-crops** | **Potatoes** | **Vegetables** | **Fruit** | **Fodder** | | | |
| % of Irrigation expenditures in total expenditures | 33.9 | 10.3 | 28.7 | 37.0 | 29.8 | 39.1 | 66.3 | |
| % of Irrigation expenditures in total expenditures in the case of doubling irrigation tariff | 50.6 | 18.6 | 44.5 | 54.0 | 45.9 | 56.2 | 79.7 | |
| price1kg | 90.0 | 80.0 | 50.0 | 60.0 | 115.0 | 100.0 | 25.0 | |
| profit before reform 1ha | 29,400.0 | –265,311.0 | –147,520.0 | –105,364.0 | –331,968.0 | –119,808.0 | –19,260.0 | |
| profit after reform 1ha (sc.1) | –19,650.0 | –333,840.0 | –269,642.0 | –242,422.0 | –439,819.0 | –225,997.0 | –13,6814.0 | |
| price1kg after (sc.2) | 99.0 | 88.0 | 55.0 | 72.0 | 126.5 | 130.0 | 27.5 | |
| profit after reform 1ha (sc.2) | 7,350 | –276,320 | –223,542 | –153,382 | –414,059 | –85,597 | –110,064 | |
| **VAJOC DJOR** | | | | | | | | |
| | **Grain-crops** | **Potatoes** | **Vegetables** | **Courds** | **Fruit** | **Grapes** | **Fodder** | |
| % of Irrigation expenditures in total expenditures | 58.0 | 23.8 | 52.0 | 61.3 | 53.3 | 63.4 | 84.1 | |
| % of Irrigation expenditures in total expenditures in the case of doubling irrigation tariff | 73.4 | 38.4 | 68.4 | 76.0 | 69.6 | 77.6 | 91.4 | |
| price1kg | 90.0 | 80.0 | 50.0 | 60.0 | 115.0 | 100.0 | 25.0 | |
| profit before reform 1ha | –44,950.0 | 330,255.0 | 100,815.0 | 469,88.0 | –341,250.0 | –204,932.0 | –221,540 | |
| profit after reform 1ha (sc.1) | –177,180.0 | 143,370.0 | –229,102.0 | –322,522.0 | –631,989.0 | –491,357.0 | –537,894 | |
| price1kg after reform (sc.2) | 99.0 | 88.0 | 55.0 | 72.0 | 126.5 | 130.0 | 27.5 | |
| profit after reform 1ha (sc.2) | –149,280.0 | 272,250.0 | –137,452.0 | –156,682.0 | –588,864.0 | –322,457.0 | –511,394 | |

| SIUNIK | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **Grain-crops** | **Potatoes** | **Vegetables** | **Courds** | **Fruit** | **Grapes** | **Fodder** | |
| % of Irrigation expenditures in total expenditures | 33.4 | 10.1 | 28.0 | 36.6 | 29.0 | 38.6 | 65.5 | |
| % of Irrigation expenditures in total expenditures in the case of doubling irrigation tariff | 50.0 | 18.3 | 43.7 | 53.6 | 45.0 | 55.7 | 79.2 | |
| price1kg | 90.0 | 80.0 | 50.0 | 60.0 | 115.0 | 100.0 | 25.0 | |
| profit before reform 1ha | 30,600.0 | 195,394.0 | 113,444.0 | 89,208.0 | –208,608.0 | –144,648.0 | 4,600 | |
| profit after reform 1ha (sc.1) | –17,440.0 | 128,610.0 | –4,722.0 | –45,522.0 | –312,479.0 | –248,477.0 | –108,954 | |
| price1kg after reform (sc.2) | 99.0 | 88.0 | 55.0 | 72.0 | 126.5 | 130.0 | 27.5 | |
| profit after reform 1ha (sc.2) | 9,560.0 | 232,130.0 | 67,078.0 | 81,918.0 | –274,759.0 | –116,177.0 | –80,204 | |
| **LORI** | | | | | | | | |
| | **Grain-crops** | **Potatoes** | **Vegetables** | **Fruit** | **Grapes** | **Fodder** | | |
| % of Irrigation expenditures in total expenditures | 23.6 | 6.4 | 19.4 | 20.3 | 27.8 | 53.8 | | |
| % of Irrigation expenditures in total expenditures in the case of doubling irrigation tariff | 38.2 | 12.0 | 32.5 | 33.7 | 43.5 | 70.0 | | |
| price1kg | 90.0 | 80.0 | 50.0 | 115.0 | 100.0 | 25.0 | | |
| profit before reform 1ha | 66,560 | –1,015 | –63,488 | –336,171 | –223,146 | 30,240 | | |
| profit after reform 1ha (sc.1) | 36,962 | –42,468 | –137,000 | –401,027 | –286,917 | –40,051 | | |
| price1kg after reform (sc.2) | 99 | 88 | 55 | 126.5 | 130 | 27.5 | | |
| profit after reform 1ha (sc.2) | 65,762 | 38,732 | –87,400 | –379,982 | –190,317 | –13,051 | | |

| KOTAIK | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **Grain-crops** | **Potatoes new** | **Potatoes** | **Vegetables** | **Fruit** | **Grapes** | **Fodder** | |
| % of Irrigation expenditures in total expenditures | 24.8 | 4.9 | 6.8 | 20.4 | 21.2 | 29.4 | 55.4 | |
| % of Irrigation expenditures in total expenditures in the case of doubling irrigation tariff | 39.7 | 9.3 | 12.8 | 33.9 | 34.9 | 45.4 | 71.3 | |
| price1kg | 90.0 | 95.0 | 80.0 | 50.0 | 115.0 | 100.0 | 25.0 | |
| profit before reform 1ha | 26,200.0 | 247,038.0 | 130,020.0 | 99,600.0 | –119,250.0 | –349,338.0 | 18,900.0 | |
| profit after reform 1ha (sc.1) | –74,680 | 212,470 | 85,690 | 22,018 | –187,406 | –418,177 | –55,674 | |
| price1kg after reform (sc.2) | 99 | 104.5 | 88 | 55 | 126.5 | 130 | 27.5 | |
| profit after reform 1ha (sc.2) | –56,680 | 324,760 | 180,250 | 88,418 | –144,281 | –357,877 | –29,424 | |
| **ARMAVIR** | | | | | | | | |
| | **Grain-crops** | **Potatoes new** | **Potatoes** | **Vegetables** | **Gourds** | **Fruit** | **Grapes** | **Fodder** |
| % of Irrigation expenditures in total expenditures | 22.8 | 4.4 | 6.1 | 18.7 | 25.3 | 19.3 | 27.0 | 53.6 |
| % of Irrigation expenditures in total expenditures in the case of doubling irrigation tariff | 37.1 | 8.4 | 11.6 | 31.4 | 40.3 | 32.4 | 42.5 | 69.8 |
| price1kg | 90.0 | 95.0 | 80.0 | 50.0 | 60.0 | 115.0 | 100.0 | 25.0 |
| profit before reform 1ha | 78,302 | 653,235 | 473,475 | 651,780 | 563,997 | 427,401.0 | 279,140 | 54,050.0 |
| profit after reform 1ha (sc.1) | 50,566.0 | 623,148.0 | 434,898.0 | 583,068.0 | 484,868.0 | 366,169.0 | 218,516 | 53,871.0 |
| price1kg after reform (sc.2) | 99.0 | 104.5 | 88.0 | 55.0 | 72.0 | 126.5 | 130 | 27.5 |
| profit after reform 1ha (sc.2) | 80,176.0 | 775,623.0 | 563,298.0 | 703,768.0 | 695,708.0 | 463,114.0 | 464,816 | 82,621 |

| ARARAT | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **Grain-crops** | **Potatoes new** | **Potatoes** | **Vegetables** | **Gourds** | **Fruit** | **Grapes** | **Fodder** |
| % of Irrigation expenditures in total expenditures | 34.8 | 7.6 | 10.6 | 29.3 | 37.9 | 30.2 | 40.0 | 67.6 |
| % of Irrigation expenditures in total expenditures in the case of doubling irrigation tariff | 51.6 | 14.1 | 19.1 | 45.3 | 55.0 | 46.4 | 57.2 | 80.6 |
| price1kg | 90 | 95 | 80 | 50 | 60 | 115 | 100 | 25 |
| profit before reform 1ha | 65,088 | 719,100 | 638,250 | 745,250 | 808,120 | 223,020 | 356,516 | 0 |
| profit after reform 1ha (sc.1) | 14,766.0 | 664,398.0 | 567,898.0 | 619,068.0 | 666,668.0 | 112,919.0 | 466,137 | –177,453 |
| price1kg after reform (sc.2) | 99.0 | 104.5 | 88.0 | 55.0 | 72.0 | 126.5 | 130 | 27.5 |
| profit after reform 1ha (sc.2) | 45,276.0 | 825,898.0 | 715,898.0 | 754,568.0 | 939,068.0 | 194,339.0 | 673,616 | –148,703 |
| **ARAGATHSOTN** | | | | | | | | |
| | **Grain-crops** | **Potatoes new** | **Potatoes** | **Vegetables** | **Gourds** | **Fruit** | **Grapes** | **Fodde** |
| % of Irrigation expenditures in total expenditures | 15.6 | 2.7 | 3.9 | 12.5 | 17.4 | 9.6 | 15.2 | 41.9 |
| % of Irrigation expenditures in total expenditures in the case of doubling irrigation tariff | 26.9 | 5.3 | 7.5 | 22.2 | 29.6 | 17.6 | 26.3 | 59.0 |
| price1kg | 90 | 120 | 90 | 50 | 60 | 115 | 100 | 25 |
| profit before reform 1ha | 23,040 | 424,790 | 421,200 | 63,990 | -93,789 | 110,290 | -194,670 | 61,560 |
| profit after reform 1ha (sc.1) | 5765 | 406,248 | 396,318 | 21,213 | -142,317 | 83,369 | -224,167 | 19,611 |
| price1kg after reform (sc.2) | 99 | 132 | 99 | 55 | 72 | 126.5 | 130 | 27.5 |
| profit after reform 1ha (sc.2) | 28,805 | 534,648 | 517,818 | 80,463 | -68,757 | 145,239 | -129,667 | 46,611 |

*Figure A1*
Map of Armenia

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## ENDNOTES

1 2001 *Household Living Standards Survey*, National Statistics Service of GoA.

