

CHAPTER IV

LESSONS LEARNED FROM IWRM IMPLEMENTATION IN CENTRAL ASIA

4.1 Pilot Projects on IWRM Implementation

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Putting some of IWRM principles into practice in the water sector has been started even prior to the independence of Central Asian countries. Over a long time, this process was being implemented without the general strategy of adapting this approach to local conditions, spontaneously putting some IWRM elements and principles into practice at the regional level of water resources management.

One of the first steps was the establishment of two basin organizations as provided by the Resolution No 1088 of the Cabinet of Ministers of the USSR issued in 1987, as well as executing a number of other measures envisaged by this document. Establishing BWO “Amu Darya” and BWO “Syr Darya” was essentially the transition towards basin management (within hydro-geographical boundaries) at the inter-republican level (subsequently at the inter-state level); and organizational efforts of the former Ministry of Water Resources of the USSR have practically created the basis for such management and coordinating the sectoral interests of different republics (countries), as well as for developing mechanisms of water allocation and operational activity taking into consideration provisions of “the Schemes (Master-plans) for integrated water resources use” in both river basins.

Subsequently, after independence, specific steps were undertaken in the frame of other projects [9] under an umbrella of the ASBP-1 (the Aral Sea Basin Program). In particular, the EC WARMAP project has, in a large measure, contributed to first actions of preparing the IMS, measures for water saving at all levels of water management hierarchy, and developing the legal base for IWRM at the top level of basin management. The GEF WEAMP project has resulted in the Regional Water Strategy that has specified the strategic grounds for introducing IWRM in the region; and its Component A-2 has clearly demonstrated the opportunities for water saving (taking into account findings of the EC WARMAP project) [13]. Approaches to rehabilitating the ecological profiles in deltas of two major rivers in the region were developed in the frame of Component “Sudoche Lake Rehabilitation” and the WB projects for rehabilitating the lower reaches of the Syr Darya River.

The CIDA project implemented jointly by the McGill University and SIC ICWC, which allowed training more than 3000 water professionals in the frame of the advance course “Integrated Water Resources Management” held at the ICWC Training Center, has played a considerable role in the popularization of IWRM principles and adoption of their backgrounds by many decision-makers in the region.

The most significant step towards IWRM was made in the frame of the regional project “IWRM-Fergana” implemented by specialists representing the Departments of Water Resources of Kyrgyzstan, Tajikistan, and Uzbekistan under overall co-ordination of the SIC ICWC and IWMI and financial support of the Swiss Development Cooperation (SDC) [41]. This project is aimed at improving the effectiveness of water resources management by means of introducing the IWRM principles in the Fergana Valley. An overall project objective is *“to contribute to more secure livelihoods, increased environmental sustainability, and greater social harmony, and to support rural restructuring in Central Asian countries through the improved effectiveness of water resources management on example of the Fergana Valley”*

Selecting of the Fergana Valley as a pilot area for introducing IWRM methods is based on socio-economic conditions in this dense populated region where more than 11 million people 60% of which are rural population reside on the territory about two million hectares. It is possible to affirm with confidence that livelihood and living standard of the population depend on the use effectiveness of water resources which, in a large extent, are

transboundary waters, as well as the system of water management over the irrigated area of 1.2 million hectares.

From the beginning, the project was aimed at maximum participation of water users and water authorities in developing the conception of IWRM adaptation to regional conditions and in selecting the pilot areas. For this purpose, the preparatory project phase was established, during which teams from three countries and all provinces representing this region took participation in selecting pilot areas using the fundamentals and requirements prepared by the regional group. The principles mentioned in Chapter 1 were proposed as fundamentals and have been carefully reviewed, discussed, approved by participants of workshops for their use in project activity. Subsequently, representatives of all provinces have received the special forms in concordance with which they had to prepare data for two pilot areas in each province. At the same time, each pilot area essentially represents a chain consisting of three levels of an irrigation system including a main irrigation canal, the network of former inter-farm and on-farm canals, on the base of which WUAs can be organized, and the end users – farms.

Based on the analysis of proposed pilot areas, project participants have selected three pilot canals: the Aravan-Akbura Canal in Osh Province in Kyrgyzstan, Khodja-Bakirgan Canal in Soghd Province in Tajikistan, and South-Fergana Canal that crosses Andijan and Fergana provinces in Uzbekistan.

After five-year project activities the following practical outcomes can be noted:

The IWRM conceptual base taking into consideration hydro-geographical boundaries, participatory approach and democratic principles of water management were developed and submitted to national water authorities. The IWRM conception was coordinated and approved by all water authorities in Uzbekistan, Kyrgyzstan, and Tajikistan in May 2003 [41].

A comprehensive approach for social mobilization (awareness of IWRM principles) was developed [18]. A training program for social mobilization and capacity building at the levels of WUA and irrigation canal was prepared. Regular training seminars and sociological surveys established by the project provide new opportunities for involving all stakeholders in reforming the water sector in the Fergana Valley. Thanks to project efforts, new water users associations (the WUA “Akbarabad” in the command area of the South Fergana Canal in Uzbekistan, WUA “Kerme-Too-Akbursay” in the command area of the Aravan-Akbura Canal in Kyrgyzstan, and WUA “Obi-Zerafshan” in the command area of the Khodja-Bakirgan Canal in Tajikistan) were established. Earlier established WUA “Japalak” was also included as base WUA into the project sphere. Newly established WUAs were registered in compliance with national legislations; and in the beginning of 2003, WUAs’ boards have signed the agreements on joint management with relevant privileges. In addition, at the instance of the MAWR of Uzbekistan and Tajikistan, the project has organized some unplanned training seminars on the topic “How to establish WUAs through social mobilization” for district-level specialists. Based on the experience learnt from these WUAs during first three years, dissemination of the proved IWRM principles and regulations over all WUAs in the command areas of pilot canals through the network of training centers and on-job training, which was conducted by specially trained project facilitators (trainers) in each province, was started [26].

Apart from the training activity in the Central ICWC Training Center, the project has established the branch of head training center in Osh City. Personnel of the Osh Training Center were trained, and then were independently carrying out the training programs related to dissemination of the project experience. Subsequently, similar branches were established under the Provincial Basin Organizations in Andijan, Fergana, and Khodjent to extend coverage of WUAs personnel and farmers in these provinces. Since July 2002, planned (according to the project program) and unplanned training seminars for personnel of water management organizations, water users and NGOs representatives from Fergana Valley were being monthly conducted. At these training courses, the great attention was paid to dissemination of the IWRM ideology. The communication network that was based on e-mail system and linked all key project participants (the SIC ICWC – national departments – provincial water management organizations – pilot canal administration - WUAs) was developed. The project has established the Information Management System (consisting of a database, a set of mathematical models, and GIS), operating in the on-line regime, which is a powerful tool for planning, operational analysis, and improving the water allocation process and actual water distribution.

Alternative organizational structures for water management at the level of WUA and main irrigation canals were specified, discussed and coordinated by project partners and other stakeholders. Based on agreements achieved, water authorities of Uzbekistan, Tajikistan, and Kyrgyzstan created new departments – Canal Administrations. In December 2003, activity on involving water users into the

decision-making process related to water governance was initiated. As a result of these works, the Pilot Canal Water Users Unions were established and officially registered on all pilot canals; and the joint governance principle was put in practice: the agreements related to joint water governance were signed, and the Canal Water Committees consisting of representatives of superior state water management organization (WMO) and water users (CWUU) were created. An effectual factor of transition towards IWRM is participation of representatives of civil society in the governance process that is also legally fixed.

In the course of following works related to institutional reforms, the need in functioning intermediate agencies – a framework of basin water authorities and provincial water authorities should be specified yet. The first steps towards establishing procedures of water resources planning, record-keeping, reporting and monitoring at each level of new water management hierarchy were made. It is expected that activity will be implemented at all levels of the water hierarchy by means of establishing the Canal Water Committees.

Many technical aspects also depend on the public. It is not easy task to provide guaranteed and equitable water distribution over the irrigation system as a whole. When water is delivered in line with planned amounts and of necessary quality increase in productivity of water and land resources may be expected. Water users themselves should participate in more precise specifying of command areas for each irrigation canal, assessment their water demands, and accounting additional available water sources (ground water, return water). Adjusting water supply, rotation and use depending on weather and economic conditions, as well as improving hydraulic measurements and record-keeping at all levels of the water management system are also their functions. To tackle arising issues it is necessary to establish extension services that assist water users in the introduction of new technologies, advanced practice of planning and production, and solving water distribution problems. The project has developed and transferred for use “Model Regulations on Canal Water Committees”, as well as recommendations for their adaptation on each pilot canal [18].

Objectively realizing that the existing national legislations in the region are not perfect and cannot be the platform for supporting necessary reforms in the water sector, the project has prepared the recommendations on the package of changes required and transferred them to all national water authorities in the region. Just laws have to specify a role and duties of governments and water management organizations in regard to water resources use, protection and development. The need to specify clearly social, economic and ecological values of water, as well as a role of water users associations and regulations for coordinating water-consuming sectors is obvious. For example, there is the need to regulate relations of water authorities with conservancies, agricultural and local authorities. Financial mechanisms should also have the clear legal regulation in the water sector. The project has paid enormous attention to aspects of disputes settling at the level of WUAs and irrigation canal administrations – sociological surveys were conducted and recommendations, for presentation of which the project organized some on-site seminars, were developed.

The project has rendered the technical assistance in inspections and extra equipping of flow-measuring structures on pilot irrigation canals (an enormous work was implemented to establish the water-metering systems within pilot WUAs). This activity allowed setting the proper water record-keeping on the pilot canals and within WUAs resulting in the more transparent process of water distribution. Water meters were mainly manufactured and certified in the Regional Meteorological Center of the ICWC in Bishkek with participation of SANIIRI. The project has started real-time management of the water delivery process on pilot irrigation canals and within pilot WUAs in the form of monitoring and updating the planned water supply schedule based on water users' applications with taking into account weather conditions during a growing season. This is the first step towards equitable and rightful water distribution and, at the same time, an attempt to reduce unproductive water losses [21].

Preparing the passports of demonstrative fields within pilot farms allowed creating an instrument for analyzing farmers' production reserves and potential with the purpose of improving productivity of land and water resources. Testing the instrument for forecasting water consumption in line with weather conditions is conducted in the real-time regime, and its introduction in wide scale during the next phase of the project is planned. Our analysis shows that on 9 of 10 pilot plots the land and water productivity was perceptibly improved. On one pilot plot located on the SFC, where farmer did not follow the project recommendations, productivity has reduced.

Many women were involved in discussions related to management of the land and water productivity and

of other water resources management problems in the Fergana Valley. For example, about 60 women actively participated only in one project seminar that was devoted to water productivity issues and was held on September 15, 2003 in the WUA "Akbarabad." Based on outcomes of these activities, the enabling environment was created for the wide introduction of extension services for farmers in the Fergana Valley.

Partners, under regular co-ordination of SDC, implement sufficiently effective governance and monitoring of project activity. Since 2003, the co-ordination meetings of project managers and SDC experts were being organized practically monthly. Problem-oriented matters of activity were being discussed at these meetings to come to an understanding and consensus in methods and approaches to implementing those or other IWRM aspects. The project has paid much attention to regular publishing of technical papers and disseminating of information related to the project activity through mass media. The project can enter as its asset the fact that as a result of intense popularization and information on the IWRM concept, the Government of Uzbekistan has decided to reform water governance in line with the hydrological principles (the Resolution No 320 of the Cabinet of Ministers "On Improving the Water Sector Governance" issued on July 21, 2003).

Major project objectives at the third phase (since May 2005 until April 2008) were the following:

- Strengthening proposed reforms at all levels of water management hierarchy and co-operation of all water-consuming sectors and completing a set of all necessary regulations for their wide dissemination;
- More wide and intense disseminating institutional, managerial, and technical information and appropriate recommendations among existing and newly established water management organizations, including agencies that co-operate with international donors.

By the end of project activity in 2010, the following is expected:

- IWRM principles will be adequately used in the practice of pilot canal management;
- WUAs, in their service area and under supporting by the project, will distribute and deliver water to their members on the equitable and sustainable basis, using IWRM guidelines;
- Advanced water management technologies will be introduced at the level of water users;
- Project recommendations will be transformed into certain political reforms at the national level; and
- Project outcomes will be positively assessed by the Swiss Develop Cooperation and national authorities.

A mission of the Swiss Develop Cooperation has already highly appreciated project outcomes and activities in the frame of its components one year before their completion.

Conclusion of this mission is the following:

"The project has developed the unique IWRM approach (reorganizing the governance and management frameworks) for which none ready model existed. Thanks to this new role, social mobilization (rising of public awareness, clarification of new conceptions, and persuasion) has become the important project component."

A token of success is the direct participation of water sector officials in governance of activities at pilot sites and in establishing national working groups consisting of representatives from water-related sectors, as well as a broad interest and support of above principles by water authorities of other regions and provinces that was expressed at the get-to-know seminars conducted by project personnel together with

appropriate national ministries and departments.

Along with activities described in detail in other chapters of this book, the project (IWRM-Fergana Project) has implemented and proceeds with implementing sub-projects aimed at putting basic IWRM principles into practice in Central Asia and Kazakhstan. These subprojects are focused on different aspects of regional activity, but one general purpose unite them – the introduction of IWRM principles into multi-sectoral water economy in the region and involving the communities into the governance process by means of establishing the system of social mobilization (of water users and other stakeholders) aimed at introducing IWRM.

The project: Transition towards IWRM in Lower Reaches and Deltas of Amu Darya and Syr Darya Rivers. The Pre-Feasibility Study

A methodology of the above project [10] (see Box 4.1.1) is based on the concept and principles adopted in the IWRM-Fergana Project, however, there are some differences resulting from the peculiarities of Amu Darya and Syr Darya lower reaches.

The project was aimed at developing the Pre-Feasibility Study (PFS) for the introduction of IWRM principles under the specific conditions in lower reaches that are the most depressive region from the socio-economic point of view in Central Asia subjected to recurrent catastrophic drops in water availability (for example, in 2000 and 2001) and environmental degradation. It was assumed that based on the PFS, international donors will receive the opportunity to assist the region in adaptation of IWRM methods to these conditions and to cover, selected with stakeholders' participation, pilot irrigation systems in Kyzyl-Orda Province in Kazakhstan, in Dashhowus Province in Turkmenistan, and in Khorezm Province in Uzbekistan, by analogy with the IWRM-Fergana Project. In spite of the fact that an appeal to the many international donors was not crowned with success, some project outcomes were reached:

- The IWRM conception was adapted to the conditions in lower reaches (considering the environmental requirements);
- Transboundary aspects of IWRM were specified.

Special consideration was given to land reclamation issues in the course of implementing IWRM. Peculiarities of Amu Darya and Syr Darya lower reaches show up, first of all, in the form of social and environmental tensions, and in some losing of *water resources controllability*, which emerges in extremely dry years (2000 and 2001).

By present time, specific socio-economic and environmental conditions conditioned by *inefficient water resources management during last 5...10 years* have been formed in different areas of lower reaches.

What kinds of activities are envisaged in “IWRM in lower reaches” for implementing measures planned in the preliminary FS?

At the national level, in contrast to “IWRM in Fergana Valley”, consideration of local peculiarities is needed for each specific area in lower reaches:

- A situation in Khorezm Province is similar to the situation in Fergana Province (limited land resources and high population density), but differs by the specific character of land reclamation conditions resulting from stratified soils of deltaic layered- lacustrine sediments.
- A situation in Kyzyl-Orda and Dashhowus provinces and in Karakalpakstan a little bit different: abundant land resources; unsustainable water supply, insufficient natural and man-made drainage; salt-affected soils, and excessive carrying capacity of irrigation and drainage canals;

Tackling these specific matters requires different managerial, technical and land reclamation approaches for developing IWRM, but should follow the same key directions and mechanisms that are fine-tuned within the framework of IWRM-Fergana Project.

At the inter-state level:

- Strengthening the interstate co-operation in allocating a runoff of the Amudarya and Syr Darya rivers based on IWRM principles and by means of improving the institutional frameworks of existing organizations established for managing transboundary waters – the BWO “Amu Darya” and BWO “Syr Darya”:
- Establishing the Public Boards (Councils) of the BWOs with inclusion to them of the representatives from all countries, provinces located in each river basin, large-scale water users such as hydropower schemes, as well as representatives of Hydro-Meteorological Services, administrations of large main canals, and the Hydro-Ecological Councils for Deltas Management that represent the interests of deltaic complexes;
- Setting up special subdivisions in each BWOs for monitoring and controlling river water quality that will be responsible for developing their proposals to the ICWC and national governments regarding measures necessary for improving natural streams and for integrated using of surface, return, and ground waters.
- Receiving national governments’ endorsement of fundamental documents related to managing transboundary river flows such as:
 - The Statute of Basin Water Councils and procedures for their participation in planning and governing the water economy in Amu Darya and Syr Darya river basins;
 - Estimated values of environmental water requirements of natural complexes, rivers, and especially their deltas;
 - Forecast of available water resources of rivers in years with the different runoff probability;
 - Rules for regulating and allocating water resources in years with the different runoff probability, taking into consideration the specificity of flow regimes;
 - Instructions to BWOs regarding water management under emergency events (extreme droughts or floods);
 - Scheme of reservoirs system operation, including the regimes of water releases and filling;
 - Procedures for financial relations between countries participating in control and regulation of river flows; and
 - Regulations concerning the responsibility of countries and large-scale water users related to maintaining of established operational regimes.
- Developing a set of models for water resources management in each river basin (for annual and long-term operation) taking into account the interacting of rivers and areas under economical activity (water diversions, formation of return water, productivity of water use). The set of developed models should become the base for:

- Developing the national and sectoral strategies for regulating their economic activity related to water use and assessing impacts of their economic activity on downstream areas and riparian countries; and
- Specifying the possible consequences of management decisions and ways for achieving the consensus in the process of decision making.

The Pre-Feasibility Study approved by the ICWC was submitted to potential donors to provide financial support to the IWRM-Lower Reaches Project.

Box 4.1.1
<p>Project name: Transition towards IWRM in Lower Reaches and Deltas of Amu Darya and Syr Darya Rivers. The Pre-Feasibility Study (FY 2003 OESI Water Project, the Regional Environment Office of US Department of State) [10]</p>
<p>Donor: US Department of State</p>
<p>Project period: 2004 to 2005</p>
<p>Executors: The Regional Environment Office of US Department of State, national experts from Kazakhstan, Turkmenistan, and Uzbekistan</p>
<p>Project objective: Developing the detailed plan of supporting and establishing the IWRM system and creating the water partnership at the national and inter-state level in Amu Darya River lower reaches (Khorezm Province and the Republic of Karakalpakstan in Uzbekistan and Dashhowus Province in Turkmenistan) and in Syr Darya River lower reaches (Kyzyl-Orda Province in Kazakhstan). A priority of this objective is conditioned by extremely keen ecological and socio-economic problems in above regions due to Aral Sea crisis and the low level of water resources control.</p>
<p>Key project outputs:</p> <ul style="list-style-type: none"> • Review of the current trends and issues that need to be tackled; • Analysis of the political, legal and institutional frameworks necessary for functioning IWRM elements; • Review of the national and international projects related to water resources management issues in Amu Darya and Syr Darya lower reaches; • IWRM activity planned in lower reaches; and • Regional and national action plans.
<p>Implementation aspects: The pilot sites for fine-tuning of IWRM principles taking into consideration the specific character of lower reaches were selected under consultations with decision makers, WUAs' representatives and the public, and cover three levels of water hierarchy: hydro-ameliorative / irrigation system – water users association - farms. Selection criteria have included:</p> <ul style="list-style-type: none"> • Readiness and firm determination of all participants of the water sector for reforming the water resources management system; • Representative character of pilot sites for each of three levels of water management hierarchy according to key indicators for above regions;

Taking into consideration the dependence of lower reaches from the quality of transboundary water resources management, the additional component (level) was included: “Amu Darya and Syr Darya transboundary water resources management.”

The plan of introducing IWRM principles at pilot sites and all three levels of water management hierarchy and for implementing the additional component (level): “Transboundary water resources management” was elaborated in details.

Key tasks and principles for each level and phase of activity, as well as expected outcomes and implementation indicators were specified.

Necessary funds for implementing project activity over the three-year period were estimated: US\$ 35,255,000 including US\$ 907,000 of counterpart funds provided by Kazakhstan, Turkmenistan, and Uzbekistan.

The Pre-Feasibility Study was approved by members of the ICWC (Interstate Coordination Water Commission for Central Asia).

The Project: Developing the Kazakhstan National Integrated Water Resources Management (IWRM) and Water Efficiency Plan

Under current socio-economic conditions in our region, Kazakhstan is a more advanced country having sufficient financial resources and appropriate legislative base for purposeful activity related to putting the IWRM principles into practice in the national water sector. Part of IWRM provisions was included in the new Water Code (passed in 2003).

The project “Developing the Kazakhstan National IWRM & Water Efficiency Plan” [14] (Box 4.1.2) is a considerable step towards awareness of the IWRM principles and substantially facilitates follow-up introducing this method into the practice of national water sector.

The plan (its first draft) outlines the actions needed to reduce wastes a significant proportion of national water resources through both inefficient use of water and through pollution; it also focuses on the problem of managing water resources use and water quality. As top-priority measures, the plan envisages strengthening a role of the State Water Resources Committee and Basin Water Organizations (BWOs), establishing the National Information Center, preparing the Basin IWRM and Water Efficiency Plans and providing sufficient funding the water resources management system. **The strategy for achieving the MDGs in the field of water supply and sanitation** has to be developed as well.

In 2007, the following activities were planned and implemented in the frame of this project:

- Submitting the National IWRM & Water Efficiency Plan for endorsement by the ministries and departments of the Government of the Republic of Kazakhstan;
- Supporting the formal meetings of Basin Councils of the Republic of Kazakhstan;
- Preparing the proposals concerning address some modifications in the Water Code of the Republic of Kazakhstan to strengthen a role of the Basin Councils in decision making;
- Specifying possible financial mechanisms for achieving the MDGs; in the field of water supply and sanitation in the Republic of Kazakhstan;
- Developing the program for achieving the MDGs; and
- Informing the general public (public awareness) and stakeholders regarding the MDGs and the importance of their achieving.

The project is quite important for the top level of IWRM introduction, because as a result of this project, not only IWRM has received the legal acknowledgement in the first one of countries in Central Asia and

the water management organizations based on the hydro-geographical principle were officially established, but also the National IWRM & Water Efficiency Plan was approved. This plan outlines the time constraints and financing sources for some IWRM components, including establishing the training network, national and basin information systems, Basin Councils etc.

However, the IWRM introduction mechanism is insufficiently outlined in the plan, since the National IWRM & Water Efficiency Plan was confined exclusively to the national and basin level of water management without coverage of all water management hierarchy, especially of the most crucial “bottom” level - WUAs and farms. Just on that level, a considerable scope of works related to social mobilization of water users, including public awareness regarding putting IWRM principles into practice in the irrigated farming sector, need to be implemented. All measures for improving the efficiency of water use by direct consumers have been ignored. Public involvement was confined to the advisory functions and powers, but decision making remains the prerogative of water authorities. Thus, functions of water governance and management remain only in the hands of water professionals even at the top level of governance resulting in the possible strengthening the professional hydroegoism.

Box 4.1.2

Project name:

Developing the Kazakhstan National Integrated Water Resources Management (IWRM) and Water Efficiency Plan (under assistance of the UNDP)

Donor:

The Government of Norway and the UK Department for International Development

Project period:

June 2004 to June 2007

Executors:

Basin Water Organizations (BWOs), Ministry of Agriculture and Ministry of Economy and Budget Planning of the Republic of Kazakhstan, the UK Department for International Development (DFID), Global Water Partnership (GWP)

Project objective:

Assistance to the State Water Resources Committee and Ministry of Agriculture of the Republic of Kazakhstan in developing the National Integrated Water Resources Management (IWRM) and Water Efficiency Plan, as well as Basin IWRM and Water Efficiency Plans for eight river basins in the Republic of Kazakhstan (Aral-Syrdarya, Balkhash-Alakol, Irtysh, Ishim, Jayik-Caspian, Nura-Sarisuy, Tobol-Torgay, and Chu-Talas)
Establishing the Basin Councils in all eight river basins in the Republic of Kazakhstan.
Developing the strategy for achieving the MDGs in the field of water supply and sanitation, reducing by half a share of the population without access to safe drinking water by 2015.

Key project outputs:

- The conceptual note for the National IWRM and Water Efficiency Plan (March 2005);
- The Cross-sectoral Working Group for IWRM (ISWG) (May 2005);
- Draft IWRM plan sections (July 2005);
- The First National IWRM Forum (July 2005);
- The first draft of National IWRM and Water Efficiency Plan (November 2005);
- The second meeting of the ISWG (January 2006);
- The Second National IWRM Forum (March 2006);
- The Substantiation Report for including the National IWRM and Water Efficiency Plan into the National Medium-Term Socio-Economic Development Plan;
- The Resolution No 978 of the Government of the RoK issued on October 11, 2006;
- The second draft of National IWRM and Water Efficiency Plan (November 2006);
- The third meeting of the ISWG (December 2006);
- The Congress of Basin Councils of the Republic of Kazakhstan (April 2007) *where expected*

project outcomes by 2008 have been reviewed;

- The National and Basin IWRM and Water Efficiency Plans for Kazakhstan; and
- The Strategy for Achieving the MDGs in the Field of Water Supply and Sanitation.

Implementation aspects:

Seven Basin Councils were established and are operable:

Balkhash-Alakol (09.09.05), Nura-Sarisuy (21.12.05), Chu-Talas (24.05.06), Aral-Syrdarya (29.07.06), Tobol-Torgay (17.10.06), Ishim (02.11.06), and Irtish (01.12.06).

The BWO "Nura-Sarisuy" has prepared and signed two multilateral agreements (the first one for the Samar Reservoir water area and adjacent water protection zones; the second one for water protection zones adjacent to the Nura River).

The BWO "Aral-Syrdarya" has prepared and signed inter-provincial agreements on water protection zones, strips, and protection ground water and surface water of the Syr Darya River.

The BWO "Chu-Talas" has prepared and signed four basin agreements on water protection zones and strips along rivers Chu, Asa, Talas, as well as Lake around Bibikol.

The UNEP and UCC-Water Sub-Regional Program for Central Asia: "Speedup of IWRM-2005 Goals Implementation in Central Asia"

A key output foreseen for three countries: Kyrgyz Republic, Tajikistan and Uzbekistan in the frame of the UNEP and UCC-Water Sub-Regional Program for Central Asia: "Speedup of IWRM-2005 Goals Implementation in Central Asia" is the road maps / work plans for implementation of the IWRM target [15] (Box 4.1.3).

This "road map" describes objectives and the process of phased transition towards IWRM-2005 MDGs achievement (for short-term, medium-term, and long-term periods). To the point, the road map is the working sketch of the detailed IWRM plan, which should be prepared by each country-participant of the project in compliance with the proposals of the World Summit on Sustainable Development (Johannesburg, 2002).

The process of developing the national "road maps" within the framework of the UNEP and UCC-Water Sub-Regional Program for Central Asia was initiated at the first national workshops held in April 2006. There was proposed to national experts from three countries and members of the National Groups for Coordination and Support to IWRM to assess the following:

- At which stage of the IWRM planning cycle does a country stand?
- What factors are restraining the process of planning?
- What actions should be undertaken for implementing the IWRM plan?
- What is required for realization of these actions?

On the basis of the specificity of IWRM processes in each country, a composition of measures, dates scheduled for their implementation and funds required for the short-term period could be different, but were grouped in similar clusters:

- Capacity building in water management organizations;
- Establishing the enabling environment for IWRM (legal and political); and
- Technical and technological measures.

In the process of developing “the road maps”, along with specific tasks conditioned by peculiarities of the water policy in different countries, purposeful activity for phased solving of the following key problems existing at different levels of water management hierarchy was envisaged:

1. Practical providing the jurisdiction of water organizations within hydro-geographical boundaries that meets to IWRM principles and allows making water management decisions in timely manner and to render water services without interference of administrative-territorial authorities.
2. Integrated water resources management taking into consideration all types of water use within the hydro-geographical boundaries, and based on the analysis of real-time hydro-meteorological information including data on the dynamics of water supply and multi-sectoral water resources use. This information should be in a format suitable for all water users.
3. Strategic planning of water use and consumption taking into consideration the needs of agriculture, municipal and rural water supply, industry and nature, as well as other water-consuming sectors.
4. Practical decentralization of water governance with transferring of the administrative functions towards an acceptably low level (WUAs and their federations, Canal Councils) based on the national legislation and under assistance of the Government in establishing and developing WUAs and their federations.
5. Gradual transition from direct state governance of water supply to regulation of water sector’s activity and its relations with other economic sectors.
6. Step by step transition towards governing WUAs’ activity (and later the water management organizations’ activity) by Public Councils that will be authorized by relevant powers in the frame of national legislation in order to pursue a water policy, to establish procedures and rules necessary for their water management systems.
7. Based on the introduction of the measures for improving land and water productivity, to provide the conditions, which enable farmers to cover completely all expenditures related to O&M, as well as small repairing works and improving all irrigation and drainage systems within WUAs.
8. Assurance of the practical participation of Canal Councils, WUAs and their federations in developing a water policy and establishing rules for water resources management.

The draft national “road maps” were reviewed and discussed at the first regional seminar (Bishkek, July 27-28, 2006). During discussions, participants of the seminar made the constructive comments and proposals on the presented draft national “road maps” (the need to stress the improvement of water use productivity, prepare rational of the essential activities, social mobilization of stakeholders, and training in IWRM principles etc.).

The draft “road maps” and rational improved in accordance with these comments were discussed during the second phase of national seminars and then submitted to the key ministries and institutions of Kyrgyzstan, Tajikistan, and Uzbekistan. The national “road maps” and rational for the short-term period coordinated with key national ministries and institutions were presented at the final regional seminar (Tashkent, November 29-30, 2006). In the course of this seminar, it was proposed to national experts to submit “road maps” to the national governments officially to make decision on their practical implementation, and to the GWP CACENA (with assistance of the UNEP Collaboration Center for Water and Environment) to submit the project findings to potential donors / international organizations with purpose of seeking the financial support to the follow-up developing of the national IWRM plans based on “road maps.” [15].

The UNDP support to the Ministry of Agriculture and Water Resources of Uzbekistan in developing the national IWRM plan was the important follow-up step of promoting the project findings. After consultations with stakeholders and representatives of governmental and donor organizations, the decision was made to implement the pilot project “Zerafshan River Basin IWRM Plan” as the first phase of developing the national IWRM plan on the ground that the Basin Water Organization is the most advanced for introducing IWRM: i) water management is implemented within hydro-geographical boundaries; ii)

there is the database on water diversions and water delivery to users; iii) considerable donors' assistance in rebuilding WUAs and water authorities' capacity. A preparatory phase (September 2007 to January 2008) covers clarification and coordination of project objectives, as well as preparation of project rational for its submitting to the Cabinet of Ministers of Uzbekistan.

Box 4.1.3
<p>Project name: The UNEP and UCC-Water Sub-Regional Program for Central Asia: "Speedup of IWRM-2005 Goals Implementation in Central Asia"</p>
<p>Donor: Danish International Development Agency (DANIDA)</p>
<p>Project period: November 2005 to November 2006</p>
<p>Executors: UNEP Collaboration Center for Water and Environment - GWP CACENA and national experts from the Republic of Kirgizstan, the Republic of Tajikistan and the Republic of Uzbekistan</p>
<p>Project objectives:</p> <p><i>Long-term objective</i> is: «<i>Speedup of IWRM-2005 Objectives Implementation in Central Asia</i>».</p> <p><i>Short-term objectives:</i></p> <ul style="list-style-type: none"> • Assistance to development of the IWRM plans in those countries which are ready to start this process; • Promotion of the IWRM in dialog about water policy through initiatives for awareness improvement with involvement of the ministers of water resources; • Capacity building in the area of the IWRM plans development; and • Analysis of the IWRM problems at the national level.
<p>Project outputs:</p> <ul style="list-style-type: none"> • The sub-regional and national reports on progress with implementation of the IWRM 2005 MDGs and the IWRM planning in three countries in Central Asia: the Kyrgyz Republic, the Republic of Tajikistan, and the Republic of Uzbekistan; • The accomplished national road maps/working plans for implementation of the IWRM objectives; • Capacity needs assessment for support to implementation of the IWRM reforms, as identified in the "road maps" and working plans; • The managerial capacity building in the IWRM planning for the key water managers and decision makers.
<p>Implementation aspects:</p> <p>The "road maps" developed by national working groups describe in detail the process of phased transition from national visions towards IWRM plans.</p> <p>"Road maps" consist of three key sections:</p> <ul style="list-style-type: none"> • Capacity building in water management organizations; • Establishing the enabling environment for IWRM (legal and political); and • Technical and technological measures. <p>These sections specified objectives, scope of works, project periods (short-term – 2007 to 2009; medium-term – 2007 to 2012, and long-term – 2007 to 2025) executors, and potential sources of funds. The rational of implementation methods and necessary inputs was prepared for short-term actions.</p>

Approvals of “road maps” were obtained from key ministers and institutions. The “road maps” were submitted to the national governments officially (through the Department of Water resources in the Kyrgyz Republic, Ministry of Water Resources in Tajikistan, and Ministry of Agriculture and Water Resources in the Republic of Uzbekistan) to make decision on their practical implementation.

The RIWERTWIN Project (www.cawater-info.net/rivertwin) was initiated by the SIC ICWC together with the Hohenheim University (Germany) and is the only project in our region covering long-term planning of improvements in the water and water-related sectors based on IWRM principles that is implemented in the Chirchik sub-basin (Syr Darya River’s tributaries: Chirchik, Akhangaran, and Keless).

Available water resources in the sub-basin, the efficiency of water use in irrigation, hydropower, water supply and other sectors were assessed by the project with special emphasis on the environmental needs. Based on former national elaborations and methods developed by European partners, the models for selecting long-term development scenarios have been developed. Alternative options for implementing the selected scenarios were assessed with participation of beneficiaries. Institutional approaches for transition towards the highest form of IWRM - hydro-environmental management, under which the needs of nature are considered as the top priority, were also developed (the Nature Managers Association represents the interests of nature management in the Basin Council).

At present, the Regional UNDP Office for Eastern Europe, Caucasus and Central Asia in Bratislava together with UNDP Offices in Tashkent, Dushanbe, and Bishkek prepare the proposal on developing the national IWRM plans in Kyrgyzstan, Tajikistan, and Uzbekistan. National Coordination and Support Groups, established in the frame of the IWRM-Fergana Project will participate in this activity based on national “road maps” prepared under the UCC-Water & Environment Project. The summary of IWRM projects’ outputs and progress according to developed indicators is given in Table 4.1. As shown, the actual introduction of almost all IWRM principles takes place only in the IWRM-Fergana Project, and only the RIWERTWIN Project provides for joint consideration of all IWRM principles.

Table 4.1. Planning and the Introduction of IWRM Principles in Various Projects in Central Asia

Project Name	WARMAP	WEAMP	WB project in lower reaches of Syr Darya	IWRM-Fergana	National IWRM plan in Kazakhstan	Canadian Training Project	UCC WATER	IWRM in lower reaches	RIVERTWIN
1. WM according to hydrological principles: - at the inter-state level - at the national or basin level - WMS as a whole		<input type="checkbox"/>		+	+		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Accounting all kinds of waters: - at the inter-state level - at the national and all sub-national levels	<input type="checkbox"/>			+	<input type="checkbox"/>				<input type="checkbox"/>
3. Coordination of all water uses: - at the inter-state level - At all sub-national levels.	<input type="checkbox"/>	<input type="checkbox"/>		+					<input type="checkbox"/>
4. Public participation				+	partially			<input type="checkbox"/>	<input type="checkbox"/>
5. Priority of environmental needs		+	+	+	partially			<input type="checkbox"/>	<input type="checkbox"/>
6. Water saving and preservation		+		+				<input type="checkbox"/>	<input type="checkbox"/>
7. Information exchange	+			+	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	+
8. Economic and financial sustainability				partially					

LEGEND:

- planning & designing,
+ - put in place

4.2. Aspects of Transboundary Water Resources Management

(V.A Dukhovny, A.G. Sorokin)

Existing realities of inter-state relations in Central Asia are conditioned by the global political processes that are in progress during last two decades. These processes have started in the mid 1980s, and from the beginning of the 1990s, the geopolitics has drastically changed – the international relations system become more unsustainable. A new situation stipulates liberty to choose own way of further development by new players on the world political arena and exclusive complexity of this choice. However, finishing of “the Cold War” allowed us to look differently at the world and a role of a human being on Earth. One of benefits inherent in a new system of international relations is the recognizing by most of states of the fact that overall security depends on joint efforts related to elaborating the ways of sustainable development. The above directly refers to new independent states in Central Asia (Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan) that face new tasks of protecting their national interests, foreign-policy aspects of which are closely interrelated with problems of regional and global security. In April 2007, the 15-year anniversary of activities on governing transboundary waters in the Aral Sea basin that is jointly implemented by five riparian countries was celebrated in Almaty. In our opinion, the President of the World Water Council Mr. Loic Fauchon, in his welcome address to participants of the Central Asian International Scientific-Practical Conference dedicated to the 15th Anniversary of the ICWC, has delivered the most valuable assessment:

“There are more than 260 transboundary basins in the world. But very few examples where five states are working together, hand-in-hand. Five States that are not only dealing with planning and negotiation but also with day-to-day management and functioning of two weighty rivers: the Amudarya and the Syrdarya. My congratulations”

It is necessary to give credit for strategic wisdom of the political leaders of Central Asian countries who, already in September 1991 one month after disintegration of the USSR, have initiated the meeting of national ministers of water resources (at that time, of the republics in this region). In Almaty, on February 18, 1992, after discussing the issues related to establishing the ICWC and preparation of the agreement between the Republic of Kazakhstan, the Republic of Kyrgyzstan, the Republic of Uzbekistan, the Republic of Tajikistan, and Turkmenistan on collaboration in the area of joint management, use and conservation of inter-state water resources, they have signed this agreement. Approval of the agreement by Heads of five states on March 23, 1993 at their summit in Kyzyl-Orda has demonstrated to the whole world their political will to collaboration. In January 1994, Heads of the States have approved the Aral Sea Basin Program (ASBP-1), which envisages the major directions of works for strengthening collaboration in the region, and the concept to tackle basin socio-economic and environmental challenges. Both documents created the platform for activity not only the ICWC but also for other regional organizations that were established in the frame of IFAS (International Fund for Saving the Aral Sea): the Executive Committee National Branch Offices, ISDC, and Regional Hydro-Meteorological Centre. Declarations adopted in Nukus, Dashhowus, and Dushanbe and follow-up inter-state agreements (1997, 1999, and 2002) allowed developing the inter-state collaboration in the area of transboundary water resources management. The agreement on water-energetic resources management in the Syr Darya River basin, signed by Kazakhstan, Uzbekistan, and Kyrgyzstan in 1998, plays a central role in developing the cooperation of water management and hydropower organizations.

International financial institutions and agencies for international development of many countries such as the World Bank, Asian Development Bank, UNDP, UNECE, GEF, ESCAP, OSCE, USAID, CIDA, Swiss International Development, GTZ (Germany) and many others, as well as many target projects financed by the EC (TACIS, EuroAid, Regional Programs), NATO, INTAS made a valuable contribution to strengthening the co-operation of our countries. It should be also noted the active participation of international non-governmental organizations such as the World Water Council, Global Water Partnership, International Network of Basin Organizations and many others in strengthening the regional collaboration and relations.

A major achievement of ICWC activity over last years, under valuable support of other national and regional organizations, is the conflict-free water supply to riparian countries, in spite of all difficulties, different interests of riparian countries and their principle water users (irrigation and hydropower sectors), and alternating of extreme drought and flood periods.

As a result of joint institutional efforts, the ICWC structure was formed as a combination of regular sessions of leaders of national water resources departments and operational activity of executive bodies acting on the permanent base. The sessions chaired by a host country are held in all riparian countries in turns to specify the tasks of regional executive bodies and national departments for the periods between sessions. The executive bodies represented by the BWO "Amu Darya", BWO "Syr Darya", ICWC Scientific-Information Center, Secretariat, and Coordination Meteorological Center (CMC) implement all operational work, including:

- A joint planning of the regime of regulating river flows with adjusting the annual water sharing process for different periods (crop growing seasons and dormant seasons);
- Operative management of water releases, water delivery from inter-state sources to national consumers, monitoring of river flow rates (including monitoring of water quality at some gauging stations belonging to the BWO "Syr Darya");
- Capacity building of ICWC executive bodies by means of procuring machinery, computers and equipment, upgrading the communication system and training of personnel.
- Developing the regional information system, providing its openness and accessibility;
- Implementing joint regional projects based on common principles ; and
- Introducing and development IWRM both at regional and national level.

Joint activity of representatives of all riparian countries and regional organizations, covering last three directions, plays a central role in strengthening a mutual understanding, developing common approaches, overall awareness of local personnel, and establishing the system of co-operation. Consolidating the personnel in the process of assimilating new knowledge and joint adopting new technologies and technique, under technical assistance of international experts, is of great importance, since there is not more powerful uniting force as collective work, face to face.

Joint efforts of the ICWC, Canadian International Development Agency, Swiss Agency for Development and Cooperation, USAID and many other agencies in developing the training network and activity that allowed more than 2000 practitioners representing different levels of water management hierarchy to improve their professional skill should be also noted. The CAREWIB Project, which was jointly developed by the consortium consisting of SIC ICWC; GRID-Arendal and UNECE and funded by mainly the Swiss Agency for Development and Cooperation and partly by the United Nations, makes a valuable contribution to popularization of regional co-operation and has wide popularity in the region and abroad. Establishing the national information systems were initiated based on the unique Central Asia Regional Water Information Base with an integrated interface that enables developing the database and a set of models combined with the GIS. One of new outputs of this system is information-analytical reports that promote the improvement of current management quality of sharing water diverted from inter-state water sources.

Noting the positive tendencies in ICWC activity, the transboundary water resources management and use can not be evaluated as sufficiently sustainable due to some external and internal causes.

External challenges are predetermined by the following destabilizing factors:

- *Population growth*, although its rates have reduced in comparing with the last quarter of 20th century, makes up not less than 1.5% per year resulting in annual population increase in the amount of half a million people, that even at a minimum water supply rate that equals to 1200 m³/year/person require about 700 million m³ of additional water resources annually;

- *Urban population growth* and expanding urbanized areas at the expense of irrigated lands causes the additional need in water resources and, at the same time, necessitates replacing them with new irrigated areas;
- *Changes in crop pattern* due to restructuring of large farms and tendency to receive second crop yields and produce high-valuable crops;
- *Raising environmental awareness* promotes fulfilling the requirements to maintain ecological flows through rivers into their deltaic areas;
- *Climate changes* that are exhibiting increasing crop water requirements and more often recurrence of extreme flood and drought events;
- *Progressing decrease in world prices on agricultural produce* against increase in prices on agricultural inputs makes the irrigated farming quite low cost-effective, but under the need of developing irrigation due to its high social significance in the region (about 60% of rural population).
- *Increase in use of hydropower potential* through construction of hydropower stations on upstream river reaches, strengthening the competition for water resources mainly due to shifting the water use regime towards the interests of maximum hydropower production, especially in winter time, for satisfying own consumption and export of electric power with the purpose of receiving extra revenues.
- *Possible increase in water withdrawals from the Amu Darya River by Afghanistan* after the stabilization of political situation in this country. Already now, there are some documents, which indicate that the Government of Afghanistan intends to raise a special demand regarding the Amu Darya water resources, considering that in the past the interests of this country have not been taken into account in the Basin Schemes of Integrated Water Resources Use.