2 Independent expert estimates suggest a higher figure—around two billion USD. For more concrete estimates for each of these sectors, see relevant sections.

3 The World Bank, *Armenia: Towards Integrated Water Resource Management* ECSSD Environmentally and Socially Sustainable Development, Working Paper No. 35 (2002).

4 *2001 Survey*.

5 Independent expert estimates suggest a higher figure—around two billion USD. For more concrete estimates on each of these sectors, see relevant chapters of the paper.

6 GoA Decree No. 440.

7 In Western Europe and Best Practice emerging countries, collections are about 0.7–0.8% GDP.

8 GoA Decree No. 440.

9 WB Working Paper No. 35, 11.

10 WB Working Paper No. 35, 13.

11 Lampietti, J. *Utility Pricing and the Poor* (2001).

12 see GoA Decree No. 440 and WB Working Paper No. 35, 12

13 The bulk of non-payers, including the non-poor, justify their behavior by the discrepancy between the amount and quality of the delivered commodity and its price. This result was obtained during discussion groups held in the framework of the Plot Study on Poverty and Social Impact Assessment of water Sector Reform in Armenia, ERI/DFID, 2002.

14 The World Bank, *Armenia Irrigation Development Project Appraisal Document* (2001).

15 Often farmers located even at minimal distance from the existing outlets have no way of directly receiving water and no dependable scheduling technique is used to benefit all farms. In some areas, water distribution is erratic and many irrigators have broken concrete canals and pipes at points closer than the originally installed outlets to have access to irrigation water. The World Bank, *Armenia Irrigation Development Project Appraisal Document* (2001).

16 FAO/Ministry of Agriculture of the Republic of Armenia, *Strategy for the Development of Agriculture in Armenia* (2002).

17 The World Bank, *Armenia Irrigation Development Project Appraisal Document* (2001)

18 Working Paper No 35, 6.

19 The World Bank. *Armenia's Private Agriculture: 1998 Survey of Family Farms*. ECSSD Working Paper No.17 (1999).

20 Working Paper No 35, 8.

21 GoA Decree No. 440.

22 Is proposed that the existing Energy Regulatory Commission is reformed into a Tariff Regulatory Commission covering both the energy and water sectors. A Draft Law in the National Assembly is scheduled for hearings in mid-2003.

23 Armenia is divided into ten *marzes*, including Yerevan. Marz leaders (*marzpets*) are appointed and not elected.

[24] YWSC was transferred under SCWR (from the Yerevan Municipality) control only by the end of 2001.

[25] Not particularly successful, as admitted by GoA (see Goa Decree 690A). Reasons include the inadequate contract, legislative drawbacks, failure to meet obligations on behalf of the Armenian and the Italian sides.

[26] In addition, four cities and about 600 villages, totaling about 0.6 million inhabitants, directly operate their water systems.

[27] KfW/MACS GmbH project Document on the establishment of Nor Akunq JSC (2000).

[28] The new Law on Condominiums define those as "non-commercial cooperative union of physical and juridical bodies' membership, established based on membership fees, with the aim of management of joint ownership parts in apartment building/buildings." In contrast with the western experience these are not form of ownership but rather a form of management. We had doubts about the merits of using the term condominium in this paper, but finally were inclined to do so, since it is the term most widely used in Armenia. The official term is *hamatirutiun*, which means "Joint ownership".

[29] Condominiums, licensed or entrusted management bodies are specified as forms of management of multi-apartment buildings by the Law on the Management of Multi-apartment buildings.

[30] For example, the contracts between the water operators and condominiums specify that, a proportion from the collected amounts for water use—gradually decreasing within 19 months—would go to the condominium's budget. What the source of funding the maintenance and repair costs (even if only for the poor) for the intra-building pipelines would be after the 19th month is not clear.

[31] According to GoA Decision No.55 (01/2002), almost 247,000 customers in Yerevan will be serviced by the existing condominiums

[32] For example: (a) the limitation of joint ownership to commonly used spaces that could not be used for income generation, depriving condominiums from collateral that could have been used for access to capital; (b) the fact that unlike other transition countries neither the land underneath the buildings nor retail and commercial spaces attached to the buildings have been added to the assets of the association: and so on.

[33] IFAD has supported the establishment and further development of water user consumer cooperatives - to operate as independent, self-managing tertiary-level management entities, capable of maintaining the tertiary system and, eventually, participating in the management of higher-level sections of the irrigation conveyance system.

[34] GoA pursued this direction raises some concerns however. According to GoA Decision No. 232 (2001), internal irrigation channels in those hamainqs where water user groups did not perform efficiently (criteria being collection rates below 60%), are to be re-delegated to Irrigation JSC. It also stipulated that where water user groups do not exist, branches of Irrigation JSC could be opened to substitute them. This is done with good intentions—to increase the efficiency of the system. Regardless, the requirements under the new law stipulate re-registration. Ultimately, the manner of dissolving self-regulating entities could jeopardize the emerging trust in water user groups.

[35] The issue of arrears deserves closer attention, but is not feasible in this paper.

[36] See Perry *et al.* (1997).

[37] e.g. clarification of the legislation governing ownership issues on underground waters will be necessary in Armenia.

[38] If property rights in water formally recognize rights to diversions while denying historical rights to return flows, as has been done in Mexico and Chile (Gazmuri and Rosegrant 1994), they institutionalize theft. The same problem can occur at the level of entire water basins, as in Pakistan and Egypt. As development proceeds upstream, down-stream users receive progressively less, and more polluted, water.

[39] Perry (2001) disagrees, arguing that irrigation releases from a dam could be reduced due to the considerations of achieving maximum economic value, and allocated to domestic use. If inter-sectoral benefits of market transfers are to be realized, then the entire agriculture sector must be covered by infrastructure and bureaucracy required for the measurement, billing, and transfer of water from the least-productive parts of agriculture to the more-productive areas.

[40] The introduction of Water Users Federations' water right system will be piloted under the proposed IDA funded Irrigation Development Project.

[41] Perry *et al.* (1997).

[42] Water basin (scheme) based management is a widely accepted form of WRM worldwide, since it captures the cyclic flow of water in a water basin thus forming a rather closed system. In the Armenian context the water basin/scheme based management will: (a) eliminate the negative effects (cross-subsidization; reduced incentives foe commercial efficiency) of putting units within AWSC and Irrigation, which do not form a technological unity, in the same agency; (b) create conditions for a wider use of zone tariffs' for each unit—based on economic and technological considerations; (b) foster more active stakeholder participation in decision making, e.g. in choosing the public/private O&M agency; and so on. Taking a decision on water basin based management idea does however raise questions about its efficiency given the very small size of the country, and needs a careful cost-benefit analysis.

[43] In Spring 2003 the Energy Regulatory Commission of the Republic of Armenia was transformed into a small-sector regulator to cover water issues (both municipal and irrigation) as well. ECA "Armenia: Development of an institutional framework for regulation of pubic utilities," 2001.

[44] Household Survey (2001).

[45] Gleick (1996); Postel (1996); Seckler *et al.* (1998).

[46] Perry *et al.* (1997).

[47] Briscoe J. *Water as an Economic Good: the Idea and what it means in practice*. Paper presented at the World Congress of ICID, Cairo, Egypt (1996).

[48] *Economic rent or alternative value:* when a unit of a certain resource is used for a particular project or goal, it cannot be used for another project or goal. Thus, it cannot create benefits for another project. The alternative value of a resource is comprised from benefits which it could have brought had it been used for another program or project. Hence, the notion of the alternative value is a very important one when taking decisions about resource allocation and pricing. It is also no doubt that we have to allocate the resources in a way that we achieve the highest possible well being of the society.

[49] Although it is preferable to define it as a percent of net revenue, it may take the form of a fee per cubic meter as there of a problem informing regulators of cost structures.

[50] The World Bank, while supporting this effort through a series of direct investments, has also conditioned loans and credits, e.g Structural adjustment credits (SAC) IV and V on GoA's passage of tariff increases, improved collections and strengthening of governance and regulation in the sector. "Zero subsidies" by 2005 is a conditionality of SAC IV and SAC V.

[51] Since the resource fee from Sevan US cents 0.4 per cubic meter, and surface water is free (in terms of resource fee), often a situation arises when the hamainq wants and is able to receive surface water, and is forced by the operator to buy the water—a situation that should be changed.

[52] GoA Decree No. 33 (01/1999) states that until new tariffs are set by the Government, the old ones, set by GoA Decrees No 368 (09/1997) for the wholesale tariffs and No. 256 (07/1997) specifying the rules for calculating retail tariffs, are in force.

[53] Compare to water fees in: Germany 181, Belgium 121, Italy 73, US 50 (US cents/$m^3$)

[54] More precise estimates are complicated since it a lot depends on the accounting for the accumulated debts.

[55] Project Document on Nor Akunq JSC, KfW/ MACS, 2000

[56] It has been recommended to charge a full cost rate already in the midlevel of the tariff structure to avoid financial dependence on high consumption patterns and to preview a negative income effect related to price/demand elasticity.

[57] "Utility Pricing and the Poor" study also recommended to introduce an affordable fixed tariff to encourage a consumption of the socially optimal level of water plus a marginal tariff to cover water consumption above this level. USAID/PADCO AST (Armenian Social Transition) Project, Report No. 18 recommended introduction of a "lifeline" tariff.

[58] Whether it is indeed possible to deliver reliable water service to households at a price below the full cost-recovery price (which is currently) the case remains to be determined. As far as prospects for 2005 are concerned, GoA expects to increase the collection rate at more than 80% for AWSC and 88% for YWSC, envisioning increases in current revenues by 3.2. or 3.3. times. The questions are (a) whether it will be indeed possible to more than 80% collection rate and (b) how dramatic will the reduction in consumption. Our calculations show that it is realistic to increase water utilities revenues 2.4 to 3 times. It will be more difficult to achieve a higher level of revenue; this will require the implementation of efficient measures to increase the solvency of the vulnerable.

[59] They include depreciation of assets and provision for arrears.

[60] Household Survey (2001).

[61] One-time survey of 2000 households in July-August 1999.

[62] While the attempts in 1998 to address the link between poverty and payment for electricity were discontinued rather shortly, this should not be discouraging for the idea as some argue: in our view the success of the proposed program will largely depend on its design and finding the necessary financial means for that—which is again a matter of design to a large extent.

[63] In 01/1999, a targeted poverty family cash benefit replaced the old system of social assistance with many different schemes. The benefit is awarded to eligible households (not individuals)—3,000 AMD per month and an additional 1,300 dram per month for each family member. The average benefit per month is 8,000 AMD. The system employs a means-tested targeting mechanism, where households are ranked based on a single-index formula that includes individual and household indicators and uses such filters as telephone bills, real estate transactions, customs transactions and private entrepreneurialism.

[64] In Central Europe, the availability of these funds, often disbursed through publicly owned banks or municipalities, allows for reducing both the costs of capital and liquidity problems associated with housing rehabilitation. A cap was put on amount of rehabilitation costs. This is not advised by the authors for Armenia

[65] In the case of repayment of the water meter price and installation cost over a 5-year period, the monthly amount liable to payment will be 0.43 to 0.56 USD, which is equal to 3.4 to 4.5% of the minimum food basket. Particularly, we shall not discount the fact that the water meter over 5 years will need numerous repairs and even may break down, and create desperate situations for its financially poor owners.

[66] Ukraine for example, has suspended penalties and other financial sanctions for untimely payment for services. This is the case for both legal and technical reasons CSEs are not able to disconnect provision of services to residential customers and budget organizations which are in debt.

[67] Perry (2001).

[68] Probably the most important benefit of irrigation is the overall reduction in food prices resulting from increased production. Thus the indirect beneficiaries of irrigation, the consumers of cheaper food, should be happy to subsidize irrigation development through taxes. Care is needed however

to be exercised, since this objective discriminates the farmer who does not receive irrigation water - a service charge may be appropriate to recover a proportion of the benefits or to cover the costs of the service.

69 Perry (1995) and (1996).

70 Perry (2001).

71 Analysis from other countries (see Perry, 2001) suggests that the likely charge needed to cover O&M costs would be 0.3–0.5 cents/$m^3$ (having minimal efficiency impact), while the charge required to substantially affect demand would be much higher—perhaps 2–5 cents/$m^3$. Impact on demand (for example, by a factor of 5–10) would be politically very difficult to enforce, resulting in substantial profits to the supplying agency, with further potential political costs.

72 Perry (2001).

73 For a critique of applying volumetric pricing in irrigation in developing countries, see also Fraiture and Perry (2002).

74 Including: volume-based and two-part tariffs; fixed charges; and so on. Mostly they are designed to cover the O&M costs and a percentage of capital replacement. Supply characteristics differ: wholesale; wholesale plus minimum charge to retail; and so on.

75 Perry (2001).

76 In India, the long-tested *warabandi* irrigation system (Malhotra 1982) is based entirely on ensuring an equitable distribution (over the land) of limited water resources. Water charges are not high, and not volumetric, but because all farmers are water-short, they experiences directly the true value of their water ration, and strive to save every drop and maximize its productivity.

77 The planned tariff for 2002 was 4.93 but it met with significant resistance within GoA, and the rate at 4.21 was adopted.

78 The World Bank, *Irrigation Development Project Appraisal Document*, 2001.

79 The only documents available are economic, social and ecological impact assessments within the Project appraisal Document of the Irrigation Development Project. Assessments, however, look at the impacts of the Irrigation Development Project.

80 An important objective of agricultural development is to ensure appropriate levels of food security of urban and rural population. It is estimated that food expenditure amounts to between 60–70% of the total consumption of households. This figure is as high as 85% for the poorest quintile, while it is 57% for the richest quintile.

81 Economic Research Institute of the Ministry of Economy and Finance of the RoA. The PSIA on water sector reform in Armenia was funded though DFID. The author of this paper was part of the team. The publication is expected in 2003

82 The results obtained result from a joint work by L. Melikyan, A. Kakossyan, A. Darbinyan, and Alan Roe within framework of ERI/DFID PSIA.

83 National Statistics Service.

84 *Strategy for Sustainable Development of Agriculture in Armenia* FAO/Ministry of Agriculture of Armenia (2002).

85 There are other estimates regarding farm productivity, costs, and expenses at the farm level. For example, there are unofficial estimates by the National Statistics Service. These "productivity" figures are much lower than those we used, thus implying even lower estimates for profits.

86 Economic Research Institute of the Ministry of Finance and Economy of the Republic of Armenia: Pilot Study on Poverty and Social Impact Assessment of the Water Sector Reform in Armenia. Forthcoming (2003).

87 *Strategy for the Development of Agriculture in Armenia* FAO/Ministry of Agriculture (2002).

88 Of course, the development of exports, not only of food products, is conditional on an array of factors that can facilitate or impede it. This includes exchange rates and other macro-economic policies, transport infrastructure, diplomatic efforts aimed at the conclusion of trade agreements to facilitate access to foreign markets. "Trade diplomacy" should also focus on addressing trade facilitation with countries in the region (combating corruption, diminishing non-tariff barriers, harmonizing standards, abandoning transit taxes, etc.). Finally, the trade embargo is an important impediment to the development of international trade of Armenia.

89 The World Bank, *Armenia's Private Agriculture*: Working Paper No. 17 (1999)

90 Economic Research Institute of the Ministry of Finance and Economy of the Republic of Armenia: Pilot Study on Poverty and Social Impact Assessment of the Water Sector Reform in Armenia. Forthcoming (2003).

91 IWRM study has revealed significant changes in cropping mix as a result of increasing irrigation tariffs.

92 These scores are computed from three poverty indicators for 1996/97: poverty incidence or proportion of population below national poverty line, the severity poverty index representing the intensity of poverty, and unemployment rate representing the poors' opportunity to secure means of sustainable livelihoods; and two regional factors representing boarder and earthquake zones.

93 Such causal relationship was established for a number of countries recently in *Irrigation Impacts on Income Inequality and Poverty Alleviation: Policy Issues and Options for Improved Management of Irrigation Systems* IWMI, Working Paper 39 (2002).

[94] In general, opportunities for agriculture in Armenia are limited by the small extension of agricultural land and low levels of domestic output compared with domestic demand (41.1%). After a period (1994–1998) when of steady growth, agriculture faced grave difficulties that seriously limit further prosperity in the sector—primarily, underdeveloped infrastructure. *Armenian Economic Trends*, (July–September 2001)33–35.

[95] The average farm size varies, however, according to the areas and ranks between 0.61 hectare in the Ararat marz, where irrigated high value crops are cultivated, to 3.0 hectares in the Syunik marz, which has more extensive crop and livestock farming. *Strategy for the Development of Agriculture in Armenia* FAO/Ministry of Agriculture (2002).

[96] Since independence, cropping patterns in Armenia have shifted toward cultivation of basic food crops for self- consumption (cereals, potato) at the expense of fodder crops, fruit trees and vineyards and industrial crops. As a result, Armenian small-holder agriculture has been transformed into a mixed crop/livestock farming system. Crop and livestock production yields are low as a result of the use of small quantities and poor qualities of agricultural inputs and inadequate farming practices. Irrigation is important too: only 0.7 hectare per farm is irrigated. The World Bank, *Armenia: Towards Integrated Water Resource Management* ECSSD Environmentally and Socially Sustainable Development, Working Paper No 35 (2002), 8.

[97] A natural question, then, is how irrigation water is paid for. For many, it has become a regular practice to pay "in- kind" with agricultural products produced. This is illegal, characterized with problems like extremely low price for crop, corruption, and so on.

[98] See e.g. Tsur Y., Dinar A., Doukkali R. and Roe T. "Efficiency and Equity Implications of Irrigation water Pricing" presented at the International Conference on Macro and Micro Economic Considerations of Irrigation Reform, Agadir, Morocco, (2002).

[99] Ibid.

[100] World Bank, 1999b

[101] Out of the 26 schemes considered, 18 showed satisfactory ERR, i.e. above a benchmark of 15%. Due to resource constraints, however, the criteria for inclusion in the project was further tightened and only 8 schemes with an ERR of at least 20% and an NPV of at least 1.5 million USD, qualified for funding. Following Government decision to implement the project in two stages, priority in IDP-Stage I was given to 3 schemes with highest potential for saving energy, namely, Ajgedzor, Ajrum, and Eghegnadzor.

[102] National Statistics Service

[103] Draft *Strategy for Sustainable Development of Agriculture in Armenia*, FAO/Ministry of Agriculture of Armenia, (June 2002).

[104] van Koppen B, Parthasarathy R, and Safiliou C. *Poverty Dimensions of irrigation Management Transfer in Large- Scale Canal Irrigation in Andre Pradesh and Gujarat, India*, IWMI, Working Paper 61 (2002).

[105] e.g. development of other rural infrastructures, creation of crop insurance institutions; further developing banking and other financial services available to the farmers and village banking in particular; assisting farmers with exporting their products abroad and so on.

[106] According to *Poverty in the vulnerable groups of RA population* (Yerevan: UNDP, 1999) among the rural households, the percentage of extremely poor (very poor) is higher, and even more so where the vulnerable population, e.g. refugees are concentrated.