In addition, permanent raising the world prices on electrical energy (according to the forecast, prices will increase two times up to 2025) makes other kinds of water resources utilization, including irrigated farming, are absolutely noncompetitive in comparing with hydropower production. Nevertheless, the socio-economic significance of irrigation in the region is not subjected to doubts and infringement of its interests can cause a social burst due to very low incomes in rural areas in all countries of the region.

A number of *internal challenges*, which characterize consumption factors and can be controllable, first of all, due to the introduction of IWRM in the region, should be added to the above:

- *Ignoring proper managing of water*, as extremely scarce resource, at the level of state governance;
- *Lowering an accuracy of flow rates measurement*, resulting in water losses in river channels, which have risen almost two times!!!
- *Aging and obsolescence of water infrastructure* at all levels of water management hierarchy leading to unproductive water losses and deteriorating the controllability;
- *Low level of capital investments to rehabilitating and upgrading water infrastructure*;
- *Increase in the amount of water users*; and
- *Insufficient financing O&M organizations resulting in loss of skilled personnel*.

As a result, unfortunate prospects in water supply can be met in 2030. Figure 4.1 shows what we can wait for regarding a specific water supply rates (the existing level is 2460 m³/person/year):

- Optimistic scenario – 1870 m³/person/year;
- Under current trends – 1560 m³/person/year;
- Pessimistic Scenario – 1430 m³/person/year;

It means that in dry years the mentioned values is decreasing by 20-25%, and, keeping in mind entropy of large hierarchical systems, it is expected that considerable part of end users will be provided with water at the level of 50% of their demands!!!

Such a prospect forces us, as a top-priority measure, to elaborate the strategy of surviving and sustainable development, without which conflicts and a growth of mutual distrust will spread over the whole region. In the water sector, own welfare shouldn't be built based on infringement of other users' interests, especially as multilateral links are inherent in the water system, and nobody can be absolutely independent from others. An every action causes a counteraction, and when any ambitions transcend reasonable limits of disagreement, the situation in other spheres of state relations (not related to water resources) is also worsened. This concerns both basin and inter-state levels of water management hierarchy, and all subsequent relations at the level of provinces, districts, WUAs and water users.

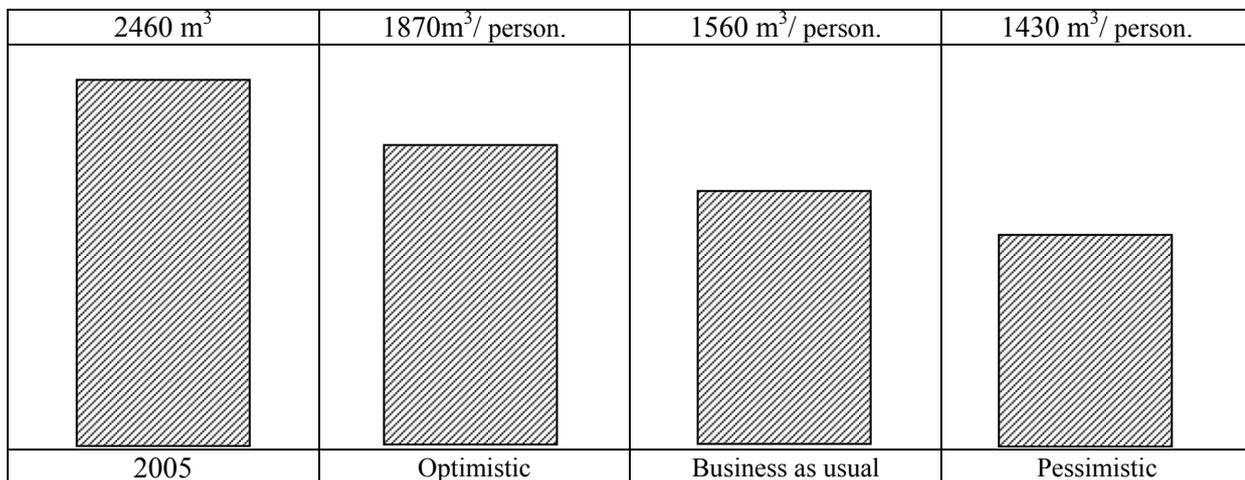


Figure 4. 1 What Can Be Expected in 2030?

Therefore, the integration strategy should be adopted as the base for all hierarchical levels – integration of all kinds of waters; integration among water users and with water management organizations; integration of all economic sectors and the natural complex. All types of integration have to be aimed at achieving potential water productivity, minimizing all unproductive losses, and ensuring the sustainability and uniformity of water allocation among all stakeholders.

Unfortunately, the basic provisions of the regional water strategy elaborated in 1995 in the frame of the ASBP funded by the World Bank [9] were not further developed in the WEAMP, where they had to be transformed into the well-proportioned strategy of regional and national development. However, three developed scenarios have a self-evident significance – they demonstrate the fact that challenges of the 21st century could be solved only under harmonization of co-operation and development parameters by neighboring countries. Thus, a new united regional strategy has to be created by joint efforts of all countries in the region, and for this purpose, institutional, legal, financial, technical and planning mechanisms have to be mobilized.

A concept of this strategy should be based on the following provisions:

- Sustainable and safe water supply to the economic sectors and natural complex in all riparian countries are impossible without guarantees of sustainable and reliable management of transboundary water resources including surface waters, groundwater, and return water;
- It is impossible to solve long-term tasks without assessment of all abovementioned destabilizing factors. By the way, apart from expected climate changes affects, such factors as population increase, possible water diversion from the Amu Darya River by Afghanistan, as well as lowering of the controllability level of depreciated water infrastructure, especially of pumping equipment, will impact on prospective water availability in the region in a considerable extent. Therefore, the concept should take into consideration both maximum and minimum parameters of external challenges. Special attention should be paid changes of the river flows regime by the reservoirs in the runoff formation zones (Kambarata, Ragun, Dasht & Jun, Yavan, and other reservoirs); and
- The concept has to reflect those political and economical changes which take place in all basin countries and to take into account their conditional character, especially in governance and water consumption in the agricultural sector as a result of the progressive introduction of market mechanisms, as well as those tendencies in overcoming increasing a water deficit which take place in the world practice.

One of key goals of the concept is *the preparedness of water sectors in the riparian countries for transition towards IWRM*, which allows, without enormous investments, to provide considerable water resources savings and increasing of land and water productivity. Special goal of the concept is the provision of water to natural complexes in the Pre-Aral deltas, preservation of rivers, water bodies and wetlands, as well as maintaining of existing biodiversity based on rational water resources use.

It is obviously that major efforts related to water saving and rational water resources use should be aimed at reducing overall water withdrawal from all sources with achieving decrease in the total water withdrawal by all economic sectors, at least, by 25% up to 2025, that is a political goal for all countries.

The current *institutional framework for water resources governance* at the inter-state level suffers from some “bottlenecks” that were not yet removed. Although the ICWC and its executive bodies are directly responsible for water-sharing management and improving of water resources use, there are three parallel structures at the inter-state level, which are also involved, more or less, in water governance and in solving the problems of its perspective development and improving. The IFAS and its national branches, which are responsible for providing funds for implementing the ASBP-2 and preparing new agreements and other documents aimed at improving the water management (rules, procedures etc.), with few exceptions, are ineffective, but due to their overrated ambitions, they create tension situations and parallelism in work. The Regional Hydro-Meteorological Center that was established in the frame of IFAS and has to provide improving the reliability of flows metering and forecasts, unfortunately, does not operate in the regime promoting improvements in water management. At a distance from others the ISDC exists, which should be an initiator of monitoring and management of transboundary water quality, as well as of the regional measures to achieve the MDGs in the field of sustainable development. Although the representatives of national conservancy agencies participate in the national working groups established by the ISDC for improving management of water quality, but their participation is out of the ISDC program. The Regional Ecological Center with its national branches also acts on the same field (Figure 4.2).

Hydropower production, which is coordinated, in our opinion insufficiently, by the Central Asian Energy Council and UDC “Energy”, exerts great impacts on the river flows regime. Representatives of the National Ministries of Energy and United Dispatcher Center (UDC) are also involved in activity of ICWC working groups, but with a little progress.

In addition, the Eurasian Economic Community (EAEC), which established the special group for reviewing water and energy resources issues, intermittently, participates in discussions related to water resources management (these issues also discussed at the meetings of the Shanghai Cooperation Organization

(SCO)). Regional influencing on the system of water governance (the organizational aspect) creates a troublesome and instable situation in water supply from transboundary sources that is reflected in indicators of water availability, and sustainability and uniformity of water supply. This situation is clearly shown in Figure 4.3 and in Box 4.2 that contains a summary of assessing water sharing and water supply in the Syr Darya basin in 2007.

Box 4.2.1

In spite of the fact that actual inflow into the Togtogul Reservoir was higher than forecasted inflow (a divergence of 7%), the schedule of water releases from the reservoir was upset; and actual water releases were less than planned ones on 1.08 km^3 (a divergence of 15%). At the end of the growing season, a water volume accumulated in the Togtogul Reservoir was on 1.8 km^3 more than a planned volume. Drawdown of the Togtogul Reservoir was uneven: in the beginning of June and July, discharges were less than planned ones on $161 \text{ m}^3/\text{sec}$ (29%) and $209 \text{ m}^3/\text{sec}$ respectively, but in the beginning of September, they exceeded the planned values on $63 \text{ m}^3/\text{sec}$ (21%).

This situation could not be improved at the expense of water releases from the Andijan Reservoir, due to insufficient inflow to this reservoir (actual inflow was on 27% less than forecasted inflow) they were less than the planned water releases on 0.7 km^3 (a divergence of 27%). An actual filling of the Andijan Reservoir was close to the planned one at the end of the growing season.

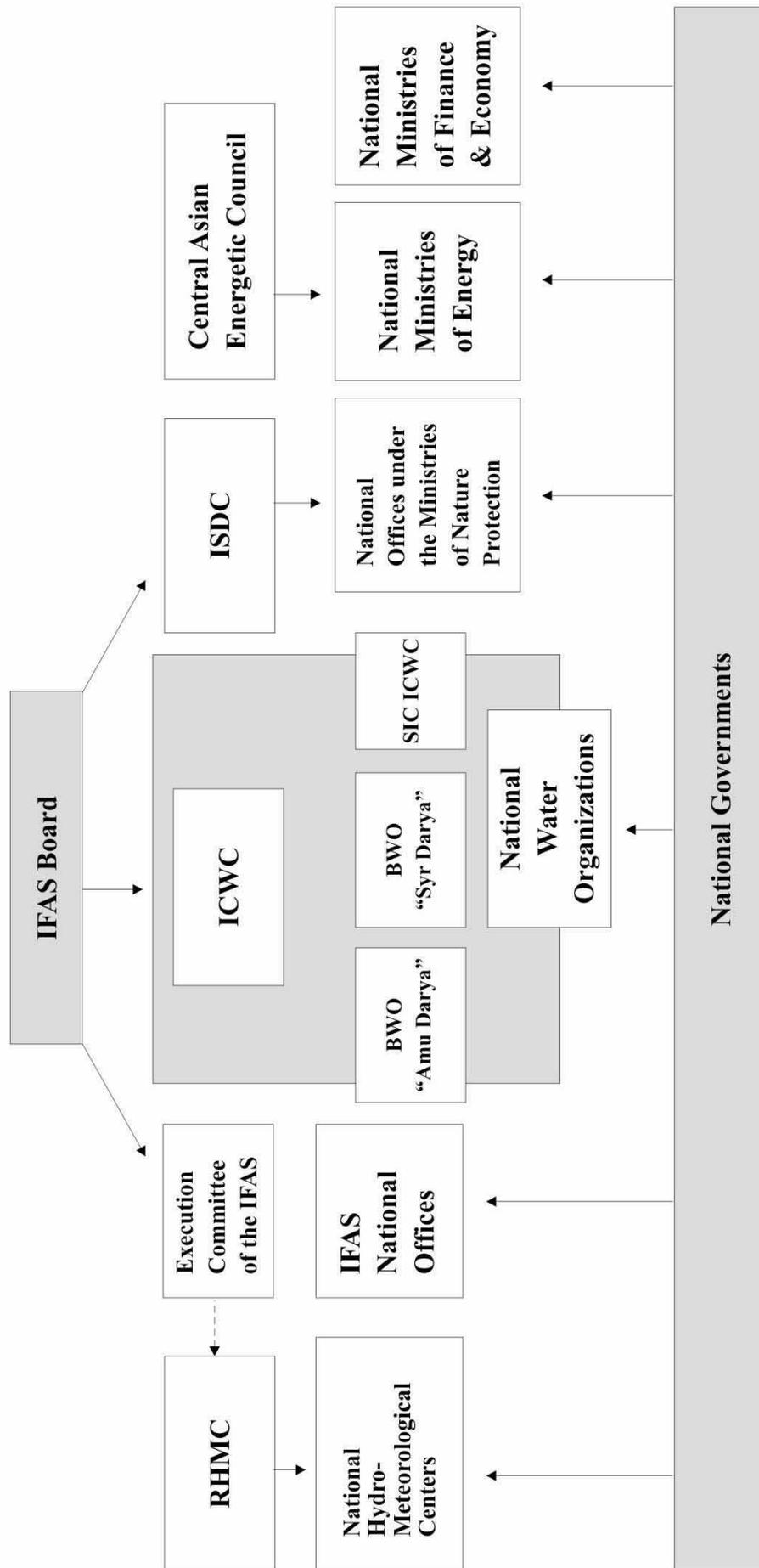


Figure 4.2 Existing Institutional Structure

It is necessary to establish the regional organizational framework with clear distributing the rights and duties, which could provide the sustainability in operation and, first of all, in financial aspects, as well as good co-ordination with national authorities related to the water sector, based on mutual trust and openness in its activity.

The following organizational structure for inter-state water governance that will allow avoiding an overlapping in operation and specifying clear rights and duties of its entities is proposed as one of options. The organizational structure of the Mekong River Commission was taken as a prototype but with taking into consideration the peculiarities of existing organizations in our region (Figure 4.3)

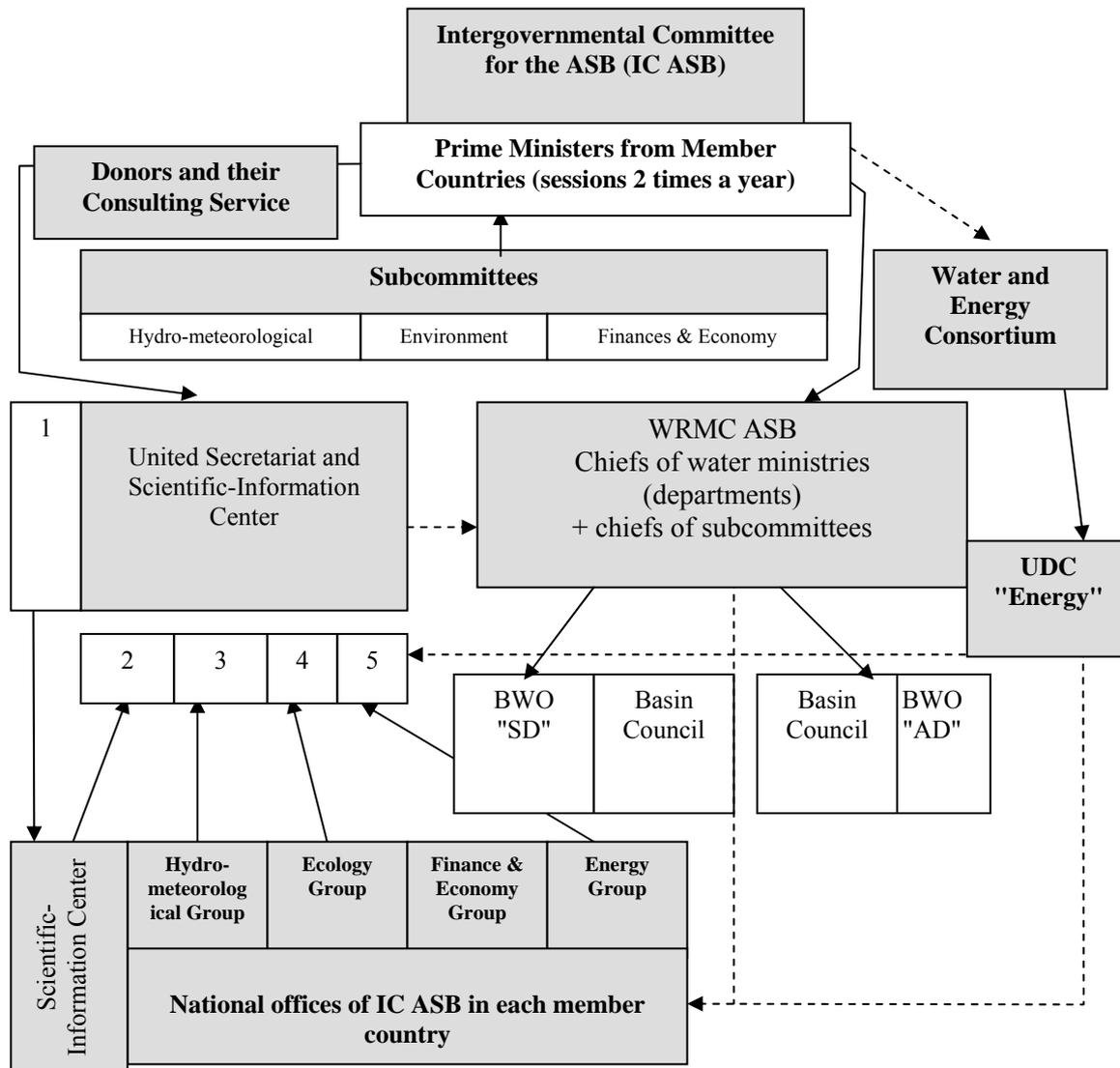


Figure 4.3. The Proposed Regional Organizational Structure for Water Governance in the Aral Sea Basin

The Intergovernmental Committee for the Aral Sea Basin (IC ASB) headed by Prime Ministers of all basin countries (in consideration of the significance of water factor) who will be, by turn, in charge of ICASB sessions that will be held strictly two times a year, prior to and after the growing season. The Committee consists of Ministers (or heads of relevant national Departments) of water resources, hydro-meteorological services, conservancy, energy, economy, as well as of Deputy Ministers of Foreign Affairs. Committee's sessions should be held strictly on that day which was specified in the regulations without preliminary co-ordination (the experience of the ICWC shows that the process of gathering all plenipotentiaries became the procedure of long-term co-ordination according to the following path: a host country → all members of the

ICWC → national governments → cross-sectoral coordination → repeated co-ordination to reach a consensus regarding a date). Over last 5 years, there were four occasions when the ICWC members did not attend the sessions, and they have signed adopted documents after the events. The proposed Committee has to replace the IFAS Board, which today lowered its status (from the representation only by Vice Prime Ministers to the combined representation by Vice Prime Ministers and Deputy Ministers)

The ICASB has to establish national offices in each riparian country, which have to replace the national branches of IFAS. ISDC, SIC ICWC, and REC. The Water Resources Management Commission for the Aral Sea Basin (WRMC ASB) becomes an executive body consisting of managers of water management departments from member countries, the Regional Hydro-Meteorological Center, subcommittee on water resources protection (former ISDC) and other subcommittees (finance and investments, energy), and UDC “Energy” (or a representative of the Central-Asian Energy Union). All chiefs of subcommittees take turns each half a year (according to the alphabetical order).

National offices include specialized subdivisions acting on behalf of appropriate ministries and departments and aimed at executing the measures adopted at the ICASB sessions for improving transboundary water resources governance and management. At the same time, a co-ordination of specialized subdivisions is implemented by relevant subcommittees in the course of their semiannual (or quarterly) meetings through personnel of appropriate national ministries and departments. Such an approach will provide their permanent participation in activity related to regional problems including transboundary waters issues, and reasonable continuity of policy, since because of frequent replacing of the sectoral representatives in the working groups and, as a result, shifts in personal attitude, hinders often the preparation of principle decisions, agreements, and operational procedures.

The United Secretariat with Scientific-Information Center in its structure will be established as a single executive body for planning, co-ordination, financing and managing water resources. This executive body will perform those functions, which, at present, are implemented with inherent fragmentariness (or have to be implemented) by the SIC ICWC (Box 1), Regional Hydro-Meteorological Center (Box 2), SIC ISDC (Box 3), Executive Committee of the IFAS (Box 4); as well as the Energy Group, which will represent the UDC “Energy” (1 or 2 persons) will be additionally established in the framework of the United Secretariat. According to the experience of activity of the Mekong River Commission, the United Secretariat should be headed by a non-resident of this region, but its personnel have to be composed by citizens of the member countries. Taking into consideration that the President of Kazakhstan Mr. N. Nazarbaev and the President of Uzbekistan Mr. I. Karimov have suggested, many times, to put the Aral Sea Basin Commission under the UN aegis, it would be rational if a UN representative will head the United Secretariat, with providing the diplomatic status to the United Secretariat and the WRMC ASB. In this case, the United Secretariat will work in close co-ordination with the Donors’ Consulting Service, being established also under the UN aegis.