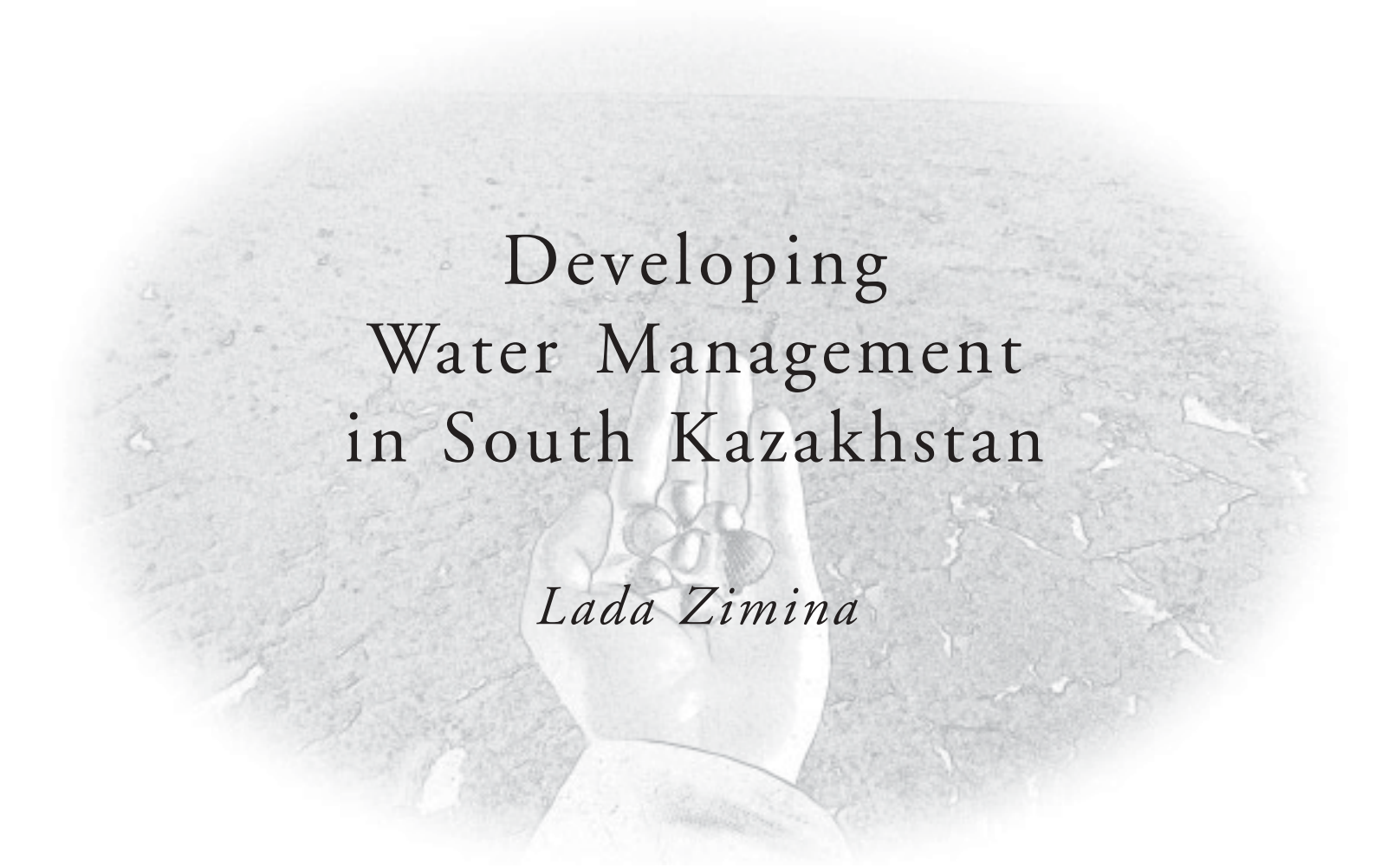
[107] GoA, realizing the particular problems to certain regions, is planning to implement specific measures to rehabilitate the water services (both for drinking water and irrigation water for Meghri and Tavush regions. Decree of the SCWR No 42 (05/2001).

[108] U*N Human Development Report for Armenia* (2001), 52.

[109] *Foundations of Local Self-government*. Instruction manual, Yerevan (2000).

[110] Including developing other rural infrastructures, creating crop insurance institutions, developing banking and other financial services available to the farmers and village banking in particular, and assisting farmers with exporting their products abroad.

[111] According to *Poverty in the vulnerable groups of RA population* (UNDP, Armenia 1999) amongst the rural households, the percentage of extremely poor (very poor) is higher, and even more so where the vulnerable population, e.g. refugees are concentrated.



# Developing Water Management in South Kazakhstan

*Lada Zimina*

## ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| AWS | Administrations of Water Structures |
| BWA | Basin Water Authority |
| ICWC | Interstate Commission for Water Coordination |
| WUO | Water Users' Organization |

# Developing Water Management in South Kazakhstan

*Lada Zimina*

## EXECUTIVE SUMMARY

This paper provides a critical assessment of the recent policy decisions related to water management in Kazakhstan, with a focus on irrigation management transfer in the South of the country. Current difficulties in the water sector stem largely from the dependence of southern areas on transnational watercourses—that of the Syrdarya river and, in turn, on upstream countries (Uzbekistan, Tajikistan and Kyrgyzstan). The core problem, meanwhile, concerns the lack of consistent national policy within the country itself.

To address this issue, the paper begins with a description of the current state of water management reform in Kazakhstan and the difficulties involved by examining the Makhtaaral southernmost in the country.

The paper continues by assessing the recent legislative and administrative measures in irrigation water management and its implications for the district. Recent steps that can be categorized as part of a larger irrigation management transfer strategy have involved: upgrading the water management legislation; administrative reforms to redistribute responsibilities among the state water management bodies; and empowering farmers and Water Users' Organizations (WUOs). Current achievements are analyzed, as are the gaps which require more attention.

Further steps needed include: adopting a new Water Code and Law on Water Users' Organizations; reorganizing the governmental water management institutional makeup; increasing Government and international donor investment; and improving access to information and transparency. The paper concludes with recommendations to stakeholders.

## 1. INTRODUCTION

At first glance, the water situation in southern Kazakhstan might resemble an unsolvable knot. Several decades of over-use of the Syrdarya river (as well as the Amudarya, flowing through neighboring Uzbekistan and Turkmenistan), which is the major source of water in the region, has lead to desiccation and increased salinity of the Aral Sea. The emergence in 1991 of the five independent Central Asian States in the Sea basin led the formerly unified system of water management to fragment, causing numerous disputes between Kazakhstan and its upper-stream countries, Uzbekistan, Tajikistan and Kyrgyzstan. Due to chronic underinvestment in the water sector in the 1990s—resulting from on-going economic decline—the condition of the water system considerably deteriorated. Up to 45% of irrigation water is assessed to have been lost due to depreciated canals.[1] The dissolution in 1996 of the collective farms and the formation of private farms left the water system largely neglected.

The overall scarcity of water in Central Asia presents a dilemma in itself; however, the management deficiencies both within the country and regionally exacerbate the situation even further. Though river basin management (that is, when a river is considered to be one unit regardless of its path through multiple states, provinces or districts) is officially proclaimed to be the underlying principle of water management in Kazakhstan, it is rarely observed in practice. Current irrigation management transfer processes are somewhat hectic and incoherent. State water management institutions are endowed with both controlling and regulatory functions on the one hand, and water delivery service functions on the other, thus causing conflicts of interests. Moreover, the governmental institutions responsible for water management have thus far failed to develop a coherent policy for addressing the above mentioned issues.

The lack or misdistribution of water for irrigation primarily affects farmers, as well as the crop processing industry and the consumers of agricultural production. Even more detrimental consequences are brought about by poor quality of drinking water which impacts the population at large. The continuing overuse of water further deteriorates the condition of the Aral Sea, resulting in one of the most appalling man-made environmental disasters in history. Undeniably, environmental degradation is detrimental to future generations inhabiting the area.

Water management involves stakeholders at different levels. At the international level, the Interstate Commission for Water Coordination holds the primary position. Nationally, the Committee for Water Resources (which has recently been transferred from the Ministry of Natural Resources and Environmental Protection to the Ministry of Agriculture) dominates. Republican State Enterprises and Basin Water Authorities (BWAs), the territorial and basin units within the Committee for Water Resources, as well as local *akimats* (executive bodies) and *maslikhats* (legislative bodies) are significant players at the province level. The district level involves Administrations of Water Structures (AWS) and district akimats; as well as Water Users' Organizations (WUOs) and individual farmers.

There are several problems associated with water management in South Kazakhstan, ranging from economic to social and from domestic to international. The major difficulties indicated unanimously by experts include: pollution and overuse of water resulting from supply-driven water consumption and the lack of crop rotation; lack of coordination among relevant governmental bodies leading to mismanagement and conflicts of interest between the BWAs and Republican State Enterprises; weakening of WUOs; lack of investment into irrigation sector; and finally, poor cooperation with upstream countries.

This paper contends that the Government of Kazakhstan should implement a comprehensive reform program in irrigation water management. The irrigation management transfer should consist of such components as legislative reform, redistributing responsibilities among state water management bodies, and empowering farmers and WUOs. While technical upgrades present an important task for increasing water productivity, the focus should be shifted to institutional rather than technological solutions.

The focus of the paper is limited to irrigation as the main consumer of surface water; though the importance of safe drinking water is fully recognized, its discussion is not within the scope of current study. State policies relating to irrigation management are country-wide; a case study of the Makhtaaral district of the South Kazakhstan province was selected in order to demonstrate practical application of these policies. This is the southernmost district of Kazakhstan, dependent on upstream countries for its water supply, with cotton serving as the predominant crop. Thus, it reveals in a concentrated form the water management problems of the entire country.

In the course of the study, more than 40 interviews were conducted in Astana, Almaty, Shymkent, Zhetysai and Tashkent. The interviewees included representatives of the Committee for Water Resources; its province and district affiliations; province and district akimats; interregional organizations; farmers and members of Water User Organizations; international organizations; and non-governmental organizations and journalists. Semi-structured interviews were employed, as well as previous research performed by international organizations, government reports, and analyses of the portrayals of the issue in the media.

## 2. WATER IN KAZAKHSTAN: A VICTIM OF GEOGRAPHY OR GOVERNANCE?

### 2.1 Background Situation

Surface water resources of Kazakhstan comprise on average 100.5 $km^3$ per year, out of which only 56.5 $km^3$ (57%) originates on Kazakh territory. The largest basin area is that of the Syrdarya river; others include the Ural and Irtysh rivers, Lake Balkhash, as well as a multitude of smaller rivers and lakes in Central and North Kazakhstan.

Kazakhstan's relative diversity of available water resources allows for favorable conditions when compared to other Central Asian counterparts, which depend largely on the waters of the Syrdarya and Amudarya rivers. In Kazakhstan however, southern areas also depend heavily on Syrdarya resources. Around 2.5 million people (17% of the country's population) live in

the Kazakh part of the Syrdarya basin, 1998.6 and 601.2 thousand people in South Kazakhstan and Kyzylorda provinces respectively.[2] This makes the area a very important factor to the country politically and economically.

Compared to the Amudarya, the Syrdarya ranks second in volume but first in length. It stretches over 2337 km, out of which 2219 km flows through the territory of Kazakhstan; the basin area on Kazakh territory is 219,000 km$^3$. Though the majority of the Syrdarya flow exists outside Kazakhstan, a number of its tributaries are formed within its territory, such as Arys, Keles, and Kuruk-Keles.

It is important to note that the basin areas of the Syrdarya and Amudarya have been cultivated for centuries, but the ecological balance has been preserved by the use of traditional cultivation techniques. The roots of the current shortage date back to the 1960s, when extensive land reclamation campaigns began in Central Asia. A complex water system was constructed in order to divert waters from the Amudarya and Syrdarya to enlarged irrigated areas for cultivation. The project was established with the hope to ensure the food self-sufficiency of the rapidly growing Central Asian republics and, moreover, to provide the entire Soviet Union with rice and cotton.

For the past 40 years, the rivers' flow to the Aral Sea has drastically decreased, from 67,000 km$^2$ to 30,000 square kilometers. The sea level, meanwhile, has dropped by 16 meters. From 1974 to 1986, the Syrdarya never reached the Sea at all. In fact, the Sea has now split into two smaller lakes—the Northern Aral (fed by Syrdarya) and the Larger Southern Aral (fed by Amudarya).

In 1960, Kazakhstan was consuming 9750 million m$^3$ of the Syrdarya's volume, out of which 9495 million m$^3$ was used for irrigation. These figures continued to rise through the 1970s (12,850 and 12,275 respectively) and 1980s (14,200 and 12,830 respectively), but decreased somewhat in 1990 (11,320 and 10,136 respectively). This can be attributed, in part, to the economic crisis following the disintegration of the Soviet Union that adversely affected agriculture. The overall water intake in 1999 was 8235 million cubic meters, out of which 7959 million m$^3$ were used for irrigation.[3]

At present, the total intake of water resources in the Syrdarya basin reaches 130–150% through repeated use of the drainage water.[4] Due to large volumes of sewage water from both agricultural and industrial production, the amount pollution contaminating the river has rose dramatically; mineralization now reaches up to 1.7–2.5 grams per liter. The deficit of water resources in the Syrdarya's lower areas hovers around 1.2-3.5 cubic kilometers per year. Ulitmately, the surface resources of the Syrdarya been nearly completely exhausted.

For the past 20 years, pasturelands in South Kazakhstan and Kzylorda provinces have decreased from 45 million ha to 41.5 million hectares. Erosion affects around eight mln ha of agricultural land, while desertification has destroyed over two mln hectares. In the Kyzylorda province alone, 104,000 ha of 278,000 ha of irrigated land—approximately 37%—cannot be used, either because of the high salinity level, or due to deficiencies in the drainage system.

The Syrdarya river is regulated through the Naryn-Syrdarya Reservoir Cascade, which incorporates five major reservoirs: Toktogul (Kyrgyzstan), Charvak (Uzbekistan), Andijan (Uzbekistan), Kairakum (Tajikistan) and Shardara (Kazakhstan). The total volume of these reservoirs adds to 24.1 cubic kilometers; the volume of the Shardara reservoir alone amounts to 4.2 cubic kilometers. Most of these reservoirs were constructed more than 25 years ago (for example, the Shardara reservoir was built in 1965) and their operational volume has decreased due to silting. Many of the reservoirs operate a hydropower station which further affects the annual water discharge schedule.

Though not a focus of this study, it is important to mention the role of the Toktogul reservoir and hydropower station. In the past decade, issues surrounding Toktogul have sparked fiery disputes among the riparian countries. The reservoir started functioning in 1988, initially meant to facilitate irrigation by accumulating water in high-water years and compensating for deficit in low-water years. Hydropower was generated when water was needed for irrigation or when it could be stored in a downstream reservoir. However, in 1992, the Toktogul reservoir was switched to an energy regime, producing electric power for both domestic consumption in Kyrgyzstan and for export to other countries. As a result, more water passes in winter months, thus flooding downstream areas in Uzbekistan and Kazakhstan. The average annual discharge of the Syrdarya water from the Shardara reservoir into

the Arnasai depression (a swamped area on the Uzbek territory) is approximately four cubic kilometers. Because of this, the volume of water reaching the lower parts of Syrdarya has decreased from ten $km^3$ in 1994 to 5.4 $km^3$ in 2000. Moreover, this has significantly depleted the amount of water available for irrigation in the vegetation season, July and August.

This predicament of winter floods and summer droughts exacerbates the existing problems. Meanwhile, it is also perilous in that it offers an "easy way out" by attributing all problems related to water management to external factors. Many domestic shortcomings are thus overlooked.

## 2.2 Imperatives for Reform

The principles of the current water management system have been inherited by the Central Asian states from the Soviet command economy; water supply norms have been driven by the demand considerations with no regard for environmental implications. In the previous system, water was available for free resulting in mass overuse.

The issue began to attract public attention in the 1980s, when the disastrous effects of the Aral Sea situation on the environment, economy, and public health came to light. However, it was only in 1987 that the first attempt was made to introduce a more integrated approach to managing the water resources of the area: BWAs were established for both the Syrdarya and Amudarya rivers.

The issue also became of immediate concern to the governments of the newly independent Central Asian states. In February 1992, within a few months of independence, the heads of Kazakhstan, Kyrgyzstan, Uzbekistan, Tajikistan and Turkmenistan created the Interstate Commission for Water Coordination (ICWC) which was intended to serve as the forum for coordinating water management among the countries and resolving conflicting interests within the region.

Transition to market economy and the ensuing economic crisis also fostered change. As the Asian Development Bank affirms, "In Kazakhstan, concepts such as: i) water pricing; ii) water user fees; iii) financially viable irrigation investment; iv) recovery of investment cost; and v) the transfer of irrigation system management to farmer organizations have all become, at least in principle, part of the evolving water management regime."[5]

Because no centralized authority to make decisions on water allocation existed after the disintegration of the Soviet Union, competition between downstream and upstream countries increased. The creation of the ICWC has advanced little in addressing the issue; the agreements on water allocation in the past decade tend to be bilateral rather than multilateral, concluded on a yearly basis rather than long-term, and often fail to be implemented by one or more sides. Moreover, as exemplified by the Toktogul reservoir case, competition has also increased among different sectors within national economies, particularly energy (hydropower) and irrigated agriculture.

Finally, one of the elements central to economic reform was the privatization of land in 1996, whereby large collective farms were divided into a multitude of small- and medium-size private farms. In turn, a considerable proportion of secondary level (inter-farm) canals remained unattended.

## 2.3 Transition Steps in the 1990s

In Kazakhstan, the agricultural sector is the main consumer of water, using up to 80% of the country's overall water volume. In South Kazakhstan, this proportion increases to 90%.[6]

In March 1992, the Government introduced a system of water pricing. In 1997, tariffs were introduced to specify charges for different sub-sectors in each river basin. Since that time, irrigation water users in the Aralo-Syrdarya Basin Water Authority are charged 3.02 tyin (0.0002 USD) per cubic meter; the cost has not changed for the past five years. The present water tariff comprises only five to eight percent of crop production costs. Upon confirmation of water volume used, which is provided by the BWA, the water user makes monthly payments to local fiscal authorities.

However, the overall water price payable by farmers augmented by the addition of service charges from the AWS and WUOs. AWS tariffs are subject to approval by the State Anti-monopoly Committee. Tariff levels are based upon evidence of actual and agreed-upon depreciation costs. Therefore, they reflect the minimal level of actual maintenance expenditure by the Administration.

*Table 1.*
Water Tariff Collection in 2000–2001,
South Kazakhstan Province [Thousand USD]

| | 2000 | 2001 |
|---|---|---|
| Cost of services provided | 11,521.84 | 9,937.76 |
| Amount collected | 9,395.85 | 7,775.09 |
| Percentage | 82% | 79% |
| Average tariff per 1,000 $m^3$ | 0.69 | 0.73 |

*Source:* Yugvodkhoz

According to the Water Code, the tariff is to be spent on reconstruction, construction and maintenance of water management structures. Yet the low collection rates prevent the completion of these activities on an adequate level.

Ultimately, the water tariff does not adequately reflect the real value of water supply and management. Though water charges have been introduced as a matter of principle in the reform process, thus far they have failed to serve as a legitimate incentive for saving water.