The proposed organizational structure will allow the following:

- To concentrate all governance of basin water and hydropower resources at the level of Prime Ministers, including developing key aspects of annual and long-term planning, faster developing the united legislative platform for inter-state relations, decision-making on principle issues of financing, expenditures distribution and cross-sectoral co-operation, removing any sectoral barriers and interference;
- To preserve the well-functioned management system at the national level in water-related sectors, controlling and coordinating this system with regional rules, limitations, and requirements through the United Secretariat and IWRMC;
- To involve the representatives of other economic sectors and departments, apart from water and agricultural sectors, such as hydropower specialists, hydrologists, economists, ecologists and others into the decision-making process, as well as to provide an additional status of the United Secretariat by involving the representatives of National Ministries of Foreign Affairs in its activity (therefore, reorganization of the ICWC into the IWRMC does mean not only the change of its name);

- To obviate responsibilities' overlapping, latent competition and dissipation financial resources allocated by donors and national governments, by directing them for implementing the measures clearly specified at the level of the Basin Committee;
- To establish the Water & Energy Consortium as the mechanism for coordinating interests of the energy sector with irrigation practice; and
- To involve hydro-meteorological and conservancy agencies into the united system of water management and in activity of the IWRMC in order to provide more reliable water monitoring and forecasts; to raise their responsibility for data reliability; to improve their operability in data collection and developing clear regulations for water quality control; as well as to provide their participation in monitoring and control of waste discharges for environment improvements.

Transition towards the IWRM principles at the basin level will have a great significance for improving the institutional structure. It means that activity of the BWOs should be supported by establishing the Basin Councils in each river basin with inclusion in their composition the representatives of provinces, large water users (HPS), deltaic associations and other stakeholders. Similar to the Public Canal Committees (or Water Users Unions), established in the frame of IWRM-Fergana Project on the pilot canals in the Fergana Valley, these public organizations will participate in coordinating plans and operation schedules, monitoring their implementation, assistance to the BWOs in obtaining funds for improving O&M and upgrading water infrastructure.

Along with these institutional principles, it is rational to establish the Basin Committees or Councils in the basins of small transboundary rivers. Apart from two big rivers in the region there are more than 20 basins of rivers that in the past were tributaries of the Amu Darya and Syr Darya, but currently they have lost their links with big rivers. By analogy with creating of the BWO "Chu-Talas", which is a now active, similar water management system should be established in the basins of Zarafshan, Kafirnigan and other rivers located mainly in the Syr Darya basin. At present, in the frame of IWRM-Fergana Project, such activity is initiated in river basins of Shakhimardan (Kyrgyzstan and Uzbekistan) and of Khoji-Bakirgan (Kyrgyzstan and Tajikistan). It would be rational to cover all other transboundary river basins with similar activity.

Improving legal base for inter-state collaboration

At present, there are a few principle inter-state agreements related to water resources management in Central Asian countries: two framework agreements – the first agreement adopted on February 18, 1992 and the second agreement linked to the Syr Darya River (1998), as well as earlier mentioned agreements and declarations concerning the IFAS.

An intention to support the framework agreements with more detailed legal documents was already mentioned in the Basic Provisions of Regional Water Strategy. A preliminary assessment has shown that under the general correct orientation of interstate agreements and regulations and their compliance with the international water law, their improvement, development and clarification (some aspects) are quite necessary.

It is supposed that legal and juridical provision of the water strategy will be created in the form of some fundamentals and agreements that will regulate clearly its development and implementation, including those rules and norms, which can cover various situations in regional relations and must provide sustainable conflict-free development.

Such documents, in the first approximation, have to cover the following matters:

- Inclusion of all transboundary waters, including ground water and return water, into the ICWC sphere of influence;

- Specifying the BWO's functions and its organizational structure considering the strategy being developed with the purpose of possibly full coverage of each river trunk using the BWO's capacity;
- Rules for joint use of all types of waters;
- Legislation and standards for monitoring water quality and limitations for waste discharges and disposal of some harmful ingredients into rivers and other water sinks;
- Procedures for preparing and making decisions by the inter-state water organizations;
- Arbitrage and procedures for disputes resolution;
- Liability due to infringements of water quotas, water supply schedules, operational rules, water pollution, as well as due to derangement of water supply to the Aral Sea;
- Safeguarding infrastructure and watercourses of international importance;
- Responsibility for establishing and maintaining an overall database;
- Procedures for joint activity on transboundary rivers, lakes, and streams;
- Specifying damages and procedures for their compensation, including compensations for flooding and waterlogging of lands, deteriorating of water quality etc. In addition, the further studying of these aspects and clear reflecting of studies' findings in appropriate inter-state documents are necessary;
- Public awareness and providing equal rights in water use;
- Criterion of use efficiency for transboundary waters; and
- Providing the priority of overall interests over national interests in the basin, and limitations of this priority.

At the same time, the following additional matters have to be included in some constituent documents of the inter-state organizations:

- A structure of organization;
- Official powers and duties;
- Procedures for the decision-making process; and
- Financing the inter-state activity;

Their development was started in the framework of the WARMAP Project funded by the EC, and was continued by the ICWC with participation of the EC IFAS and support of the RETA 6163 Project funded by the Asian Development Bank. At present, the ICWC has approved a text of agreement on information exchange; as well as the drafts of ICWC statute and agreement on improving the ICWC organizational structure were prepared for discussion. At the same time, under discussing a new text of this agreement on using water and energy resources in the Syr Darya basin, the existing disagreements are smoothed away by the working groups.

A considerable part of the ASBP-2 approved by Heads of the States is devoted to the need of developing a legal base for inter-state relations, in which not only the agreements developed in the frame of ADB RETA 6163 Project, but also specific procedures and rules of O&M as an attachment to these agreements were included. Thanks to the Asian Development Bank, this activity was initiated and now is in progress, though with some delay. A draft of Statute of the Water & Energy Consortium (WEC) (with different conceptions responding viewpoints of different countries) is among other problematic documents. Some experts suggest establishing the WEC as the complement body to the existing organizational structures, but other experts - as their replacement. The reasons of difficulties in forming the legal base for inter-state collaboration, first of all, consist in absence of the continuing expert group, which would tackle this problem, and in a very

complicated system of co-ordination. Drafts of abovementioned documents are developed by national and regional working groups (NWG and RWG) in the frame of ICWC. Different countries have different approaches to forming and approving the National Working Groups. The Government of Tajikistan, by its decree, has approved the composition of NWG; however, in other countries the governments only coordinate the composition of experts from different ministries. Hereinafter, the procedure of elaboration and co-ordination of documents is moving forward as follows: the NWGs submit their proposals regarding the text of different documents (drafts of agreements, regulations etc.) to the RWG, and then the text is agreed at the meeting of RWG with participation of 2-3 representatives of NWGs and returned back to NWGs. As a result of coordinating with the Government and other institutions, the text coordinated with the RWG can be considerably modified. This procedure can be repeated many times. For example, the text of some agreements on the Syr Darya River went through this iteration process 11 times, but some positions remain uncoordinated. Changes in the composition of NWGs, replacements of heads of national ministries and, sometimes, lack of powers from the Government affect the coordination process.

In case of adaptation of the organizational structure proposed above (Fig. 4.3), all the coordination process will be established in the frame of the Inter-State Committee and its regional and national structures, which will have sufficient powers due to a high rank of their members. Participation of Prime Ministers and representatives of the Ministries of Foreign Affairs should provide higher status of legal documents and streamline their adoption.

At present, FINANCIAL INSTRUMENTS of the inter-state co-operation consist of proportional financing of inter-state organizations, and implementation of necessary works on the transboundary water objects within the national territory or, under co-ordination (or on request) with another country, on objects located in another country based on contractual obligations with payment for use of its territory. In the framework of the RETA 6163 Project funded by the ADB, the ICWC working groups collected data on expenditures of different countries for O&M of infrastructure on transboundary watercourses and for covering operational costs of regional organizations. In spite of some disagreements regarding the methodology employed, an assessment was made and described in the report that was submitted to ICWC members (key findings are presented in Table 4.2).

Table 4.2.
Summary of Works Implemented by Riparian Countries for Supporting of Joint Management
of Amu Darya and Syr Darya Water Resources, as of 2006

	Activity/Expenditures	Kazakhstan 000' USD	Kyrgyzstan 000' USD	Tajikistan 000' USD	Turkmenistan 000' USD	Uzbekistan 000' USD	Total	%
1.	River training works and flood control measures	14,298.3	536.4	2750.0	4897.2	3433.9	25,915.8	42.6
2.	O&M works on inter-state water infrastructure, including works related to safety of waterworks	3300.0	1906.8	3230.0	2179.1	15,195.1	25,811.0	42.4
3	Running costs of inter-state water management organizations	307.0	32.2	347.3	3543.0	2859.7	7089.2	11.6
4	Hydro-meteorological services and forecasting	1074.5	165.8	10.0	78.8	663.6	1992.7	3.3
5	Other interventions				44.2		44.2	0.1
	GRAND TOTAL:	18,979.8	2641.1	6337.3	10,742.3	22,152.3	60,852.9	100.0
	Total in %	31.2	4.3	10.4	17.7	36.4	100.0	
		Kazakhstan	Kyrgyzstan	Tajikistan	Turkmenistan	Uzbekistan	Total:	
	Share of total water withdrawal, including internal sources, %	11.2	4.3	10.2	22.9	51.4	100.0	
	Water withdrawal, including internal sources, km ³ (2003)	11.6	4.4	10.5	23.7	53.1	103.4	
	Total expenditures for maintaining joint water management in the basin (according to audit results), USD	18,979.8	2641.1	6337.3	10,742.3	22,152.3	60,852.9	
	Costs per 1 m ³ of water withdrawal, USD/m ³	0.164	0.060	0.060	0.045	0.042	0.059	

Under considering expenditures for 1 m³ of water diversion from rivers, it becomes obvious that riparian countries incur different costs.

Continuing this activity, the working group has made up a list of services and costs that should be considered under specifying running costs for 2006. However, issues of distributing profit and compensation for damage, which in opinion of some countries they did not receive from their neighbors were out of consideration. In particular, this concerns damages due to incomplete use of the hydropower potential in winter time by countries located in upper watersheds and less production of electric energy. A lack of clear recommendations of the international law regarding similar precedents does not allow definitely answering what mechanism should be used for similar estimates. However, combining principles of “equitable and rational use” and “do not harm, and pay for caused damage” allows developing a certain approach, which was proposed by the specialists of the SIC ICWC (V. Dukhovny, A. Sorokin) in the process of evaluating impacts of operation of the Vakhsh Hydropower Cascade, including the Ragun HPS, on downstream users in the Amu Darya basin.

Comparing of impacts under different operational regimes of this cascade on socio-economic indicators of irrigated farming in middle and lower reaches of the river in Turkmenistan and Uzbekistan up to 2055 is given in Table 4.3. It is assumed that prices on hydropower and agricultural output are kept at the current level under a certain increase in cost of one kilowatt-hour in winter time against its cost in summer time (USD 0.02 and 0.015 respectively). Five combinations of three operational regimes (hydropower, irrigation, and combined) and two options for dam crest levels (DCL) of the Ragun Hydro-Scheme (1240 and 1290 m) were considered in comparing with the existing operational regime of the Vakhsh Hydropower Cascade.

Table 4.3.
Comparing Impacts of Different Operational Regimes and Ragun Hydro-Scheme Parameters on Socio-Economic Indicators over the Period of 2005 to 2055 (million USD/year)

Options	Losses of irrigated farming and related sectors output during the year	Reducing (-) or increase (+) of planned output against current output, including power production	Power production at Ragun HPS in money terms	Total profit against the revenues under current operational regime of the Nurek HPS
Keeping the current operational regime of Nurek HPS	94.71	-	-	-
Power regime with dam level at 1240 m	211.3	116.59	162.35	45.76
Power regime a with dam level at 1290 m	174.6	79.89	194.71	114.82
Irrigation regime with dam level at 1240 m	59.2	-35.5	159.39	194.89
Irrigation regime with dam level at 1290 m	37.85	-56.86	188.41	245.27
Combined regime with dam level at 1240 m	76.18	-18.53	194.84	176.31

If to follow the “do not harm” principle, a total effect from constructing the Ragun Hydro-Scheme should differ by the amount of output losses in middle and lower reaches of the river due to affects of construction activity. In this case, both options of the power regime are less effective than three other options. At the same time, advantages of the combined regime option (irrigation and hydropower) become more obvious, because under increase in power production almost up to the level of power regime option it reduces losses in irrigation farming output in comparing with the option of current operational regime of Nurek HPS on USD 18.5 million a year, on average.

A foreign practice, for example, the experience of the USA and Canada, provides some possible solutions based on separating the functions of irrigation water management and water releases for energy production when hydropower stations should pay for water passing through turbines and, respectively, the irrigated farming sector has to pay for irrigation water supply on the commercial competitive base. Some elements of similar approaches may be used under establishing the Water and Energy Consortium (W&EC), a concept of which was proposed at the top level, but unfortunately did not get an overall understanding and supporting from all countries in the region. Some officials and experts propose to use it as a financial mechanism for implementing the water releases schedule agreed by the ICWC, but others suggest establishing a super-uniting body for governing all water and energy resources in the region. More weighted and correct solution was proposed by the Eurasian Economical Community (E. Vinokurov: Financing the Water & Hydropower Resources Complex in Central Asia, 2007) suggesting establishing the W&EC as “a permanent inter-state body with functions of a coordinator of investments and a dispatcher of the water and hydropower resources complex.” This position also envisages that in the prospect the W&EC will coordinate developing the hydropower potential in the region, unutilized resources of which are estimated in the amount of 15,000 MW, for covering the winter deficit of electric power (in combination with some thermal power plants). This point of view is close to the concept developed by the SIC ICWC for the W&EC, which, first of all, is considered as the financial mechanism for regulating the necessary regimes of water releases, and then for regulating the matters related to investments into long-term development. In our opinion, the Water and Energy Consortium should be established as:

- A body, which, by means of regulating fuel and energy resources of Central Asian countries and financial flows, will organize the regular exchange of these resources with the purpose of strict coordination of the plans of water allocation and delivery to countries and their water management systems, as well as water releases from reservoirs that must be established by the ICWC taking into account social and environmental needs of riparian countries;
- An energy and fuel flows operator that provides to regional countries guaranteed supplies of fuel resources and electric energy necessary for optimal life support and functioning national economy; and
- A financial structure for seeking funds for implementing various projects with purpose of developing new hydropower capacities based on parameters of water management and water releases from the reservoirs agreed by all countries.

Activity of the regional bodies of W&EC can promote the improvement of the PLANNING MECHANISM of water allocation and the regimes of water releases from the multipurpose reservoirs with hydropower plants. At present, the ICWC is approving only water supply regimes and recommends the regimes of water releases for their coordination with the hydropower production organizations and owners of the Hydropower stations. As a result, the process of coordination with participating of the administration of national hydropower ministries, based on the mechanism of compensations for procurement of fuel resources or electric energy, is sometimes delayed until June, slowing the procedure of normal planning (prior to the beginning of a growing season (1st April) or a hydrological year that starts since 1st October).

Among other measures for improving the planning system, enhancing an accuracy of forecasts regarding natural inflow into reservoirs in the upper watersheds and lateral inflow into rivers, including return water, should be noted. Analytical documents that were placed on CAREWIB portal are showing that if a mean annual accuracy of forecasts for a growing season varies over the range of 17 to 35%, accuracy of forecasting inflow into some reservoirs (from April to June) within 50% resulting in quite unstable operation of inter-state water organizations at the beginning of the growing season. At present, BWOs have mastered the computerized technique of planning and adjusting their plans depending on updating forecasts and current water situation. However, to improve the effectiveness of this planning process it is necessary to implement some measures for enhancing the coordination of five national hydro-meteorological services, their capacity, and collaboration with national and regional water administrations, in particular:

- To put into operation the united system of record keeping and monitoring of river flows, including transboundary and ground waters;

- Specifying and permanent control of river flow losses, in their channels, that increased two times during last years;
- Preparing the reliable climatic and hydrological forecasts with special emphasis on monthly forecasts in dry and wet years;

Unfortunately, efforts of different donors and, first of all, the Swiss Development Cooperation (SDC) to assist in establishing the Regional Hydro-Meteorological Center face the ambitions and commercial egoism of some national services. On the way towards the proposed organizational structure of water co-operation under the direct leadership of five national governments, these adverse tendencies can be overcome if to proceed from the vital need to strengthen the collaboration of countries in managing transboundary water resources in the interests of all riparian countries in order to survive under the conditions of the growing water deficit.

The above system of STRATEGIC PLANNING that may create the platform for future water welfare in the region under a great complexity of coordinating the national interests and keeping in mind regional limitations has to become the cornerstone of the planning system. Undoubtedly, funds are necessary, but also other principles of joint activity – not only inviting the foreign consultants who can submit the non-committal report but also joint alternative planning of possible prospects by national institutions of strategic researches with the participation of regional water organizations based on the inevitability of seeking the joint solutions. Creating this document will be under permanent monitoring of the Inter-State Committee and former ICWC transformed into the IWRMC, which, through the United Secretariat (with the Scientific-Information Center) will seek the regional consensus in developing the strategy and its preparation for approval by the Governments of all riparian countries.

INSTITUTIONAL MECHANISMS of the co-operation suggest, first of all, establishing the transparent and accessible regional information system including sub-systems for each river basin. It has to be coordinated with national information systems based on the principle of “information screen” and an integrated morphological structure of regional, basin, and national systems. Such a system was developed in the framework of the CAREWIB Project for top levels of water management hierarchy (the region, basin, and country) and even covers, partially, a sub-national level in the form of so-called “planning zones” that coincide with boundaries of provinces, or are their parts. Using the GIS, the planning zones are aggregated with sub-basins and then subdivided into irrigation and drainage systems. The morphological layout of the Syr Darya basin with subdivision into planning zones (PZ) is given in Figure 4.4, and the principle of their coordination with the irrigation systems, is demonstrated in Figure 4.5.



Figure 4.4 Morphological Layout of the Syr Darya Basin by Planning Zones

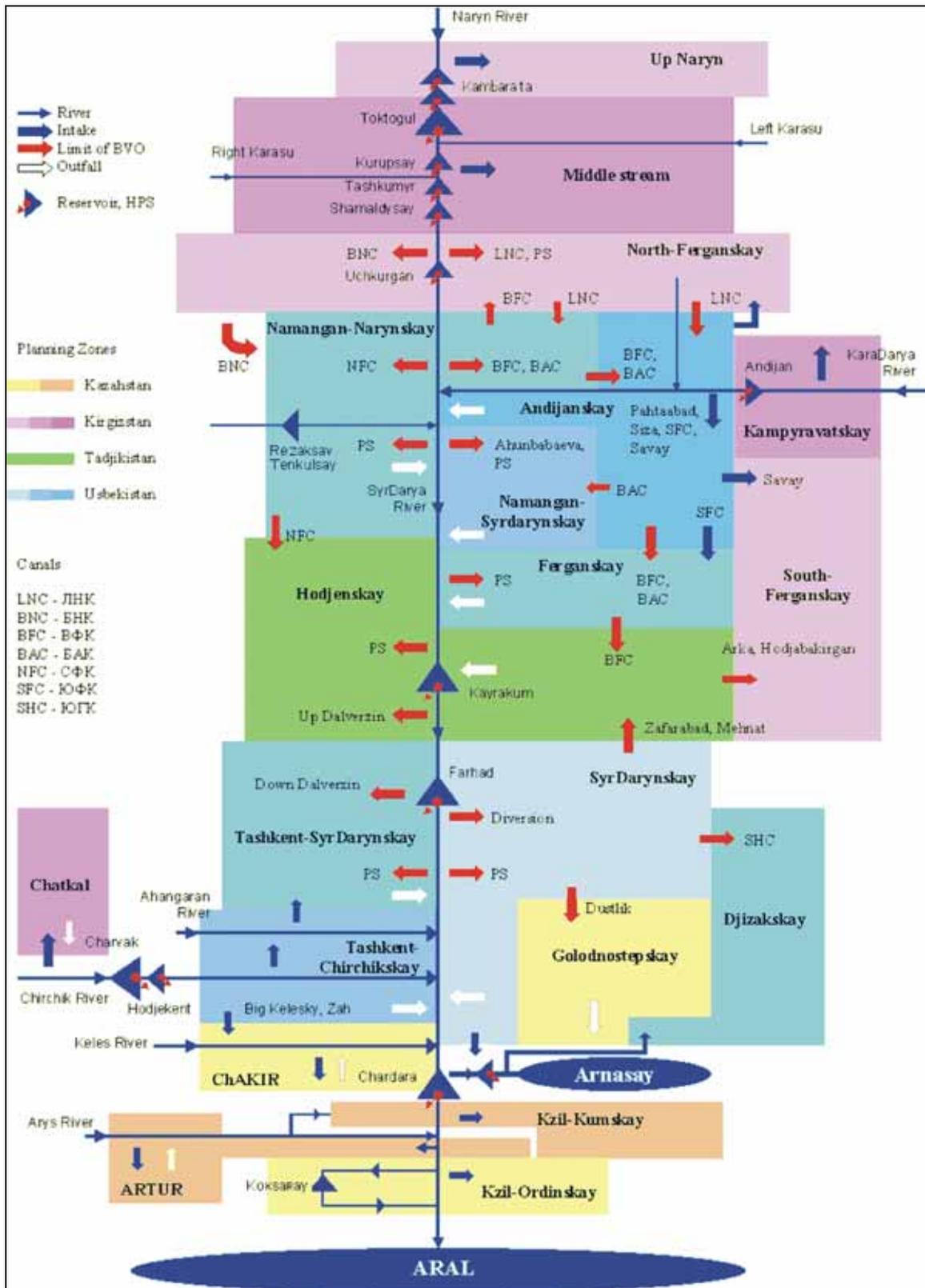


Figure 4.5. The Syr Darya Basin. Interrelations of Planning Zone with Irrigation Schemes.

The Management Information System includes database, GIS, and a set of subsidiary models links of which are given in Figures 4.6 and 4.7., and which allow solving operational management problems and supporting long-term planning.

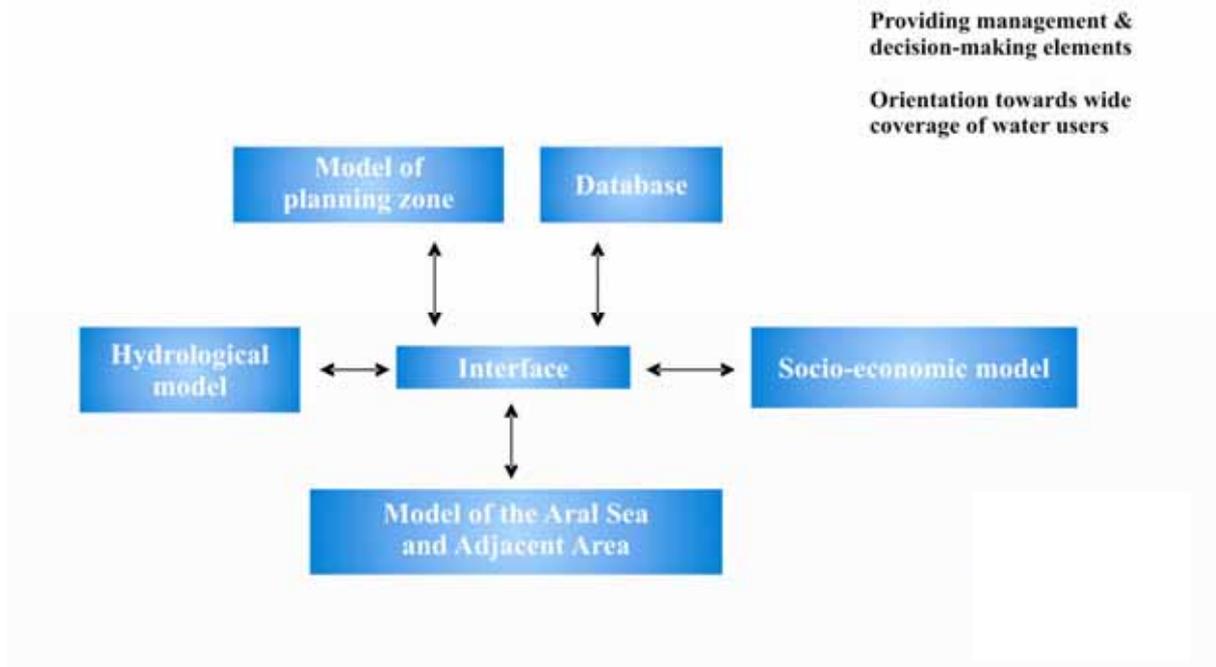


Figure 4.6 Hydrological Model (HM) of the Syr Darya Basin in a Set of ASB-MM

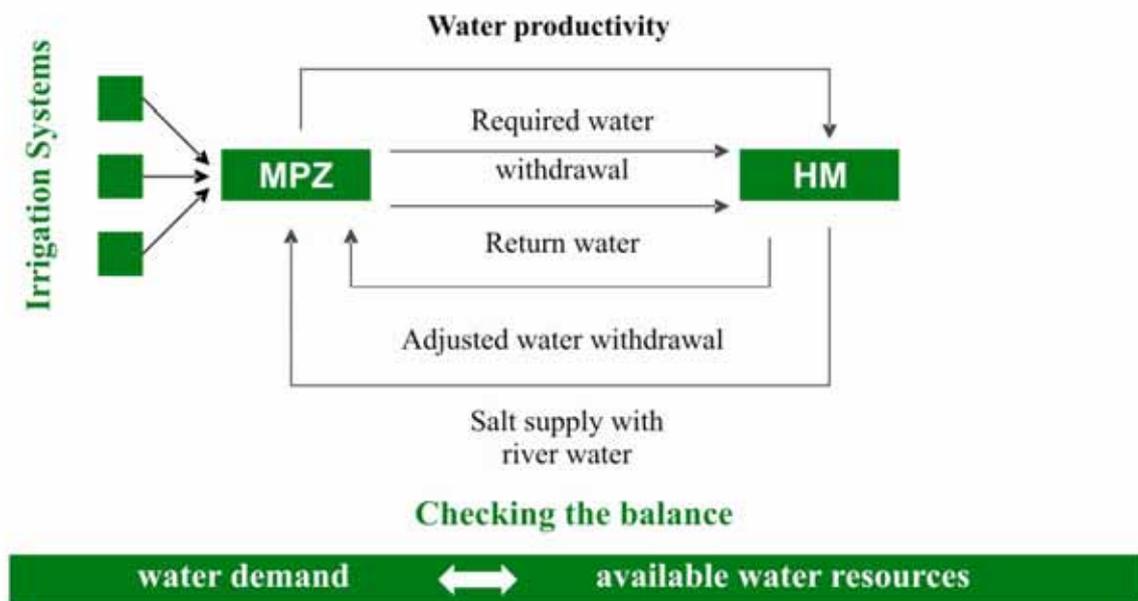


Figure 4.7 Links between the Hydrological Model (HM) and the Planning Zone Model (MPZ)

A set of models proposed for planning and evaluation of management results enables to adjust water allocation continually in order to maximize implementing the planned water use limits in each zone, country, water district, and planning zone. At the same time, socio-economic blocks allows estimating an effect of one or another principle of water allocation and its impacts on productivity of agriculture and development of secondary services so that “initiators of actions” may understand and evaluate effects of their actions

Another important tool is the involvement of all stakeholders into the water management process. Introducing of IWRM on the South Fergana Canal (a command area of about 100,000 hectares) allowed to

reduce water supply through this canal on 39% in comparing with water supply in 2003 (Fig. 4.8) only owing to use of participatory and hydrological approaches with minimum costs for improving the hydrometric practice.

Similar involving of water users, under establishing the Basin Councils under the BWOs “Amu Darya” and “Syr Darya”, enables to enhance coordinating of different water organizations’ activity and, at the same time, to assist BWOs to introduce proper order in water allocation. An experience of pilot projects shows that monthly meetings of Canal Water Council’s members allow involving communities in the water management process not only as supervisors but also as parity participants

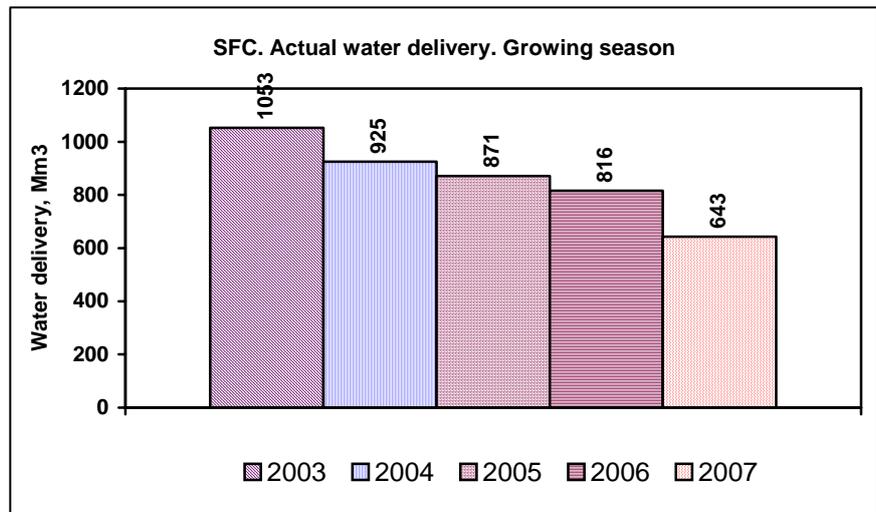


Fig.4.8. Dynamics of water delivery from the South Fergana Canal

responsible for maintaining planned regimes and water diversions at each river section. It is rational to subdivide the Basin Councils into separate units representing each balance site on the river, firstly, in order to monitor these parameters of water management within own site, and, secondly, to defend the interests of own site at regular meetings of the Basin Council.

It is very significant to involve the representatives of lower river reaches, especially, of deltaic water administrations, with their interests that are often infringed upon, in particular, in dry years. The Basin Councils, with their site entities, can assist clearly to specify the environmental requirements of both deltas and some basin sites for preserving the rivers as natural objects. For this purpose, water users and representatives of provincial water administrations, owners of reservoirs and hydropower stations, as well as representatives of the fishery sector, public utilities, and conservancy agencies should be members of the Basin Councils.

One more important element of water management is the training and professional development of personnel of water management organizations engaged in O&M of waterworks on the river, BWOs, national water management organizations, and water users. In 2001, the ICWC Training Center was established based on financial and technical assistance of the Canadian International Development Agency (CIDA), Swiss Development Cooperation and other donors. More than two thousands of water professionals were trained at advanced training courses covering IWRM principles, advanced technologies, international water law and a number of other areas of water management under relatively low financing by donors (about USD 130,000 annually). On the same base, affiliates of the ICWC Training Center were established in Osh, Fergana, Andijan, Urgench for covering water professionals of the intermediate and “grass roots” level, as well as water users. However, after cessation of CIDA financing, since 2006 we are forced to seek funds for training activity continually since even support of trainees (accommodation, travel expenses, daily allowances, learning aids etc.) requires the availability of currency allocations, which the ICWC does not practically have.

The Asian Development Bank renders some support, using which, in 2005 and 2006, 11 advanced training courses covering topics related to water management and water law were held for personnel of national ministries and basin organizations; and this training activity allowed promoting some improvements in operation of ICWC organizations and adopting the inter-state agreements.

It is also necessary to note two target programs funded by the ADB and OSCE. These are: the program “Water & Gender Policy”, based on which the Central Asian Network of Global Water Alliance was established with broad involving of women and opening of liaison offices in all regional countries; as well as the program “Water & Education,” with help of which the topics covering special knowledge on water resources will be included in a curricula of secondary schools.

Developing of gender movement in the water sector has already provided some results, namely the emergence of women among chiefs of WUAs and even CWUCs. As an example, the great organizational activity of Mrs. Maysura Sayfutdinova, the chairwoman of the Water Users Council of the South Fergana Canal, can be mentioned. Often, women-managers are more “go-getter” than men, especially, keeping in mind the local mentality. Therefore, the special training programs should be aimed at training of women-farmers and women - water users in order to strengthen a role of women in WUAs.

An interactive training method, employed in the ICWC Training Center, under which all trainees can exchange their practical experience, is exceptionally useful for creating the atmosphere of collaboration and an understanding of peculiarities and approaches of other countries, as well as for reaching the consensus in the overall view on the future of water resources use. In our opinion, development of training activity is the most profitable and effective investments into raising knowledge and capacity of water professionals, into strengthening the co-operation and creating the atmosphere of “team spirit” in riparian countries, sub-basins and provinces.

Technical assistance and enhancing of training activity at the regional level is one of top-priority objectives of the EC strategy for strengthening the co-operation between Central Asian countries. Proposals for developing training activity were jointly prepared by the SIC ICWC and UNESCO IHE and submitted to the embassies of EC countries; we hope that the international institutions, in the first place, the EC will provide the financial support to the central training center and its affiliates.

Technical mechanisms for improving water resources management at the regional level, first of all, include the system of monitoring, record keeping, and information exchange. Some progress was reached in this direction. In particular, in 1996, activity related to the introduction of the SCADA (Supervisory Control and Data Acquisition System) on the Dustlik Canal’s headworks funded by the CIDA was initiated; and later on the technical and financial assistance of the SDC allowed automating operation of the first dozen of hydraulic structures in the Syr Darya basin. The SCADA, in spite of all fluctuations of water levels and flow rates near a head hydraulic structure, ensures sustainable water delivery into secondary irrigation canals in accordance with planned parameters and, simultaneously, implementation of the monitoring and control of water levels and flow rates within the irrigation system. Earlier, all changes in flow rates near the Uchkurgan Hydro-Scheme (sometimes, up to 100 m³/sec) immediately affected irrigation water supply over the whole Fergana Valley (through headworks of North Fergana Canal, Big Fergana Canal and other main irrigation canals). At present, in spite of the same flow rate fluctuations, deviations in flow rates passing through the headworks do not exceed $\pm 2\%$.

International experts who monitor the introduction of the SCADA on irrigation canals have highly assessed the reached progress and prepared the special presentation for the ICID⁶ session in Sacramento.

It is necessary to note that the participation of local personnel and use of engineering tools that earlier were employed only at USSR enterprises with restricted access (“SIGMA”) allowed reducing the cost of these works 5 to 6 times in comparing with foreign prototypes, ensuring the same quality of operation. The introduction of SCADA is the cheapest way of water losses control. The SIC ICWC together with BWOs developed the proposal on completing these works in the Syr Darya basin and their full developing in the Amu Darya basin that is estimated in the amount of USD 16 million; however, unproductive water losses in the region will be reduced minimum by 7-8%.

We hope that donors and financial institutions in Central Asian countries will find the funds for completing these works in two major river basins within the next 2-3 years.

The introduction of SCADA provides two technical innovations – regular control of water levels and flow rates passing through headworks of inter-state importance and permanent monitoring of water quality. Such a continual monitoring with simultaneous transferring of data to the control units of territorial and central BWO offices allowed avoiding considerable fluctuations in flow rates that took place earlier when flow rate measurements were performed only four times a day. In addition, this system creates the trust and openness in water management in the basin. Including the network of hydrological monitoring on rivers and in upper watersheds that maintained by the National Hydro-Meteorological Services into this system is the next topical task. These works are quite significant for improving an accuracy of water records and forecasts.

DEVELOPING THE NATIONAL PROGRAMS FOR EFFECTIVE WATER RESOURCES USE is no less important instrument than strengthening the collaboration at the regional level. It is very important that,

⁶ International Commission on Irrigation and Drainage

within the above framework of jointly developed strategy, all riparian countries will provide the progress in achieving those indicators of rational water consumption and improving water productivity, which were put into the joint plans.

It is also very important to return former governmental attention and support to water sector in Central Asian countries. First of all, it should be expressed in establishing the united state bodies for governing water resources at the top level as it was done in Tajikistan and Turkmenistan. At the same time, the National Water Councils under the leadership of Prime Ministers should be created in all riparian countries to provide the broad public participation in the decision-making and to coordinate other ministries in respect of rational water resources utilization.

Of course, the proposed program is not complete. This is only some considerations aimed at assisting in developing appropriate plans and measures that can be a cornerstone of the holistic survival program of Central Asian countries under conditions of a future water resources deficit.

4.3. Water Resources Governance and Management at the Level of Irrigation Systems

(N.N Mirzaev, R. Saidov)

As was mentioned in Chapter 1, establishing of water management structures within administrative boundaries, which do not coincide with hydrological boundaries, entails loss of the controllability of some elements of the water cycle affecting sustainability and uniformity of water allocation i.e. of major water management objective. The above is correct for both the whole river basin and some irrigation systems.

Instability and unevenness of water delivery through irrigation canals are caused by both the technical reasons and the organizational ones. Under conditions of administrative-territorial organizational upbuilding of water resources management, it is very difficult to maintain proper water distribution due to the fact that there are many “owners” of the irrigation system: district and provincial water administrations, and local authorities. Owing to such an approach, the well-known problem “head-to-tail” arise when, under a water resources deficit (but sometimes without a deficit), downstream water users have the “impaired rights” in comparing with upstream users. It was typical for the pilot canals at the initial project stage in 2003 (Table 4.4).

Table 4.4.
Uniformity of Irrigation Water Supply from the Pilot Canals Prior To and After the Introduction of IWRM

Pilot Canal	SFC		AAC		KBC	
	2003	2007	2003	2007	2003	2007
Uniformity, %	60	92	45	82	36	77

At present, it becomes more obvious that the problem of improving water resources management is an institutional (organizational) problem rather than a technical one.

One of key directions of institutional improvement of water resources management is the introduction of hydro-geographical principle or, correctly saying, the coming back to the hydro-geographical principle, since earlier, as known, water management organizations were formed based on the hydro-geographical principle.

Subsequently, under pressure of local authorities (District or Provincial Committees of the Communist Party) there took place the reorganization of the Irrigation System Administrations (ISA) into District and Provincial Water Authorities, which established their jurisdiction over a part of the irrigation system or canal within their administrative boundaries. This situation made the process of water distribution more complicated and enabled the local authorities to actively interfere into the process of allocating water resources; and this interference has not always met the requirements of equity, sustainability, uniformity, and efficiency.

At present, the process of transition towards the hydro-geographical principles of water resources management and refuse from the administrative-territorial principle of upbuilding of water management

organizations (WMOs) was initiated in Central Asian region.

A historical aspect of reforming water organizations in Uzbekistan:

1. Hydro-geographical approach (up to the 1960s):

- Irrigation System Administrations.

2. Administrative-territorial approach (with some elements of the hydro-geographical approach - Zerdolvodkhoz, UPRADIC, ADUOS) (until 2003):

- Rayvodkhoz (District Irrigation Administrations);

- Oblvodkhoz (Provincial Irrigation Administrations).

3. Hydro-geographical approach (after 2003):

- Irrigation System Administrations (ISAs);

- Basin Irrigation System Administrations (BISAs); and

- Main Irrigation Canal Administration.

Prior to reforming the institutional structure within the framework of the IWRM-Fergana Project, the pilot canals were under jurisdiction of the following organizations:

- The Big Fergana Canal Administration (BFCA), Andijan and Fergana Provincial Irrigation Administrations (Uzbekistan);
- Aravan and Karasu District Irrigation Administrations (Kyrgyzstan); and
- Gafurov and Rasulov District Irrigation Administrations (Tajikistan).

At present, three Irrigation Canal Administrations: SFCA (South Fergana Canal), AACA (Aravan-Akbura Canal), and KBCA (Khodja-Bakirgan Canal) are active in the project area.

Earlier, prior to the transition towards the hydro-geographical principle, a path of co-ordinations in case of a conflict was the following (the Aravan-Akbura Canal Case Study): the Aravan District Irrigation Administration – Aravan District Authorities – Provincial Authorities – Karasu District Authorities – Karasu District Irrigation Administration. Now, after establishing the AACA, the decision-making process became more simple and effective. At the same time, this facilitates the operation of local authorities, which earlier was forced to solve continually water issues. According to representatives of the local authorities: “there are not now concerns related to water.”

The decision-making process regarding operation of the KBC was also facilitated. As known, depending on seasonal water availability, a decision on “introduction” or “cancellation” of the inter-district water rotation on the KBC had to be made. Like the practice of the AAC, prior to establishing the AACA, it was impossible to make a decision regarding the water rotation in a *timely manner*.

Water resources management based on the hydro-geographical principle was completely put in practice on the KBC and AAC.

In Uzbekistan, transition towards water resources management according to the hydro-geographical principle took place in the scale of all the republic (the Resolution of the CM No 320 of July 21, 2003). There is a reason to consider that the IWRM-Fergana Project contributed into issuing this Resolution. However, it is necessary to note that the process of transition towards water resources management based on the hydro-geographical principle in Uzbekistan was not yet completed, since there

is an intermediate link between the Main Canal Administration and water users that is represented by the Basin (essentially, Provincial) Irrigation Administration i.e. “a body was united but wings were cut.” Nevertheless, a very important step on the way of improving water governance was done. In the frame of the IWRM-Fergana Project, activity related to completing this process on the SFC is in progress.

In particular, in 2006, on the SFC the following was made: almost 40 km of the Shakhrikansay Canal and two remaining hydro-operational sites of the SFC (“Margilan” and “Fayziobod”), which were under the jurisdiction of the Sokh-Syrdarya Basin Irrigation System Administration (BISA) were transferred under the authority of the SFC Administration. In addition, there is the permission enabling five WUAs in Fergana Province to sign the contracts on irrigation water supply directly with the SFC Administration, by-passing the Irrigation System Administration “Isfayram-Shakhimardan.” Activity related to transition towards water resources management based on the hydro-geographical principle on the SFC will be continued.

In those regions where the necessity of transition towards water resources management based on the hydro-geographical principle cannot be put off, water professionals, water users and other stakeholders should initiate this process, not living to see when this problem will be solved at governmental level.

We would like to stress that the necessity of transition towards water resources management based on the hydro-geographical principle at the level of inter-farm canals and, especially, of main canals is out of doubts. At the same time, the practice of establishing WUAs in Central Asia within former collective farms shouldn't be ignored. An adherence of many practitioners to this approach is evidence of the fact that at the level of WUAs, it is necessary to take into consideration not only the belonging of private farms to single hydro-geographic network but also certain social aspects and economic links established last decades. In particular, a role of the hydro-geographical approach at the level of WUAs is not so obvious when the irrigation system has a “fishbone layout” rather than a “nodal layout” [22].

Bottle-necks and ways for reforming the institutional structure of water resources management (the SFC: Case Study)

The experience of introducing a new version “IMS-Fergana” (Uzbekistan, 2007) has shown that under establishing the M&E system on the SFC, some problems arise due to the existing boundaries of WUAs, which can be settled by reorganization of the WUA based on the principle of matching to hydro-geographic boundaries.

Problems related to establishing the affiliates of Canal Water Users Council at the so-called hydro-operational sites arise because some WUAs simultaneously cover two hydro-operational sites⁷.

In 2007, an operational experience of the SFC Administration has shown that in the tail part of SFC (hydro-operational site “Fayziobod”), also on other big secondary canals, it is necessary to establish either the big WUA or the Union (Federation) of WUAs.