## 2.4 Current Legal Framework

Water management is regulated by a number of laws, decrees and resolutions. The current Water Code was adopted in May 1993 and amended twice, in December 1996 and May 1999. Article 4 of the Code affirms that all water in the Republic is State property; the uses of water by natural and legal persons are affected on a contractual basis.

The Code describes management principles and responsibilities with regard to water management. Article 6.1 maintains that "water management is based on a combination of basin water and administrative-territorial principles, providing for conservation and regeneration of water resources, optimal water management conditions and preservation of environmental sustainability."

This piece of legislation, however, arouses a great deal criticism in that it fails to adequately reflect the needs of the sector. Proposals for a new Water Code were proposed in 2002, when the first draft was developed by the Kazgiprovodkhoz research institute. Currently, the country is obliged to amend the code; Kazakhstan signed the Helsinki Convention on the Protection and Use of Transboundary Watercourses and International Lakes in 2001, and in turn is bound bring its national legislation up to the stipulated standards. The need for a new Code has furthermore been reflected by the Government in its proposal for the Development of the Water Sector of Economy of the Republic of Kazakhstan till the year 2010 (adopted January 21, 2002) and by the Agriculture and Food Program for 2003–2005 (adopted June 5, 2002).

Other relevant documents shaping the legal framework for water management include: the Law on Farms of March 31, 1998 (amended December 2001); the Law on Rural Consumer Cooperation of July 21, 1999; and the Decree of June 25, 1996 "On Distribution of Functions between the BWAs and Province Committees of the Committee for Water Resources of the Republic of Kazakhstan".

The Agriculture and Food Program aims to ensure food security in the country through the development of an efficient agro-industrial complex with competitive products. The following objectives are included:

- to ensure the food security of the country;
- to establish an efficient agro-industrial system;
- to increase sales of farm products and processed farm products in both domestic and foreign markets; and
- to optimize the state support to the agricultural production.

The Program envisages increased state support to farmers and irrigation water users; moreover, it commits an additional 24.5 billin tenge (160 million USD) to the agricultural sector, thereby doubling current expenditures (1.8% of the GDP).

## 2.5 Current Institutional Makeup

The Committee of Water Resources, the main body dealing with water management issues, has an overall responsibility to develop policies and plans for the national water resources. The responsibilities of the Committee were originally held by the Soviet Ministry

of Water Resources, which was subsequently transformed into the State Committee for Water Resources under the Cabinet of the Republic of Kazakhstan after independence, and later to the Committee for Water Resources within the Ministry for Natural Resources and Environmental Protection. In 1997, the Committee was transferred to the Ministry of Agriculture, which aimed at raising the profile of the irrigation water consumption. However, having failed to address the water issue comprehensively, it was moved back to the Ministry for Natural Resources and Environmental Protection in early 2000, then moved to its present position, again with the Ministry of Agriculture, in August 2002. This current status encourages more attention to be focused on irrigation issues (as part of the overall process of agricultural production), but simultaneously risks overlooking the complexity of managing different types of water sources—and in different sectors or industries.

The river basin offices of the Committee for Water Resources are Basin Water Authorities. According to the 1993 Water Code, BWAs are the primary water management agencies in Kazakhstan. The 1996 Decree on the Differentiation of Functions between Basin Water Authorities and Province Water Resource Committees stipulates that the former are responsible, among other things, for: water resource management based on the basin-territorial principle; State control over the water consumption and conservation; issuing permits for special water use; controlling inter-state and inter-province water reservoirs; overseeing water quality and pollution levels; and managing State metering of water consumption. The province Water Resource Committees are responsible for: dispatcher and executive regulation of the water system units (in coordination with BWAs); operation of the water system units; primary metering of water use; maintenance and improvement of technical infrastructure conditions and related activities; and prevention of and reconstruction after the emergencies.

This distribution of responsibilities is, however, not reflected in reality. Territorial units have been transferred to the Republican State Enterprises. In turn, they function on a self-financing basis, competing for government funds to maintain their primary systems. The basin units, meanwhile, have yet to be managed on a budgetary basis. For the last several years they have been considerably under-funded, due to the financial constraints resulting from the economic crisis of the 1990s. Thus, they have weakened dramatically and are now largely incapable of fulfilling their functions. A paradoxical situation ensues, as the executive/technical body possesses more technical and human capacity than the actual controlling body. This results in a conflict of interest between the territorial and basin authorities, whereby the management/control body is unable to fulfill its functions.

At the district level, some Administrations of Water Structures have been absorbed by local administrations. In the South Kazakhstan province, five of the nine district administrations have been transferred to local akimats, receiving up to 80% of their funding. AWS is the custodian of secondary irrigation systems.

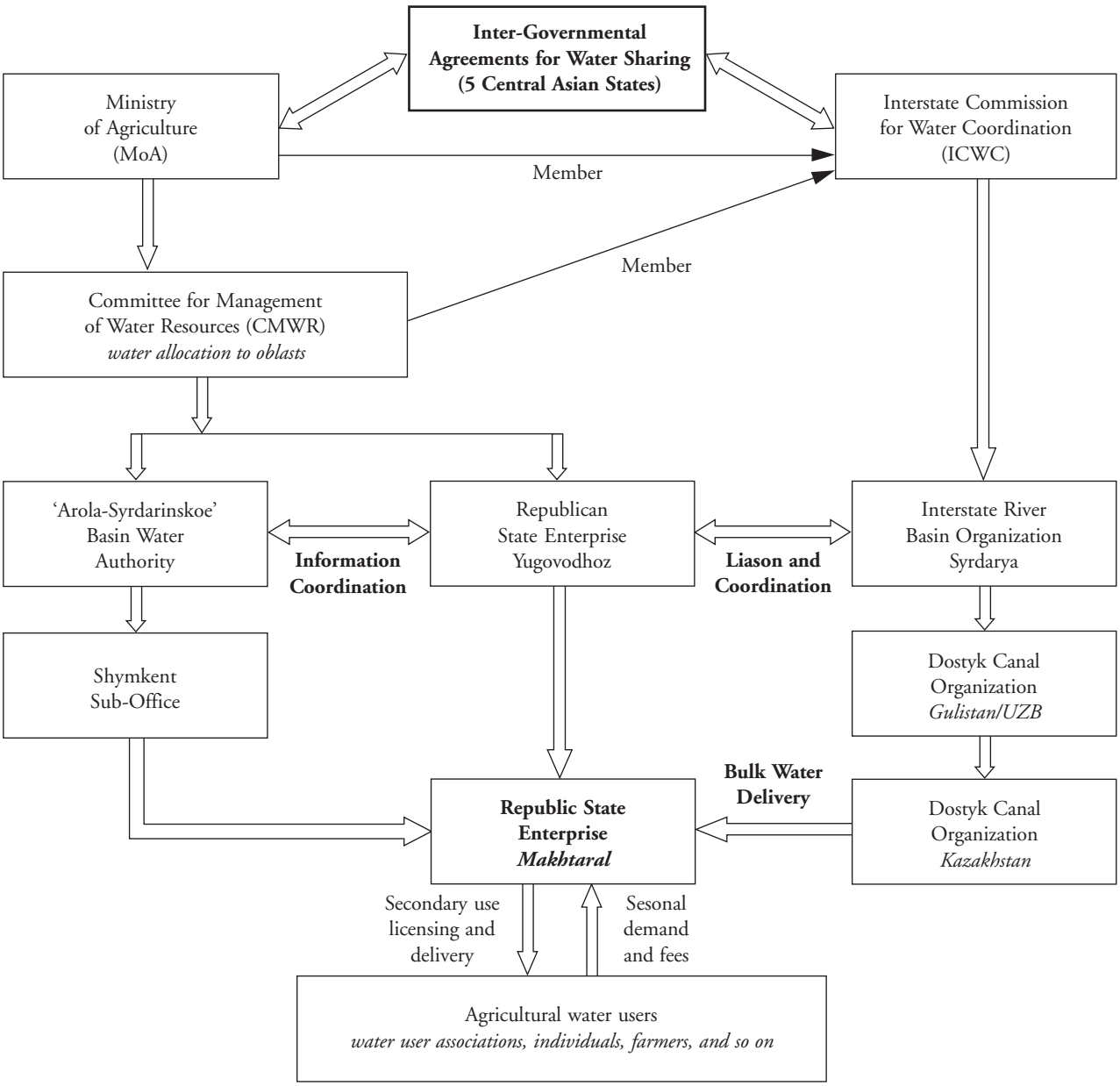
The lack of transparency of the local akimat operations makes this arrangement particularly uncontrollable. Cases have been reported when local akims (governors) withdraw the secondary irrigation system from the State cadastre, thus enabling their sale to private entrepreneurs.

## 2.6 Water Management at the Local Level

The Makhtaaral AWS (based in Zhetysai, capital of the Makhtaaral district) is a branch office of the Republican State Enterprise Yugvodkhoz. It possesses overall executive responsibilities for the operation and management of all irrigation and drainage infrastructure registered on its cadastre. These include the secondary (former inter-farm) canals of the irrigation system. Currently, the government does not provide funds for the operation of AWS. As such, it must support itself financially through the provision of services to water users.

In the Makhtaaral district in particular, the situation is complicated by its dependency on interstate watercourses. The major source of irrigation water is the Dostyk canal, which diverts water from the Syrdarya at the Farkhadski hydro-unit in Uzbekistan. In total, it flows 79 km on Uzbek territory and then 49 km more on Kazakh territory. The Dostyk Canal Organization, with headquarters in Gulistan, Uzbekistan, possesses overall managerial responsibilities for the operation and management of the canal along its entire length. This creates a complex interdependency structure reflected in the chart below.

*Figure 1.*
Institutional Linkages for Water and Irrigation Management in South Kazakhstan, as of September 2002




*Source*: ADB 2001, adapted.