Principles of reforming the institutional structure of water resources governance (the SFC Case Study) are the following:

- *A hydro-geographical approach is not an end in itself. It should facilitate the process of monitoring and evaluation of water distribution, which, in its turn, has to facilitate decision making and control of implementing the decisions*
- *A hydro-geographical approach is not a dogma. If under specific conditions, any other factors (technical, institutional etc.) facilitate improving the efficiency of water resources management in*

⁷ A term “hydro-operational site” is of local origin and means a section of an irrigation canal or irrigation system, which is operated and maintained by a separate group (sub-division) of the Irrigation Canal Administration implementing such activities as monitoring, O&M works, record-keeping, and reporting.

the larger extent, then a deviation from the hydro-geographical principle is possible.

- *As a rule, the territorial principle of establishing WUAs in the SFC command area causes some troubles in water resources management.*
- *An issue of improving the water governance structure cannot be considered in isolation from land resources management.*
- *According to its formulation, IWRM requires not only an organizational separation of irrigated areas according to their belonging to irrigation water sources but also their integration if this measure facilitates a holistic settling of problems related to water and land resources management.*
- *Parameters of water management structures depend on sizes of the irrigation system.*

It is desirable to adhere to the following principles under realization of the hydro-geographical approach:

- *Irrigation water supply to a WUA only from one water source;*
- *A WUA has to be located within one hydro-operational site. If it is difficult to change WUA boundaries then the possibility of changing hydro-operational site's boundaries should be considered;*
- *WUAs have to be located within one administrative district (exception can be made only for WUAs located on inter-district canals);*
- *WUAs should cover land plots along both banks of the SFC;*
- *Other rural water consumers (villages, holiday villages; etc) have to enter into WUAs;*
- *WUA's area has to be within 1500 to 2000 ha;*
- *Realization of the hydro-geographical approach should be implemented based on the agreed and approved plan;*
- *A plan of realization of the hydro-geographical approach must be developed with the participation of water users and officials of the SFC Administration;*
- *A plan of realization of the hydro-geographical approach has to be discussed at meetings of the WUA Council and Boards of SFC;*
- *A plan of realization of the hydro-geographical approach has to be approved at the enlarged session of the Board of SFC WC with the participation of local authorities' representatives.*

The Action Plan on reforming the water governance structure should include the following measures:

- *If a WUA takes water directly from the SFC, a WUA has to sign the Contract on irrigation water supply with the SFC Administration;*
- *If a WUA takes water from different irrigation water sources (not only from the SFC), a WUA should be restructured in such a way in order to take water only from the SFC;*

A number of WUAs divert water from the canals of different ranks in the SFC system.

Recognizing the importance of transition towards water resources management based on the hydro-geographical principle, it is necessary to acknowledge that only the transition towards the hydro-geographical principle does not make the decisions of water professionals more equitable and effective. It creates opportunities (prerequisites) for making more equitable and effective decisions. Whether a water professional will take advantage of the opportunities (or not) to make water governance effective depends on some objective and subjective factors; and the participatory approach is a key factor among others. A

problem of improving water governance based on the participatory approach is topical not only for the Central Asian region (CAR). A World Water Forum Declaration (The Hague, 2000) contains the following statement: “The water crisis is often a crisis of governance”; therefore, making water governance effective is one of topical priorities (GWP, 2000). A Ministerial Declaration on Water Security in the 21st Century reaffirms this standpoint and calls on: “Governing water wisely: to ensure good governance, so that the involvement of the public and the interests of all stakeholders are included in the management of water resources.” [39].

Reforming the agricultural and water sectors in the CAR creates opportunities for encouraging equitable and effective water governance on the market base. Established institutional and market conditions, being major prerequisites, are not insufficient for appreciable improvement of water allocation governance. At present, a lack of the public participation in governing water and agricultural sector is one of the constraining factors that impede raising productivity of agricultural production and effectiveness of water governance in the region. Therefore, the democratization of water governance through involving the public in decision making and establishing new-type water organizations (Fig. 4.9) that will take into consideration the interests of common water users becomes topical. A problem is to find a reasonable level of unity of decentralization and governmental regulation. At a “grass roots” level of water distribution (a level of former collective farms), this dilemma can be solved by establishing water users associations (WUAs). At the same time, Canal Water Users Unions (CWUUs) have to be established at the level of main irrigation canals (or irrigation systems). From this point of view, morphology of irrigation network and governance on the Aravan-Akbura Canal, where the CWUUs are formed based on the involvement of WUAs and other water users that are not WUAs members and represent non-agricultural stakeholders can be considered as an ideal solution.

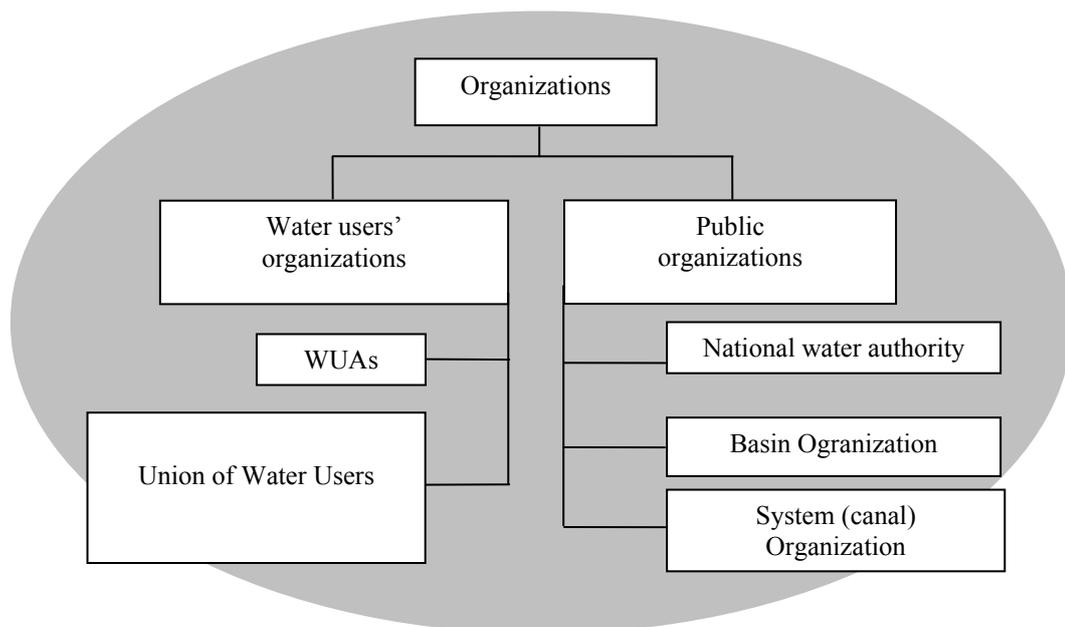


Figure 4.9 Water Organizations in the Frame of National Water Governance

Why the public has to be involved in water governance?

Due to different socio-economic approaches, there are the following methods of water allocation: centralized (governmental), decentralized, and combined.

A Centralized Method: A domestic and foreign experience shows that, at present, a purely centralized (governmental) approach does not already allow ensuring sufficiently equitable, effective, and ecologically sound water governance. Equitable water governance means that all available water resources are used in the manner meeting completely the needs of all social groups. It means that any decisions should meet the interests of all social groups, somehow or other, involved in water use, creating an enabling environment

for their direct participation in decision making. Otherwise, a risk of unfair water governance is rather great, resulting in aggravating poverty, natural disasters, and social instability. The centralized method of water governance has prevailed in Central Asia. Governmental officials have to defend the democratic fundamentals of social progress according to their official duties, although their interests can differ from interests of the civil society. Therefore, public participation is necessary in order to create the atmosphere of transparency and openness when the likelihood of decisions making contradicting the public interests is reduced.

The higher level of public participation the less favorable conditions for corruption and ignoring the public interests. At the same time, it is necessary to understand clear that the decentralized method of water governance can be completely introduced only when the public management bodies reached full institutional and financial self-sufficiency to cover running and development costs (by analogy with the French system). Under conditions of prevailing irrigated farming, as a major water consumer, and of a low level of self-payback, putting all water governance and management on “shoulders” of water users and other stakeholders means for them non-sustainable existence.

Therefore, under our conditions it is more correct to move towards combined methods of water allocation. In this case, decentralization, or its combination with centralization depending on capabilities of stakeholders, is implemented through involving the public in the process of water allocating and transfer interested entities the right to make decisions regarding issues that can be solved more effective on-site. The more decentralized the decision making the broader the public participation. It is clear that public participation is a very complicated process because the resistance of some officials should be overcome.

Here, it should be mentioned the following aspects related to assessment of a role of water professionals, water users, and local authorities. It does not mean that water professionals are “bad boys” and water users “good boys.” “Bad guys” can be met both among water professionals and among water users. It means that “good boys” among water users should be united into the public associations to help “good boys” among water professionals to allocate water in an equitable and effective manner.

At the same time, the local authorities belong to stakeholders-water users or, in other words, interested legal entities. However, traditionally, local authorities manage water professionals. It does not mean that local authorities poorly govern – the practice shows that a leading role of local authorities can affect water management both positively and negatively. In particular, a moving towards the participatory approach is aimed at enhancing a positive impact and mitigating a negative impact of some representatives of the local authority by means of democratization of water governance.

The Second Method: Water, depending on its target use, can be a social benefit. In this case, it can be used for ecological, social, recreational, sanitary, and other purposes. Such its value just strengthens the necessity of transition towards joint governance when authorized state bodies (national or local) represent the state interests in new-established management bodies, working together with representatives of water users.

The Third Method: Water users’ water governance includes water resources management and water demand control. In developed countries, an emphasis is shifted to regulating of water demand, but in the CAR, an emphasis is traditionally made on water resources management; and under conditions of a water resources deficit, problems of water use cannot be solved only by engineering tools. A specific character of water demand management consists in focusing on people engaged in water use rather than technical norms and facilities.

There is one more important aspect requiring water users’ participation – a budget deficit along with the need of public control over necessary expenditures for operation and maintenance of water infrastructure. Under budgeting, a necessity of those or other expenditures is specified practically by the same economic players that, hereinafter, spend budgetary financial resources. As a result, there is the possibility for overstatement of planned and actual scope of works. Under conditions of joint water governance, when the sources of financing are combined – partly from a “pocket” of water users and partly from the state budget

– the mechanism of public control over specifying a necessary financing and expenditures is active.

Thus, taking into account above statements, the public participation is a significant tool for improving water governance, creating the enabling environment for realization of principles of openness, transparency, and fairness due to better awareness of water users, higher material incentives of operational services' personnel to meet the needs of those who are serviced by them and on whom they depend.

Whereas, a rising of water users' awareness is able to put an effective barrier for infringement of the principle of fairness by officials and employees of operational organizations, as well as for an illegal interference of local authorities' representatives, the concept of public participation is, not always, supported by them. They pay lip service to the public participation, but, de facto, either undervalue its role or resist to it [18, 41].

Canal water users union (CWUU)

A concept of introducing IWRM, in line with which institutional improvement of water governance was planned through establishing Canal Water Users Committees (CWUCs), was developed in the beginning of the IWRM-Fergana Project [41].

In the course of its realization it became obvious that the idea of establishing the CWUC is correct, but our views on how to do this had to be adjusted. This became clearer when questions concerning a legitimacy of participating the CWUC in water governance and its sustainability in the post-project period have arisen under specifying the legal status and mandate of the CWUC.

At present, principal steps for the introduction of participatory approach are undertaken in the following sequence:

- 1. The Resolution on establishing the Canal Water Users Unions (CWUU) was adopted at the Constituent Assembly of agricultural water users; the following CWUU were established and officially registered: Water Users Union on the SFC (WUU SFC), Water Users Union on the AAC (WUU AAC), and Water Users Union on the KBC (WUU KBC);*
- 2. Official registration of the CWUUs was approved by the Ministry of Justice;*
- 3. The Agreements on the joint management of the canals were signed with water management organizations (WMOs) ranked higher than the Canal Administration (CA);*
- 4. The CWUCs, as the joint water governance bodies, were established;*
- 5. Non-agricultural water users and other stakeholders became the official members of the CWUUs (and members of the CWUCs as representatives of the CWUUs);*

Our views on joint water governance also underwent some changes. At the beginning, we thought that joint water governance should be implemented by the CWUU and the CA. Now, we consider that joint water governance has to be implemented by the alliance of the CWUU and WMO rather than the alliance of CWUU and CA. When we speak about the WMO we keep in mind the organization, which directly governs the Canal Administration

The CWUU executes its activity based on the Charter adopted at the Constituent Assembly of water users of the pilot irrigation canal.

It was decided that the water users' organization having a legal status should be firstly established. The Constituent Assemblies, at which water users approved the Charter of the CWUU, were anew held. Agricultural water users were the founders of the CWUUs on all pilot irrigation canals. In the course of consultations, jurists have clarified that other water users can become the members of the CWUU, after its official registration, submitting their applications. The Boards of CWUUs were set up when the CWUUs were officially registered.

Subsequently, a question how and who empowers the participation of CWUU in water governance was arisen.

A concept of joint water governance, in compliance with which the CWUU is authorized to participate in water governance through its representatives in the CWUC that was established based on the Agreement on Joint Water Governance, was developed and put in practice.

A joint governance body, in the form of the Board of CWUC including representatives of water organizations and agricultural water users, is established at the initial stage. The Council of CWUC including representatives of other water users and stakeholders, which are not direct water users (for example, representatives of local authorities, NGOs, sanitary services, conservancy agencies, and other organizations), is formed during the next stage.

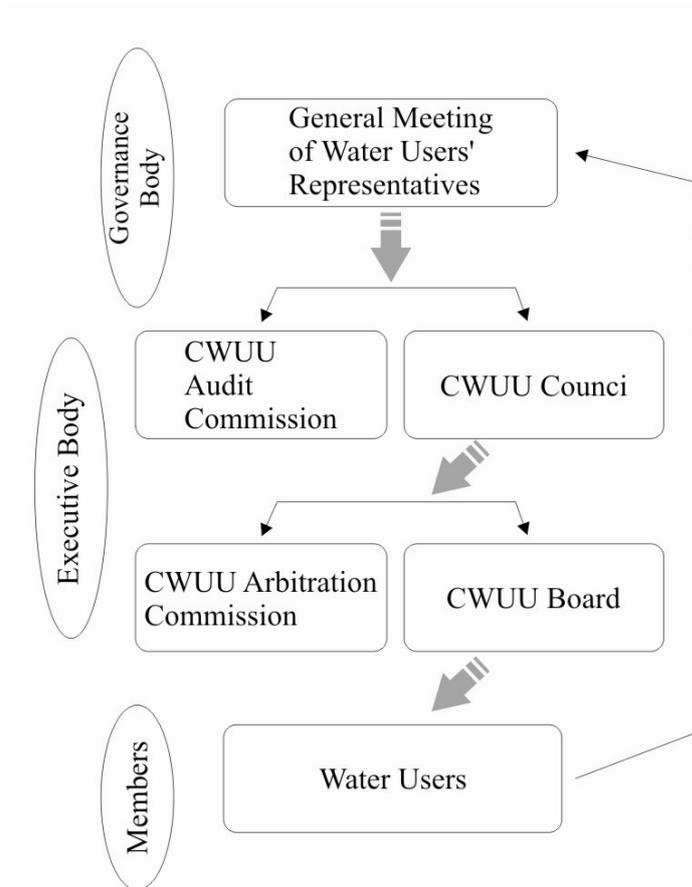
The Canal Water Users Union (CWUU) mandate and functions

The CWUU is a noncommercial public organization, by means of which all individuals or legal entities interested in water services (local authorities, irrigated farms, conservancy agencies, public utilities, power sector, fishery farms etc.) have an opportunity, through their representatives in the Canal Water Users Committee, to participate in water governance on the equitable base. Thus, the CWUU, on behalf of its members, pursues a general technical and economic policy that provides equitable, sustainable, effective, and ecologically sound governance of water allocation over the irrigation canal's command area.

For implementing these tasks, a newly-established CWUU, through its representatives in the CWUC, executes the following functions:

- Participation in elaborating the strategy of developing irrigation and land reclamation services over the irrigation canal's command area;
- Coordinating the water allocation plans;
- Monitoring of the compliance of actual water allocation with the principles of fairness, sustainability, uniformity, and efficiency;
- Coordinating a plan of water infrastructure maintenance and repairing;
- Coordinating the Canal Administration's budget and participation in drafting business plans;
- Mobilization of additional funds for activity of the CWUU and Canal Administration;
- Extension services (in the outlook under the availability of funds) in the field of water management, establishing of WUAs, and co-ordination their activity and other water users. At this stage, the project, through its local specialists, facilitates beginnings of this system by means of activity on so-called "pilot polygons" under leadership of project trainers financed by jointly the BISA and the project; and
- Others.

Due to restructuring of shirkat (cooperative) farms and establishing of WUAs, the general meetings of representatives from hydro-operational sites (HSs) were again held on ten SFC HSs to renew the membership of the Councils of these units (HSs).



Subsequently, the general meeting of representatives from the SFC water users was held to renew the membership of the Water Users Union of SFC (SFC WUU). All these measures were aimed at promoting activity related to involving water users into water governance at the level of hydro-operational sites enabling to make activity of the SFC WUU more effective.

The SFC WUU consists of a head office and 10 its affiliates (according to the number of hydro-operational sites on the SFC), representing the Water Users Unions of Hydro-Operational Sites on the SFC (WUU HS SFC), see Figure 4.11. It is necessary to note that the organizational framework of WUU HS SFC is similar to the organizational framework of SFC WUU and consists of governing and executive bodies responsible for water governance and management within a hydro-operational site.

Figure 4.10. Sample Organizational Framework of the CWUU

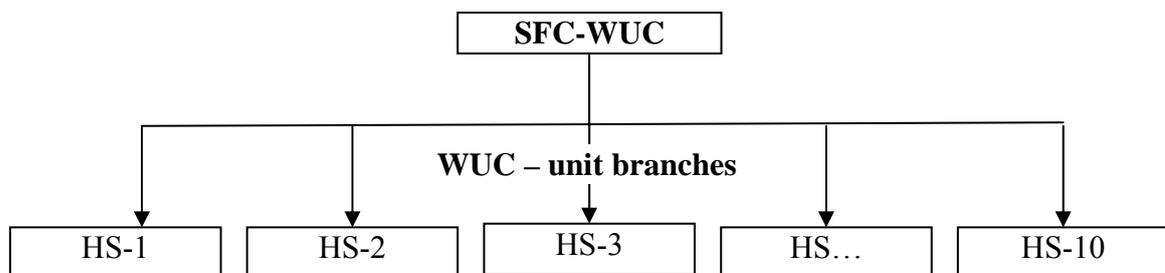


Figure 4.11. Organizational Framework of the SFC Water Users Council

Financial Aspects of CWUU Activity

Stakeholders (water users and others) and international donors finance activity of the CWUU. The CWUU budget is drawn up by the Board of CWUU and approved by the general meeting of water users (or by the CWUU council, if the general meeting authorized it).

Within the project framework it was planned that financing of the CWUU activity will be implemented at the expense of special funds allocated in the CA budget, but the experience of CWUU activity has shown that it is impossible to rely on their financing.

It became obvious that for providing the financial sustainability, the CWUU Council should be financed directly by stakeholders and donors. Water users of all WUAs on the AAC, at their meetings and at the general meeting of water users, which was held in December 2004, made decision on financing the CWUU Council. All WUAs have agreed to contribute into the annual budget of the CWUU Council in the amount of Tajik Som 10 per ha (about USD 2500 annually). This amount was sufficient mainly for covering expenditures related to conducting the meetings of CWUU Council, hiring of auto-transport, wages of three members of the Board of CWUU etc.

unds for financing the CWUU Council of the AAC are provided for in budgets of WUAs but not paid in full. Therefore, the CWUU Council of the AAC faces a lack of funds. In 2006, part of these funds was used to prepare the project proposals to potential donors to equip two newly-established WUAs with minimum office equipment.

Taking into consideration the grave financial situation in the CWUU at the initial stages of its activity due to overall financial difficulties at most of water users, it is reasonable: i) to brisk up the work with donors and water users (collection of membership fees); and ii) to seek medium-term credits, with a low interest rate. For this purpose, at the meetings of CWUU Council and the general meetings of representatives of water users, it is necessary to obtain the support of water users, and then, together with specialist, to initiate preparing and discussion of the business plans for the CWUU and to follow the formal procedure.

In comparing with other CWUUs, the CWUU SFC is in the best conditions, since more than Uzbek Sum 100,000 was transferred to its bank account, and the SDC has granted USD 8,300 (this grant covers the annual budget of the CWUU SFC that equals to Uzbek Sum 10 million), as well as it won the US Embassy Grant in the amount of USD 4,000 for conducting workshops in the SFC command area in 2007 and 2008.

Cost items of the CWUU are given in the table below. Either only the governmental budget funds or, under conditions of water charging, combined funds of governmental budget and water users' fee are used for financing CA operation.

No	Cost Items	Sources of Financing
	Wages of some members of the CWUU Board	1. Fees of WUA members
	Expenditures that covers conducting the meetings of the CWUU Board and Council, and the general meeting of representatives of water users	2. Donors' grants
	Payment for renting the office	3. Income from commercial activity of the CWUU
	Payment (in the prospect) for consulting services (jurists, scientists, engineers etc.)	
	Travel expenses	
	Entertainment expenses	
	Other operating expenses	

Legal aspects of establishing and activity of the CWUU

The CWUU is a nongovernmental noncommercial organization having the status of legal entity with own the bank account.

In Kyrgyzstan, the CWUU was registered under a name: “the Union of Water Users Associations of the AAC”, and in Tajikistan under a name: “the Union of Agricultural Producers-Water Users “Khodjabakirgansay”.” Founders of the latter are agricultural co-operatives. Representatives of the Provincial Department of Justice consider that other stakeholders (including WUAs) can become a member of the CWUU KBC after its registration based on submission of an appropriate application.

The CWUU SFC was officially registered in the Ministry of Justice of the Republic of Uzbekistan.

Constituent Assembly

A final phase of social mobilization at the level of main canal is the preparation and conducting of the meeting of representatives of water users (MRWU). The two-level system of conducting the MRWU (at the beginning at hydro-operational sites, and then for the whole canal) is recommended for big canals, like the SFC. Since only founders are attending the first meeting rather than all water users, it is called “the constituent assembly of representatives of water users.”

Agenda of the Constituent Assembly of representatives of water users:

1. Discussion, improvement, and adoption of the CWUU Charter;
2. Elections and approval of the CWUU Council members;
3. Elections of the CWUU chairperson (he/she is also a chairperson of the CWUU Board).

The first (constituent) MRWUs on the pilot canals were held in December 2003. Subsequently, MRWUs are held annually. Their agendas include discussing of activity outcomes of the CWUU and CA during a reporting year and working plan for next year, as well as some organizational issues.

Since over 90% of water is consumed for irrigation, it is important in principle in order that agricultural water users can make up a majority in the CWUU and its Board, and it is also important in order that a representative of agricultural water users from the tail part of irrigation canal would be elected as the Chairperson of CWUU (CWUU Board). As a rule, chairpersons of the CWUU SFC and CWUU KBC represent agricultural water users of pilot canal downstream areas. As a result, irrigation water supply in downstream sites of pilot canals has improved.

The CWUU Council

After the constituent assembly of water users, the meeting of CWUU Council is held to solve the following issues:

1. Elections of CWUU Board members;
2. Forming an arbitrage board and auditing committee;
3. Preparing the annual plan and schedule of CWUU activity (an assignment for members of the CWUU Board).

At present, a WUA organizational structure, in which a governing body is represented by the CWUU Council headed by a Chairman, and an executive body is represented by a WUA Directorate headed by a Director, was adopted in Central Asian region. Since the position of WUA Council’s Chairman is voluntary and a WUA Director manages all finances, the Director is a key personality and a role of the

WUA Council and its Chairman, as a rule, is negligible.

In Turkey, for example, another organizational structure was adopted, and a key personality is a WUA Chairman. It is necessary to note that the legislation of Kyrgyzstan envisages two options of WUA organizational structure, including the option adopted in Turkey. In addition, at the beginning, WUAs in Kyrgyzstan were established according to the Turkish organizational structure of WUAs. This structure can be considered as a WUA organizational structure for the transition period.

The CWUU Board

The CWUU Board, at its meetings, reviews a draft annual working plan and schedule of CWUU activity and submits them to the CWUU Council for its approval. After discussion and approval of annual working plan and schedule of CWUU activity at the CWUU Council meeting, all works are implemented in compliance with these documents.

In addition, the CWUU Board delegates its representatives to the CWUC for joint governance of the Canal Administration. The members of CWUU working in the CWUC Board participate in assessing water allocation over the last ten-day period and in decision making for a next ten-day period (based on indicators of water allocation that are calculated with help of the MIS), as well as in conflicts resolution. An example of water users' constructively participation in decision making is their participation in settling the conflict with Kyrgyz water users and also the conflict between the BISA "Naryn-Karadaya" and the Main Canal System Administration (Fergana Valley) in August-September 2007. The CWUU Board pays special attention to the tail hydro-operational site "Fayziobad" on the SFC; and therefore, indicators of water allocation at this HS have considerably improved in spite of dry year.

A CWUU Chairman

A CWUU Chairman (he/she is also a chairperson of the CWUU Board of the Council) is elected at the general meeting of water users with the 3-year run of office. During the elections procedure, a preference should be given to a representative of agricultural water users located along a downstream stretch of the irrigation canal. A CWUU Chairman can be removed from his position based on the decision of CWUU Council, if the CWUU Council considers that a CWUU Chairman is not able or unworthy to execute his assigned functions, or based on his written request about resign. The CWUU Council has a right by secret ballot to elect another person as an acting chairman instead of a former one.

CWUU Chairmen were elected by open vote at the constituent assemblies of water users. In 2004, chairmen of CWUUs of SFC and AAC were reelected at the meetings of the CWUU Councils. A reason was the following: CWUU chairmen have changed their places of basic employment and could not represent the interests of water users in the CWUU Council.

Chairmen of CWUU SFC and CWUU KBC represent the interests of water users located along tail parts of the pilot canals.

An Arbitrage Commission

The most important function of CWUU is to consider matters of argument and to settle conflicts between water users, as well as between water users and the Canal Administration. An arbitrage board (commission) is subordinated to the CWUU Council.

Since 2004, conflicts related to water allocation between the Canal Administration and water users have practically ceased at the level of pilot canals. Specialists consider that this is mainly related to reforms conducted in the frame of the project. The reforms have provided good results in dry years, but now other types of conflicts are topical mainly due to external causes: in Kyrgyzstan – "tulip revolution"; in

Uzbekistan – sudden stop of water releases from the Andijan Reservoir; and in Tajikistan – peculiar price and tax policy regarding water services of the KBC Administration.

At the same time, in Tajikistan the conflict between the KBC Administration and “non-payers” intensifies. The KBC Administration, by approbation of the KBC CWUU Committee, has attempted to use extreme, but legal pressure: temporary cessation of irrigation water delivery to water users, which do not pay for water services, and has directed this matter to economic court. Nevertheless, in Tajik water users’ opinion, without reforms it would be impossible to deliver water to the farm “Samadov” in 2006 and 2007.

In 2007, there was the conflict on the SFC between the SFC Administration and Kyrgyz water professional and water users, which was provoked by sudden stop of water releases from the Andijan Reservoir. This conflict was discussed with representatives of Kyrgyzstan (of the Aravan District Irrigation Administration and frontier WUAs) in the course of seminar on planning of water allocation (Fergana, August 2007) and at the joint meeting of SFC Water Committee and the Water Committee of hydro-operational site “Karkidon Feeding Canal” (KFC). The following attendees were at the joint meeting: Chairman of the SFC WC, Chairman SFC CWUU, representatives of BISAs “Sokh-Darya” and “Naryn-Karadarya”, and Director of SFC Administration. It was decided to strengthen and brisk up the work of SFC WC and to authorize it to settle conflict situations efficiently and promptly.

An Audit Committee

To provide the transparency and openness of CWUU activity, an audit committee consisting of three members is elected at the general meeting of water users. The audit committee does not audit financial management of the CA, but has access to auditors’ reports related to auditing its financial management. The audit committee audits only funds allocated for the CWUU Council operation.

Audit Committees of the CWUU on the pilot irrigation canals was not yet formed due to absence of such a necessity, since there are not funds.

In the course of preparing and conducting the meetings of CWUU Board and Council, an awareness of water professionals and common water users is rising. In addition, issues, about which it was preferred to be silent (interference of local authorities in water allocation) or which were ignored (uncoordinated activity of power supply managers resulting in sudden shutdowns of pumping stations and unsustainable irrigation water delivery to secondary canals) are now tackled. In Tajikistan, undue gravel excavation from the Khodjibakirgansay channel causing riverbanks’ erosion, washing out trees and reducing the safety of waterworks became the subject for consideration at the meeting of CWUU Council.

The SIC ICWC has streamlined the study of cross-sectoral interests and links in the pilot canal’s command area. Analyzing collected data has shown that the following problems are the most topical for all three pilot canals:

- Water protection zones (WPZs). Political, legal, and financial issues impede a clear definition of WPZ boundaries and owners along the pilot canals (PC). Effects of this situation are the following:
- Contamination of the WPZs (garbage; washing cars; lavatories; pumps, garages, ...);
- Unauthorized acquisition of WPZ lands;
- Water pollution (garbage, wastewater, spoils, disease carriers and pathogenic bacteria).
- Water supply to the population (also for watering livestock) both during the growing season and, especially, in the dormant season. This problem is extremely topical due to severe deficit of potable water in the pilot canals’ command areas;
- Land reclamation: rise of groundwater table on the downstream plots due to irrational water use on upstream plots; and

- Population safety. Sometimes people drown in the pilot canals (it is especially typical for the SFC); As a result, breakdowns of irrigation canal operation and decrease in the stability of water intake into the pilot canal and water diversions from the pilot canal take place.

Information collected by project consultants over the period of 2005 to 2006 under studying the cross-sectoral interests and links in pilot canal command areas was synthesized; and the book: "The Research Record on Issues of the Environment, Potable Water Supply, Land Reclamation, Power Supply, Pumped Irrigation, and Sustainability of Water Availability" was written based on collected information. The first chapter of this book is devoted to the SFC, second chapter to the AAC, and third chapter to the KBC. The book was distributed among local water professionals. An electronic version of this book will be as the basic for the Knowledge Base, which is, in its turn, the integral part of pilot canal database (www.cawater-info.net/iwrm).

Studying water management problems in co-ordination with problems of other sectors is not an end in itself. The goal is to develop appropriate action plans and streamline their implementation based on the studies of these problems. The WCUUs of pilot canals (SFC, AAC, and KBC) and the canal administrations are responsible for implementing these plans in the frame of the project.

Action Plan No1 that is covering the environmental issues, potable water supply, and land reclamation under water management on the pilot canals was developed based on findings of studying the cross-sectoral relations and now is being implemented including the following actions:

- Measures for cleaning and planting of greenery in the WPZs with involving stakeholders in the form of "khoshars" (a voluntary participation in works of public importance);
- Formal notifications to the administrations of districts and cities located in the pilot canals command areas with the request to improve the situation related to pollution of the WPZs;
- Joint field inspections of CWUU members and representatives of conservancy agencies to inspect ecological and sanitary conditions in the WPZs and settlements adjoining the SFC;
- Meetings for improving an sanitary awareness of settlements' inhabitants to prevent pollution of irrigation canals and WPZs;
- Operational schedules of the PCs for the dormant periods to mitigate potable water deficit in the pilot canal command areas;
- The formal letters to potential donors with the request to assist in solving PC problems through initiating the water supply and sanitation projects in the PC command areas;
- Accounting return and ground water under planning water allocation and adjusting the plans of water allocations on the pilot canals;
- Other actions.

Joint governance and management

From the hierarchical point of view, governance is implemented at the national level external regarding the overall system of governing the water sector and based on the national constitution and other regulative mechanisms executing international conventions and treaties, national laws concerning property rights, market relations, water charging, water rights, water rights market, investments, subsidies, and other national mechanisms. Its subordinated form is *internal governance* at the sectoral level, which, acting in the framework of directory regulations and financial restrictions, can establish its own sectoral regulations and rules including allocating funds, quotas, institutional structures, staff, norms, rules of information exchange, a reporting system, and many other procedures, which serve as guidelines in the management process.

From an institutional viewpoint, IWRM is characterized by transition from exclusively state governance towards the so-called joint governance when part of governmental powers are transferred to bodies formed together with public organizations.

Under these circumstances, governance bodies are the following:

1. State governance
2. External governance, which, in compliance with the Constitution, means activity of the President, Parliament, Government and local authorities;
3. Internal governance, which, on behalf of the Government, is executed by National Ministries and Committees responsible for water resources (Ministry of Public Utilities, Ministry of Agriculture and Water Resources, State Committee on Environment Protection, Ministry of Energy, Ministry of Geology) in their offices in provinces and administrative districts; and
4. Public governance represented by above CWUUs.

The WMOs that directly execute internal governance of the Canal Administrations are the following: for the AAC – Osh BWMO; for the SFC – the Fergana Valley System Administration of Main Canals with United Dispatcher Center (FV MCSA & UDC); and for KBC – the Ministry of Land Reclamation and Water Resources of the Republic of Tajikistan.

In respect of operational management that means the process of planning and implementation of technical, technological, financial, and organizational measures related to water allocation and O&M of water infrastructure, in this case we consider “management” as a synonym of “operation and maintenance.”

Functions of governance bodies are the following:

1. Annual planning:
 - Specifying and balancing water demands and available water resources;
 - Water allocation within established water use limits;
 - Managing of drainage systems and protection of water quality;
2. Implementing the plans of water use:
 - Water distribution in due time;
 - Drafting the regimes of water releases and filling reservoirs;
 - Drafting the schedules of water delivery;
 - Control of organizational water losses.
3. Monitoring of Implementation:
 - Establishing a water gauging and record keeping system;
 - Analyzing and adjustment of an operational mode;
 - Evaluation of water saving.
4. O&M of water infrastructure:
 - Reservoirs and headworks;
 - The main and secondary irrigation networks and hydraulic structures;

- Drainage network;
 - Gauging stations;
5. Establishing and maintaining the database.

A theory and practice of transferring powers for water governance

In the world practice of restructuring the water and agricultural sectors, the transferring of powers for water governance means the full or partial transferring of responsibilities and powers related to water governance from the national government towards groups of water users themselves organized in the form of various consumers' or production co-operatives, partnerships, associations, unions, federations etc.

A world practice shows that due to local conditions and economic and technical capabilities of both those who hands over the powers and those who takes over governance functions, such a transfer may have different forms and scales. A key cause for transferring governance over operational organizations, as a rule, is the lowering of a water resources controllability level and deteriorating water infrastructure and services due to the following factors:

1. Jump in the number of water users and complexity of water supply and distribution under using former methods;
2. A lack of budgetary funds for further financing of water management organizations;
3. A low level of fee collection for irrigation water delivery and other water services; and
4. A low level of professional knowledge of officials and personnel of water management organizations and a lack of incentives for proper work under conditions that were changed in the process of reforms.

Therefore, the involvement of water users in direct governance of water management organizations is a call of the times and also one of the world widespread methods to tackle the crisis in the water sector.

After independence, tens of and even hundreds of small farms were created and continue being created instead of large collective farms in the agricultural sector in Central Asian countries. O&M services that earlier operated in collective farms and state farms went out of business. Instead of them in countries of the region, water users associations (WUAs) that are operating according to principles of forgotten bygone traditions of "*Adat*"⁸ and "*Shariah*"⁹, the cornerstone of which is the public participation, are being established. Foreign and local experience of WUAs shows that a direct participation of water users in water governance, as a rule, provides sustainable, equitable and effective water resources management.

At present, an experience of public participation in Central Asia is mainly limited by the WUA level, i.e. within the former on-farm irrigation and drainage network. At the same time, the world experience shows that a direct participation of water users in water governance at higher level, for example on the main irrigation canal, also can be effective solution:

1. To improve the controllability of irrigation systems and, based on this improvement, to raise a level of uniformity, effectiveness, and sustainability of irrigation water supply;
2. To create incentives to water users and personnel of operational services for reducing water consumption and O&M costs. At the same time, performance capabilities are considerably raising due to greater responsibility of water users and allows:

⁸ A word "adat" literally means a habit, custom, or tradition. Rules and provisions of the Adat in the legal sense are regulations of the customary law

⁹ The Shariah is the Muslim Legislation

- To improve financial and technical conditions of irrigation systems;
- To reduce the number of disputes due to unsustainable irrigation water supply;
- To increase a collection of fees for irrigation services;
- To raise crop yields and revenues owing to effective water distribution;
- To defend own interests (as a more consolidated group) in the process of developing governmental and legislative decisions;

Active participation of water users in governance of operational organizations due to the transfer of powers from governmental organizations to associations of water users allows achieving more qualitative water management, rise of productivity of water and land use, improvement of land reclamation conditions, and consolidation of separated groups of water users over the whole irrigation system.

In contrast to foreign developing countries that reforms their water sector where private farms initially existed as separate water users, and inter-farm irrigation network belonged to the state, the farms in Central Asia were, as a rule, collective units and, de jure, already had powers for water governance.

In the period of reforms after restructuring collective farms, the former on-farm irrigation network became ownerless, and the controllability of water distribution has lowered up to the level when negative effects for agricultural productivity were unavoidable. At that time, the governments were forced to initiate the process of establishing WUAs, to which the governments, naturally, started to hand over powers for governance and management of the former on-farm irrigation and drainage network. Thus, without considering the short period of ownerless on-farm systems, as a result of reforms the transfer of water governance powers from restructured or completely disintegrated former large water users towards water users associations of a new type took place.

In case of big main canals, here, in contrast to the WUA level, it is planned to transfer only part of governance powers, namely, to provide the transition towards joint governance of the state and public stakeholders. At the same time, part of powers should be transferred from the state to water users. It is necessary to keep in mind that often the state, represented by state officials, does not see the exigency of this transfer, although the exigency exists. Due to some reasons, such as lack of the experience of participatory governance at the level of main canals, reluctance to hand over powers etc. the process of transition towards joint governance of large irrigation schemes cannot be smooth, rapid and extensive like what happen at the WUA level. Therefore, a period of transition is needed here – the period of joint water governance.

The key stages of institutional improving of water governance on the pilot canals

Figures 4.12 and 4.13 below show the stages of improving water governance, which were partly already passed through in the frame of the IWRM-Fergana Project and which should be passed through in the process of transition from exclusively state water governance towards joint water governance with involving stakeholders.

Rational of transition towards the joint governance

At present, the CWUUs, under support of the project, participate together with governmental water management organizations in executing the following functions of water governance:

1. Approval and collection of water users' financial contribution and its redistribution among water users;
2. Specifying the procedures for water delivery, distribution, and use (water rotations, adjusting the irrigation schedule, monitoring, and reporting);

3. Arbitrage and settling disputes between water users and the CA;
4. Approval of the business plan based on the balance of allocated state budget, collected fees, funds accumulated due to different activities, as well as procedures for creating the emergency fund and its use etc.; and
5. Decision making regarding receiving the credit that will be repaid by water users;

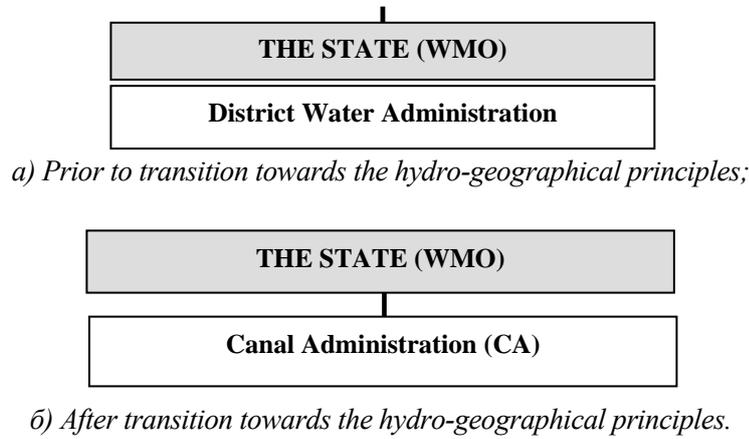


Figure 4.12. Diagram of State Water Governance

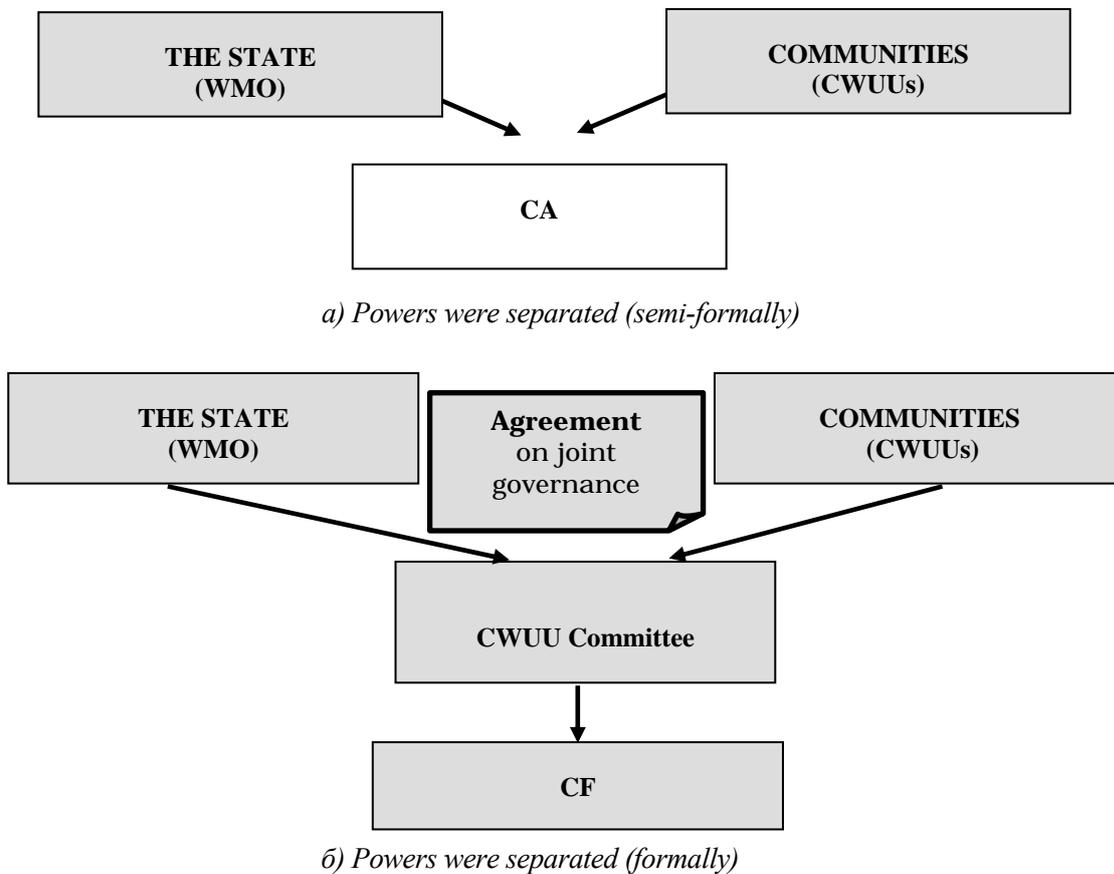


Figure 4.13 Diagram of Joint Water Governance

It is necessary to note that powers of the CWUU still are not *legitimate* and, therefore cannot be sufficiently effective and sustainable. Undoubtedly, ideally, governmental water governance should be replaced by public water governance in the canal (system) command area, namely by the CWUU, in which sectoral bodies and local authorities should participate as stakeholders – members of the CWUU, at least, making their contribution. At the same time, the CA and CWUU should merge into a united organization, in which the General Meeting and CWUU will be its board (governing body), and the CA will be transformed in its executive body.