## 2.7 Water user organizations

On-farm system operation and maintenance is now the individual responsibility of each farm. Previously, it was generally organized on a brigade basis under the direction of a hydraulic technician, who worked in close collaboration with other members of his or her brigade technical team. Operation and maintenance funds were provided by the State. Because these funds are no longer available after the privatization of farms in 1996, maintenance of the relevant facilities has been largely neglected.

Many of the privatized farms, however, have basically retained their original management structure and continued basic operations—including irrigation practices. Such operations are performed according to given rotation programs, using accumulated experience and expertise. Some privatized farms comprise of a number of small units. Where restructuring has involved the creation of such small groups or small independent units, the members who leave the larger unit are generally allocated land at the end of a watercourse. This inevitably marginalizes them from the larger unit, thus limiting their access to services and subjecting them to decisions and actions taken upstream. Such farms would benefit from the establishment of a Water Users' Organization which could serve the purpose of providing an institutional bond between all water users, transcending the remnants of the previous management structure, and allowing for continuity in the case of further restructuring.

The establishment of the first WUOs in the South Kazakhstan province dates back to 1993. Presently, there are 82 organizations in the province; the Makhtaaral district houses 64 of these. The extensive development of WUOs in Makhtaaral can be attributed to the district's large number of international donor projects, such as the World Bank Irrigation and Drainage Improvement Project (1996–2003) and the Asian Development Bank Water Resources Management and Land Improvement Project (1999–2004).

However, in many cases, authorities have essentially enforced the establishment of WUOs; evidence points that several Organization chairmen were actually appointed by local akims, or that elections were rigged. Certainly, this reflects the salience of Soviet practices, whereby free competition was imitated, but not actually pursued. In turn, not only are the democratic principles of the Organizations undermined, but also these practices have contributed to farmers' rather wary attitude toward new institutions. A rather frequent opinion among farmers thus far holds that WUOs are just another structure to extort money from the populace.

Similar to the tensions between farmers and Organization chairmen, several clashes have been reported between the downstream and upstream landowners, regarding, in particular, the timeliness and quality of water delivery. Luckily, these clashes have never reached a violent level, and have yet to warrant any formal reaction on behalf of authorities.

In regions lacking the relevant support of international programs or agencies, WUOs appear unable to perform their functions independently. As a result, other mechanisms are sought to address water repayment. For example, in the Shardara district of the South Kazakhstan province, local Organizations initially succeeded in allocating water to water users; however, tariff collection ratio was low. The Kyzylkum AWS which managed the local irrigation system preferred to collect money from individual farmers, yet this tactic proved cumbersome. Later, AWS began concluding agreements with local ginneries on pre-paying for water at the cost of the cotton yield. Ultimately, the Organizations disintegrated or became redundant. This current arrangement, however, fails to address the issues of technical maintenance and reconstruction of the irrigation infrastructure. WUOs remain the structure capable of addressing the widest spectrum of problems.

One of the major factors impeding the development of WUOs is the general absence of adequate legislation. The Water Users' Organization Law has yet to be adopted (though it has advanced through a number of parliamentary hearings); meanwhile, the term "association" as described in the Law on Not-for-profit Organizations can actually be applied to a group of WUOs and thus is not entirely relevant. To date, the Organizations have been registering as Rural Consumer Cooperatives of Water Users or Limited Partnerships. Cases have been reported of farmers mandating a colleague to deal with water issues, without registration as a legal entity.

Following land reforms, farmers lost their sense of organization and cohesion; attempts at coordinating efforts are immediately endowed with additional content. In some cases, WUOs have taken on non-traditional or atypical functions with respect to their professional background, working in machinery repair services, negotiating on behalf of other farmers with the ginneries, or purchasing seeds.

Overall, the absence of a comprehensive and well-funded State program impedes the development of WUOs. Farmers and local offices of the Committee for Water Resources alike complain about the Ministry of Agriculture's remarkable lack of involvement in developing the Organizations.

*Figure 2.*
Kazakhstan


## 2.8 Weaknesses of Current Water Management Arrangements

The current distribution of responsibilities for water management has been identified with weaknesses at virtually every level, from national agencies to local WUOs.

The Committee for Water Resources under the Ministry of Agriculture is responsible for overall policy formulation. However, it represents only one of several subcommittees of the Ministry, and stands relatively low in the Government hierarchy. Moreover, its affiliation with the Ministry of Agriculture essentially ignores other types of water and water uses (ground water, industrial water, and so on), thereby reducing prospects for the development of an integrated management scheme. As well, secondary canal ownership within a State agency or WUO is not secure.

At the basin level, BWAs are responsible for water allocation and overall basin management. However, financial constraints and conflicts within and among

territorial units prevent hinder the fulfillment of such tasks. The situation is further exacerbated by the duplication of functions between BWAs and Republican State Enterprises. As such, at the province level, Republican State Enterprises are not accountable to the very water users who provide most of their funding. This partly explains the high institutional costs of operational management of irrigation systems. By filling the gap resulting from the financial deficiencies of BWAs, the Republican State Enterprises have acquired regulatory authority over water users. Conflicts of interest with respect to service provision and need thus ensue.

Water Users' Organizations serve as the bodies responsible for delivering water to members. Characteristically, they fail to perform this function due to lack of technical, financial and management support. They are further weakened by the wary participation of and lack of trust among the farmers.

## 3. POLICY OPTIONS

### 3.1 Challenges in Policy Formulation

The Helsinki Convention on the Protection and Use of Transboundary Watercourses and International Lakes stipulates that one of the main principles behind any policy formulation should include the preservation of water resources for future generations (article 5c). Having ratified the Convention, Kazakhstan is obliged to establish a clear, long-term vision of the management and conservation of its water resources.

While there is a general agreement that short-term technical solutions are insufficient, the present program for institutional reform is multifaceted and complex. It involves political, legislative, economic, social as well as educational measures. The political measures (on national and interstate levels) include drafting of interstate agreements, as well as pursuing overall democratic reform and increasing the transparency of State structures. Legislative measures involve the adoption of legislation to regulate rights to and ownership of land, water, and irrigation infrastructure, with clear explanations of the responsibilities of each stakeholder and possible sanctions in case of violation—as well as implementation mechanisms. Proposed economic reforms, in turn, must amend water pricing mechanisms, agricultural produce price regulation, subsidies and loans, and bonuses through grants and prizes. As agriculture represents the main consumer of water, farmers need to be financially stable in order to pay for what they use. As such, economic incentives must be designed to encourage farmers to invest in land fertility and sustainable water use. Educational incentives should therefore focus on awareness-raising efforts and providing access to information for all stakeholders.

Together, this package of measures and reforms presents a multi-part challenge that requires a balanced and comprehensive approach. For example, changes aimed at market reforms (such as water pricing) must consider the financial burden on farmers, who are otherwise unable to bear the cost of the water they use—at least at the current stage. Rehabilitation investment is crucial for the adequate functioning of the infrastructure, but technical advancement must be supported by administrative measures. Relations with upstream countries regarding the water allocations also must be stabilized, in addition to domestic policies.

### 3.2 Better Technology?

Technical solutions, in terms of both agricultural technology and water infrastructure, aim at improving the productive and resourceful—or efficient—use of water, without affecting the institutional makeup of water management. While it is important to maintain satisfactory conditions with respect to infrastructure, measures such as the construction of new reservoirs and canals and the diversion of water is simply inappropriate at this stage, economically. Yet such measures continue to remain high on the national agenda.

One project which was recently proposed as a means of overcoming existing water shortages involves the construction of a pump station for automated water delivery from the Shardara reservoir to the Dostyk canal. This would ultimately make the water supply of the Makhtaaral district less dependent on the upstream allocations in Uzbekistan. This project has not been approved for government funding at present, neither has it been out-rightly rejected.

Another recent suggestion concerns the construction of the Koksarai reservoir and hydropower station on the Syrdarya river beyond the Shardara reservoir, in order to avoid discharges to the Arnasai depression.

The major justification for this project refers to anticipated disruptions of the water supply from Kyrgyzstan and Uzbekistan—thus the need to secure additional water storage. The payoffs of the reservoir would depend on development of a fishery and hydropower station; the reservoir would be able increase the area of irrigated land only slightly (by ten thousand hectares). This project was recently abandoned due to its negative environmental impact and low economic expediency. While the pessimistic predictions of project protagonists often come true (the Shardara, for example, once again hit a critical level in winter 2003), it is unlikely that the project will be implemented in the foreseeable future.

With respect to enhancing agriculture, there have been several cases concerning the installment of advanced irrigation equipment without an area-specific feasibility study or training opportunities for local farmers. Inevitably, the equipment is later abandoned, as farmers either have no personal interest in or understanding of proper maintenance.

Regardless, such technical approaches retain their attractiveness. As Altyev (2002) contends, "the most successful of the international aid projects [in the region] have been those targeted at 'technical' aid, in particular the development of the regional hydrometeorological services and automation of the reclamation systems."

Moreover, the need for rehabilitating or upgrading equipment can be argued in terms of ecological interest. According to Duhovny (2002), "…land productivity can be increased by 1.7 times and water productivity by 2.5 times without any major investment, through the strict adherence to the technology."

One particularly successful innovation involves the selection of new cotton grades in the Makhtaaral testing station. These brands are reported to be less water-consuming and more productive. According to the South Kazakhstan news site of September 9, 2002, in 2003 the new brand is expected be planted on 80 thousand ha in the Makhtaaral district (65% of the irrigated area).

Undoubtedly, rehabilitation and restoration of irrigation infrastructure comprise important aspects of water reform, but if implemented alone they prove to be either incomplete or temporary fixes to a larger problem. Meanwhile, simple technological solutions remain perhaps too attractive—as the recurrent project of transferring water from Siberian rivers to Central Asia indicates. All measures must be balanced appropriately, considering both environmental impacts and political consequences.

## 3.3 New Legislation

Legislative reform should be of the highest priority for the Kazakh government. Lack of adequate legislation impedes the implementation of irrigation management transfer and other relevant policies.

The new Water Code received significant input and support from the recently adopted Agriculture and Food Program. Developed by the Kazgiprovodkhoz research institute in 2002, the Code attempts to bring domestic water legislation in compliance with the Helsinki Convention on the Protection and Use of Transboundary Watercourses and International Lakes (1992), ratified by Kazakhstan in January 2001. Additionally, the Code aims at clarifying the issues of irrigation infrastructure ownership and the distribution of responsibilities among various governmental bodies. The draft code has been submitted to Parliament in December 2002 and is scheduled for adoption in spring or early summer of 2003.

The Draft Code consists of a number of notable modifications, particularly when compared to the previous Water Code of 1993. It introduces several new concepts regarding the ownership and management of water infrastructure, such as water inspectors, hydroameliorative condominiums, basin councils and water servitude.

One innovation concerns the position of state inspector. The deputy head of the Committee for Water Resources serves as the principal state inspector for water consumption and preservation; along with the deputy principal state inspector, senior state inspectors and state inspectors represent heads and specialists of the relevant departments of the Committee and its territorial and basin units.

While this arrangement gives inspectors considerable control over water resources, it has two substantial drawbacks: first, it does not clearly differentiate between the executive and controlling functions of the Committee and its officials; and second, it further exacerbates the conflict of interest between the Committee territorial and basin units and the Republican State Enterprises and BWAs.

Hydro-ameliorative condominiums are defined as "a special form of ownership whereby lands are in private ownership of natural and artificial persons, and water infrastructure (hydro-ameliorative structure) belongs to them as a communal share property."[7] This concept lays the groundwork for the adoption of the Law on Water Users' Organizations.

The Basin Council is an advisory and consultative body lead by a corresponding head of the Basin Authority, but possesses no control or administrative powers. As such, it remains doubtful that this body, left unchanged, will encourage any substantial reforms.

Another concept introduced in the Code is water servitude—that is, the right to limited exploitation of a water unit. A differentiation between public and private types of servitude is envisaged, with the latter involving (unlicensed) water intake without technical equipment, watering places, and waterways. Land servitude is established for land tenants and owners surrounding the water unit. In principle, the water servitude concept might allow clarifying infrastructure ownership issues; however, further elaboration is needed.

Apart from the Water Code, the second most important legislative document to be adopted is the Law on Water Users' Organizations. The Asian Development Bank prepared a draft law in 2000 in the framework of its project on Water Resources Management and Land Improvement; however, the adoption of the law to coincide with the new Water Code. Currently, it is visualized as a draft "On Rural Consumer Cooperative of Water Users" (2002). There is a danger that its adoption will be postponed again, seriously impeding the development of Water Users' Organizations.

## 3.4 Government Reform

The Committee for Water Resources, the principal governmental body responsible for water management, has endured a turbulent history since its establishment, characterized by numerous shifts in its management (from the Ministry of Agriculture to the Ministry of Natural Resources). These changes signify attempts to balance a comprehensive approach to water issues with an interest in giving sufficient attention to irrigation—as agriculture represents the major consumer of water.

A number of experts have proposed raising the status of the Committee for Water Resources from a subcommittee to that of a State Agency.[8] It was envisaged that as an Agency, it would be able to combine all water issue. Furthermore, its elevated status might promote productive negotiations on water management among member countries of the ICWC.

However, recent government decrees have slighted this possibility. In August 2002, the Committee for Water Resources was transferred back to the Ministry of Agriculture. Whereas this decision will undoubtedly increase the profile of irrigation in the Committee, previous experience casts doubts on whether the Ministry will manage to address water issues comprehensively.

Within the Committee for Water Resources, one of the most urgent challenges is the above-mentioned differentiation of functions between territorial and basin units at the province level. Any reform should clearly state the rights and responsibilities of the territorial water management units at the district level and the Water User Associations with respect to maintenance functions.

## 3.5 Economic Incentives

The severe economic crisis following the collapse of the Soviet Union pronouncedly affected the water sector. At present, market reforms conflict with the inherited state-dependent structure of the agricultural sector. Meanwhile, on-going disagreements among owners of the irrigation structure further impede the introduction of market economic relations. However, water management reform is linked not only to issues of ownership rights, but also to the development of a credit system and the overall investment climate.

Economic incentives, such as charging a water tariff, comprise important market mechanisms. Water pricing was introduced in 1997, but the low tariffs have been largely subsidized by the State; farmers, who are among the most vulnerable in society, are clearly unable to bear the full cost of the water.

The State Agriculture and Food Program (adopted in June 2002) outlines the development of the agro-industrial complex in Kazakhstan from 2003 to 2005. As agriculture is the main consumer of water in Kazakhstan, the Program involves important implications for the water management sector. Table 2. represents the funding allocations to water management sector in 2003–05.

The Agriculture and Food Program stipulates that subsidies will be offered until at least 2005—that is,

for the entirety of its duration. While the intention of the Program is to secure farmers' economic viability and survival, the economic incentive for rational water management appear somewhat lacking. As Muhametjanov *et al.* (2002) offer, "the main hindrance to competition (market relations) in the water sector is the contradiction among the owners of the irrigation structure, who would want to charge maximum fee for their services, and the water network users who are interested in the minimization of their costs." The Agriculture and Food Program seems to avoid rather than address this issue.

## 3.6 Education, Information and Transparency

Public access to information on transboundary waters comprises an important component of the Helsinki Convention on the Protection and Use of Transboundary Watercourses and International Lakes. Information that should be made available includes water-quality objectives, required permits and conditions, results of water and effluent sampling tests performed for monitoring and assessment purposes, and follow-up reports on compliance with objectives or conditions (Article 16).

Another important aspect involves establishing monitoring councils, consisting of respectable public figures at major water organizations, to address public opinion and participation. Presently, this function is not clearly structured; significant gaps are apparent. The Basin Councils that are envisaged in the draft Water Code could, in principle, take up this role, but their functions are not clearly defined.

Education holds plays a vital role on the agenda, yet currently it is somewhat overlooked. Farmers' attitude to Water Management Organizations is still rather wary; in turn, practical seminars could serve to provide information on the benefits of joint management of water systems. Such seminars have thus far been organized in the framework of international projects. The Asian Development Bank, for example, incorporated education into its Water Resources Management and Land Improvement project. Here, the role of non-governmental organizations could prove indispensable in encouraging and assisting farmers to organize themselves.

# 4. CONCLUSIONS AND RECOMMENDATIONS

> *It is essential that the States work together and that each of them involves the people at the local level, using their traditional knowledge of the region and encouraging their participation in the reconstruction process.*
>
> *(Green Cross International 2000, p.80)*

Water scarcity presents a significant problem in Central Asia; the problem is exacerbated by ongoing difficulties in irrigation which largely stem from inconsistent water policies and institutions. These difficulties and inconsistencies hinder the efficacy of irrigation

*Table 2.*
Funding Allocated for Water Management in the Agriculture and Food Program [Thousand USD]

| Budget Program | 2003 | 2004 | 2005 |
|---|---|---|---|
| Subsidizing costs of supplying water to agricultural producers | 6747.6 | 7189.6 | 9803.9 |
| Rehabilitation of the most damaged sections of inter-farm canals and irrigation and drainage facilities | 1634.0 | 8169.9 | 9803.9 |
| Establishment of the 'Kazagromeliovodkhoz' methodological center (state enterprise) | 65.4 | 65.4 | 65.4 |
| Equipping the 'Kazagromeliovodkhoz' methodological center (state enterprise) | 15.9 | 7.7 | 6.5 |
| Loans | 19,886.9 | 13,594.1 | 6398.0 |
| **Total** | **28,349.8** | **29,026.7** | **26,077.7** |

*Source:* The State Agriculture and Food Program of the Republic of Kazakhstan for 2003–2005.

management transfer within Kazakhstan and weaken the country's position in interstate negotiations.

The establishment of an adequate legal framework is essential for the development of the water sector. As such, the new Water Code, as well as the Water User' Organization Law must be adopted as soon as possible. The new Code should clarify the issue of ownership of water systems—secondary level water systems in particular. It should also clearly describe the division of functions between service-providing and controlling bodies and account for their functioning. In amending its legislation, Kazakhstan should aim at full compliance with the Helsinki Convention on the Protection and Use of Transboundary Watercourses and International Lakes, which it adopted in 2001.

Institutional reform should incorporate the development of a comprehensive water management policy for the Committee for Water Resources, raising its profile and status, and clearly distributing responsibilities between river basin management authorities and territorial-administrative branches. The former should be granted full authority to control the water management systems, while the latter should limit these functions to operation and maintenance of the irrigation system.

In the past year, agriculture has been allocated leftover funding, due to the hardships of post-Soviet change. As major economic indicators improve, agriculture (irrigated agriculture, in particular) should be funded on a more consistent basis. Moreover, a central role in developing the agricultural sector belongs to private banks. Banks should be encouraged to invest provided there is a consistent government reform policy. However, state subsidies must be carefully leveraged against market imperatives in order to prepare farmers for financial independence in the future.

The provision of information is another key element in the irrigation management transfer strategy. WUOs are a new concept in the area, and lack relevant experience and information. Effective management requires democratic participation of all members. As such, training in managerial, financial and conflict resolution skills is important to establish WUOs as genuine bottom-up institutions. Non-governmental organizations can play a crucial role with regard to providing information and education for farmers.

Finally, accountability and transparency are critical to ensuring the implementation of reforms. In particular, media access and independence are important tools in attracting public attention to the process.

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## ENDNOTES

1 Karlyhanov, 2002.

2 Ryabtsev, 2002.

3 Kipshakbaev and Sokolov, 2002.

4 Kipshakbaev and Sokolov, 2002.

5 Asian Development Bank, 2001.

6 Karlyhanov, 2002.

7 Draft Water Code, 2002.

8 Asian Development Bank, 2001; Karlyhanov, 2002; Muhametjanov *et al.*, 2002.

# Index