However it will be possible only in the future. At present, it is early to speak about this for a number of reasons. Firstly, an economic situation of water users is difficult, and they won't be able to cope with it without substantial state assistance; secondly, the time is needed to make significant progress in democratization of the national systems, as planned, in the Central Asian countries.

Today, artificial promoting the progress of events and attempts of jumping from state water governance to public water governance are wrongful. Under present conditions in Central Asia, such a revolutionary activity cannot facilitate putting the participatory approach into practice; and, moreover, the idea can be discredited. A transition period – the stage of joint water governance by two legal entities: the CWUU and WMO – is needed. In fact, duration of transition period will depend on the rate of democratization in Central Asian countries. It is necessary to continue institutional, preparedness and training activity in order to provide, on the one hand, a *real voluntary consent* of water users to undertake governance of pilot canals and, on the other hand, a consent of sectoral ministries to transfer powers to water users for governing the pilot canals. Transferring powers for governing the pilot canals has to be formalized in the form of the legal document: the agreement on transferring powers between the Ministry and CWUU.

At present, only step-by-step transition from state water governance towards joint governance, when the government participates in water governance on a par with water users is possible. Transition towards joint governance should be based on the agreement on joint water governance signed by the WMO, as a representative of the state, and the CWUU, as a representative of the community. It is suggested to make the CWUU that will be formed by representatives of state and public organizations as the governing body for the transition period of joint water governance. One of options of CWUU composition is the representation according to financial input into supporting operational activity of the CA.

The CWUC consists of 5-7 members. In the future, after transition to completely public water governance, the general meeting of water users, CWUU Council and Board will play a role of a governing body, and the canal operational administration (present CA) will execute a role of an executive body.

Water users' fees for water services of the CA are considered as water users' contribution into financing operational activity of the CA.

At the initial stage of transition period, only agricultural co-operatives within the command areas of pilot canals will be members-founders (the Union of Agricultural Producers-Water Users "Khodjabakirgansay", the Union of Water Users Associations of the AAC) i.e. other stakeholders (WUAs, conservancy agencies, public utilities etc.) are still not members of the CWUU. Therefore, at the beginning, the CWUU will consist of 5-7 members representing two Parties that sign the agreement. During the next stage of transition period, in the process of including representatives of other stakeholders into the CWUU, the composition of CWUC can be extended. A mechanism of transforming the CWUC from a "narrow" into "extended" structure of representation is envisaged in the status of CWUC. An extended structure of the CWUC is given in Figure 4.14 below.

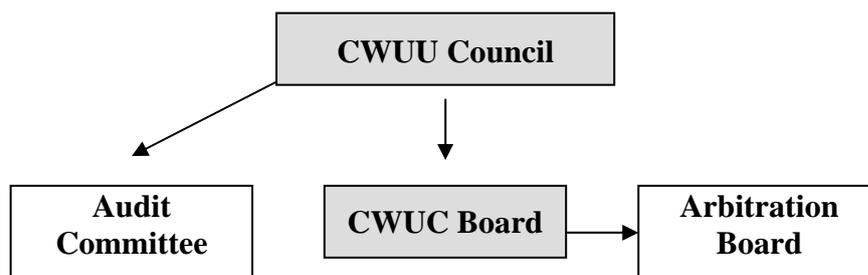


Figure 4.14 Organizational Structure of the CWUC for the Transition Period (Joint Water Governance)

Due to the fact that the CWUC is established based on the agreement on joint water governance signed by the WMO and CWUU, each party is budgeting funds necessary for participation of their representatives in activity of the new joint structure, if needed.

State financing

A role of the state financial mechanism is very important under transition towards joint water governance. Most of governments do not have the appropriate legal base for allocating budget funds to non-state structures including local public organizations, NGOs or private companies. In this case, two options are possible:

1. Firstly, water users pay for irrigation water delivery to the state organization (CA) making an addition to the funds allocated by the state for covering O&M activity, running costs and development of this organization. In this case, the state bears chief responsibility for financial sustainability of the CA.
2. Secondly, joint proportional financing by water users and the state bodies provides the financial sustainability and self-financing of the CA based on a business plan. However, this business plan has to include measures ensuring frugal expense of funds allocated for O&M, strict control of water quality, seeking of cheaper water sources, holistic use of available funds and resources (including land resources that can be underused due to poor soil conditions), and saving measures based on optimization of pumped irrigation water supply.

It is clear that during the transition period, the state should keep financing the O&M organizations in an amount sufficient for supporting the due level of water management. Further state financing is exclusively a subject for negotiations between the state and a public organization, which in the future take over the water governance based on its share (equal or less than a shareholding) under keeping opportunities for state control. In this case, the following options are possible:

1. As before, the state continues to finance the CA in spite of changes in its status;
2. The state is gradually reducing financing in the period of joint water governance;
3. The state pays a certain amount into a lump sum, as an initial capital, and then is gradually reducing annual financing; and
4. Other possible options.

In any case, the project will facilitate the negotiations between parties participating in governance of the CA related to financial matters and use of other resources handed over to a new organization. Nevertheless, even if the state financing and other resources are available, it can be insufficient for achieving the full efficiency and profitability of the production process.

Therefore, for the purpose of seeking and mobilizing own funds and resources for covering running costs and development, such an organization has to be able draw up own business plans in a manner that allows to involve all possible reserves in the form of using the water protection zones, fishery etc. and simultaneously to make possible covering of credits.

The need of state participation in financing water management organizations naturally follows from impacts of irrigation and land reclamation activity on the environment and society; and social and environmental welfare depends mainly from the level of state support including financial aid. In addition, the world experience shows that, as a rule, the state finances rehabilitation of large-scale water infrastructure of irrigation and drainage systems.

The process of transition towards joint water governance

First of all, it is envisaged to provide a necessary awareness of all stakeholders on planned reforms. In this case, we deal with three groups of stakeholders:

1. A group that participates in water governance on behalf of the community (CWUU);
2. A group that participates in water governance on behalf of the state (WMO); and
3. A group that will be governed by joint efforts of the state and community (the CA).

Water users groups should be informed: why and how reforms will be implemented and what swings and roundabouts of these reforms. These measures will be of an information-explanatory nature rather than a mobilization nature, since the decision related to transferring water governance was made earlier, and water users were informed in the course of previous campaign.

At the same time, the WMOs should be informed on objectives of reforms, procedures of implementing reforms, who and how will be involved, who and what will lose or acquire. It is also necessary to help them to make aware of possible problems, and what assistance and support they can provide to overcome them. These measures will also be of mobilization nature to prepare this group of people to some loss of their powers!

A group of people that will be governed by joint efforts of the state and community (the CA) has to be informed about their prospects, how joint governance affects their powers, rights and duties. They need also to be informed on difficulties and problems that can be faced, and how to provide the preparedness for their overcoming. Measures related to this group of people will be of an information-explanatory nature.

In the course of meeting and consultations with above groups of stakeholders, the project experts, as supervisors of this process, should collect and record all their concerns, doubts, requirements, and fears, as well as specify legal obstacles and the need in training. At the same time, it is necessary to make efforts for mitigating or neutralization of all problematic effects and, as far as possible, to include these matters into the Protocol of Intent for Transferring Governance Powers in order to attach due legal force to this process and to ensure the execution of appropriate commitments by Parties.

The following project activity was carried out for transition towards joint governance [18]:

For each pilot irrigation canal the following documents were prepared:

- *«The Concept of Joint Governance of Pilot Canal Administration's Activity»;*
- *«The Agreement on Joint Governance of Pilot Canal Administration's Activity».*
 - *The Concept and Agreement for each pilot irrigation canal were discussed at "round tables" in Bishkek, Khojent.*
 - *As a result of discussions at "round tables", the Protocols of Intent were signed by all members of the working group consisting of the representatives of Parties participating in the process of transition towards joint water governance.*
 - *The Protocols of Intent include the agreed plans and forms of transition towards joint water governance.*
 - *The CWUU (AAC, KBC, and SFC) are Party of the Agreement on behalf of the communities;*
 - *A Party of the Agreement on behalf of the state are the following organizations:*
 - *In Kyrgyzstan – the BWMO,*
 - *In Tajikistan - the MLR&WR of the Republic of Tajikistan,*

- *In Uzbekistan – FV MCSA.*
- *«Agreements...» were signed by Parties for all three pilot irrigation canals.*
- *The Boards of Pilot Canal Water Committees were established based on Agreements: WC AAC, WC KBC and WC SFC.*
- *The Board of AA Pilot Canal Water Committee consists of 7 members – 3 the BWMO, Director of AAC Administration and 3 representatives of the CWUU AAC.*
- *The Board of KB Pilot Canal Water Committee consists of 7 members – 1 representative of the MLR&WR, 2 representatives of SogWMO, Director of KBC Administration 3 representatives of the CWUU KBC.*
- *The Board of SF Pilot Canal Water Committee consists of 7 members – 1 representative of the FV MCSA, Director of SFC Administration, 1 representative of the BISA «Sokh-Syrdarya», representative of the BISA «Naryn-Karadarya» and 3 representatives of the CWUU SFC.*

Challenges and Opportunities for Institutional improvements

The experience of putting the IWRM principles into practice in the frame of the IWRM-Fergana Project shows that the introduction of hydro-geographical principles and participatory approach is the very complicated process that faces many problems, but there is not another alternative if we want raising water productivity and ecological safety in the region.

Transition towards hydro-geographical principles in the frame of the IWRM-Fergana Project did not cause any objections even in Uzbekistan since this was profitable for water professionals. However, there is another situation with introducing the participatory approach. At the “grass roots” level, the public participation, as a rule, is profitable for water professionals in contrast to water officials, who are paying lip service to a leading role of water users represented by the CWUU and even making some modifications in the Charter of Canal Administration, de facto, are trying to turn the CWUU into a “pocket” obedient body. Denial in legal registration of the CWUU, as nongovernmental, self-sufficient and noncommercial body of water users with own official stamp and bank account, promotes transforming the CWUU into a body depending from the Canal Administration, but not vice-versa. In this case, denial in legal registration of the CWUU is advantageous for water officials but not for water users.

Key challenges are following:

Psychological problems:

1. Water users traditionally play a role of suppliant for water officials rather than a Client that creates agricultural output and, therefore, has the right to demand the qualitative services from water agencies. Therefore, along with strengthening a leading role of the CWUU Council and its chairperson, simultaneously the WUA representation functions in the CWUU should be also promoted;
2. According to the same causes, the WUA in the CWUU Council should be mainly represented by its chairperson; and
3. Since the Soviet period, a distrust of public organizations that took care of the needs of communities too little is kept.

Legal problems:

1. Here and there, an illegal practice of interference of local authorities in water allocation is being continued;
2. The law on WUAs (Uzbekistan) and the CWUU was not adopted; and
3. Procedures of formal registration of the CWUU are too complicated.

Human resources problems

1. Less and less of skilled water professionals are available in water management organizations, at the same time, many persons who before were never busy in irrigated farming arise among water users.

At present, the IWRM-Fergana Project's achievements have to be disseminated "geographically" and "institutionally". When we speak about disseminating the IWRM-Fergana Project's achievements "geographically", we keep in mind implementing of similar reforms on additional main irrigation canals (the North Fergana Canal and Right-Bank Canal). When we speak about disseminating the IWRM-Fergana Project's achievements "institutionally", we keep in mind introducing the IWRM principles at higher level – at the level of river basins (Akburasay, Khojabakirgansay and others), and now a new project component has started to study opportunities for introduction of IWRM in basins of small transboundary rivers.

4.4. Water Governance and Management at the Level of Water Users Associations

(M.A. Pinhasov, A. Alimdjanov, H. Manthritilake)

In recent years, restructuring of large farms (former collective farms and state farms) has resulted in creating a whole army of small private and peasant farms, and institutional reforming of the on-farm system of water distribution becomes necessary.

In contrast to large collective farms that had own governance structure of on-farm irrigation and drainage network, under new conditions, small farms are facing problems of water distribution, repair and maintaining their irrigation and drainage systems, especially, of financing these activities.

Most of countries in the near and far abroad have faced the same problems in different time periods. To tackle these challenges the various institutional approaches were used for establishing proper on-farm water use: through the state structures; local administration, joint-stock companies and co-operative associations etc.

An institutional setup of on-farm water use in the form of water users association (WAU) is considered as the most viable of all listed institutional structures. In broad understanding, a WUA unites a group of water users and, using their financial and material resources and receiving the mandate from them, on behalf of these water users organizes O&M of their irrigation and drainage system.

Under current conditions in the irrigated farming sector in Central Asia, the following problems can be mentioned:

- Land is the state property in all countries in the region; and plots are allocated among the land users based on leasing agreements or in joint ownership. Sizes of plot and a leasing period are

considerably vary over countries – from less than 0.5 ha in Kyrgyzstan up to a few hundreds of hectares in Kazakhstan;

- Legislative bases and an extent of state regulation under privatizing the agricultural sector are also quite different;
- Drastic increase in the number of water users, and a complex system of the multi-step irrigation network result in extremely unsustainable irrigation water supply, making water resources one of key factors ensuring crop yield;
- As a result, the need to improve water availability, stability of irrigation water supply and uniformity of water distribution among water users that are located at different distances from a water source;
- There is also the need to rehabilitate on-farm irrigation and drainage systems, which during last years were not properly maintained due to grave economic conditions of farms in the period of transition towards the market relations.

Institutional problems

WUAs were established both according to the territorial approach – within the boundaries of former collective farms and state farms and according to the hydro-geographical approach i.e. establishing of WUAs within the command areas of secondary and tertiary irrigation canals (branches of a main irrigation canal). The first approach was widespread, since it allowed keeping the former system of water governance, only under a new name. Advantages of this approach are obvious: the possibilities for using common hydraulic structures, buildings, machinery in interests of a new formation without property repartition, for keeping skilled management staff, as well as good knowledge of local conditions etc. However, there is the former governance's legacy difficult for overcoming: lack of understanding the new economic conditions and inertia of administrative thinking, but the most important is the complexity of equitable and fair water delivery and distribution under strip holding of land and striped pattern of water users. The second approach enables a WUA to supply irrigation water from a single source and to use additionally internal water sources. Such an institutional set-up enables a WUA to manage available water resources in more effective manner.

The pilot WUAs established in the frame of the IWRM-Fergana Project in Uzbekistan, Tajikistan and Kyrgyzstan may be cited as examples of such an institutional set-up. For example, in Kuva District of Fergana Province in Uzbekistan, the WUA “Akbarabad” was established covering command areas of secondary irrigation canals RP-1, “Akbarabad-1,” and “Akbarabad -2” that divert water from the South Fergana Canal. In this case, integrated water resources management spreads from the main canal (the SFC) through WUAs to irrigated fields inclusive.

At the same time, most of WUAs in Uzbekistan are being established according to the territorial-administrative principle i.e. based on the institutional set-up of former large collective farms. Therefore, the problems of WUAs established according to this principle are related to the need of their restructuring based on the hydro-geographical principle. The hydro-geographical principles of establishing WUAs should be stated in the Law on WUAs.

Applying appropriate procedures for transferring the secondary canals to a WUA, which prior to establishing a WUA have played a role of inter-farm irrigation canals and O&M of which were financed by the Ministry of Agriculture and Water Resources, is a quite important matter under establishing a WUA. Two options can be used for solving this issue.

First option: For the five-year period after establishing a WUA i.e. for the initial period when water users strengthen their economic capacity (mainly based on water and land reclamation services that must be provided by a WUA), above water infrastructure (inter-farm irrigation canals) are handed over to a WUA on the contractual base for temporary use with annual payments for operation and maintenance of this water infrastructure.

The legislations of the Republic of Uzbekistan (Article 31 of the Law on Water and Water Use) and Tajikistan (Article 35 of the Water Code) state the possibility for transferring water infrastructure for temporary and continued operation.

Second option: A state water management organization becomes one of WUA co-founders. Its contribution is water infrastructure transferred to a WUA. In addition, the WMO, as the co-founder, assumes a liability to finance operation and maintenance of water infrastructure transferred to a WUA within the normative requirements.

Selecting of any option is the prerogative of water users and key officials of the Ministries of Agriculture and Water Resources. The practice of establishing WUAs in the Fergana Valley shows that the WMO can be a co-founder, transfer water infrastructure (irrigation canals) registered in its book to WUAs, and respectively provide its maintenance.

As a result of this transferring both a WUA and the WMO are the gainers: a WUA, on the one hand, provides complete hydro-geographical coverage – the opportunity of effective water management from the secondary irrigation canals up to off-takes of water users – on the other hand, a WUA does not finance O&M of that inter-farm irrigation canal which is registered in the book of WUA. Under transferring water infrastructure to a WUA, the WMO also hands over all concerns for its maintaining and repairing to a WUA and only assists a WUA by providing special machinery in the period of large-scale operational works. A water management organization, as a co-founder, is represented by a certain number of votes at the Constituent Assembly and in the WUA Council.

A WUA is in charge for the following:

I. To organize water use:

- Drawing up a water use plan for the served area that covers farms - members of a WUA and its coordination with the state water management organization based on the Agreement on irrigation water supply;
- Uniform water distribution among all members of a WUA in amounts and in terms that are established in the water use plan;
- Monitoring the correctness of flow rate measurements at the gauging stations established on irrigation and drainage canals;
- Record keeping of irrigation water supply and drainage water disposal within the area served by the WUA.

II. To organize repairing and maintenance works:

- Drawing up a business plan;
- O&M of irrigation and drainage systems within the WUA service area; and
- Rehabilitating on-farm irrigation and drainage systems.

III. Land reclamation services and drainage.

A WUA represents and defends the interests and rights of its members in mutual relations with state and public organizations, and provides economic and operational contacts with the water management organizations, on the one hand, and between water users – members and non-members of a WUA, on the other hand.

Certification of WUA activity is one of key pillars. Usually, it means receiving the authorization for executing economic, financial, legal, and production activity.

Under establishing and operation, a WUA solves the following matters:

- Overcoming the resistance of water users by means of conducting social mobilization and raising their awareness regarding the necessity of establishing and operation of the WUA;
- Receiving the authorization for establishing the WUA as noncommercial organization;
- Receiving the rights for crediting and taxation on preferential terms;
- Equipping the WUA's irrigation and drainage networks with water-gauging posts;
- Procedures for imposing sanctions on water management organizations, the WUA and WUA's members under infringing the rules of water use;
- Financial and moral incentives for WUA's personnel under achieving target indicators of irrigation water supply, O&M, and land reclamation practice resulting in the rise of crop productivity;
- Establishing and upgrading the material and technical basis of the WUA with assistance of water users, water management organizations, and the Government;
- Rehabilitating the hydrometric network and establishing the water record keeping in the WUA; and
- Establishing the system of differential fee for service of WUA's members those who use various waters (surface fresh water, drainage water, mixed water) and, due to this fact, who have different profitability, generated from to their agricultural activity.

Social mobilization of water users for WUA establishing and operation has to be organized by a group of initiators consisting of water users and representatives of water management organizations (WMOs), local authorities, environmental NGOs and, finally, mass media.

A group of initiators should disclose to water users the existing problems and opportunities for their successful solving using the capacities of WUA, as well as considerable benefits available to all stakeholders due to WUA establishing and operation.

A WUA is established as noncommercial organization exempted from taxation. As a rule, water users themselves, represented both by individual persons and legal entities, are founders of a WUA. However, the WMOs and other stakeholders also can be co-founders.

The status of WUAs as non-governmental noncommercial organizations should be stated in the Law on WUAs, and until it is absent it is necessary to include this provision into other normative and legal documents. This status allows a WUA:

- to execute its functions;
- to establish the procedures of relationships with WUA's members;
- to exclude the direct interference of governmental bodies into WUA operation activity;

WUA's relationships with water authorities are based on contractual relations. Field survey of irrigation and drainage networks conducted in the pilot WUAs under the IWRM-Fergana Project has shown that irrigation and drainage networks handed over from former owners to WUAs are insufficiently equipped with hydrometric means. This impedes equitable water allocation within WUAs, and creates opportunities for disputes and conflicts between WUAs and WMOs and between WUAs and water users.

Installation of gauging posts at off-takes into WUAs on the main irrigation canals has to be financed by the WMOs, and at off-takes into farms on secondary irrigation canals by WUAs.

For improving WUA operation it is necessary to create incentives for its personnel, but at the beginning, find answers on the following questions:

1. What indicators for assessing WUA personnel activity and what amounts of bonuses should be accepted for creating these incentives?
2. What financial sources can be used for creating these incentives?

WUA personnel should be encouraged due to achievement of the following indicators:

- Reducing unproductive water losses due to WUA personnel activity on the way from the WUA water intake to off-takes into farms of water users;
- Implementing all planned works including repairing and maintaining of irrigation and drainage network, and uniform and sustainable irrigation water delivery to WUA members both in the growing season and in the dormant season;
- Saving funds against the estimated finances under implementing the planned works;
- Improvement of soil and hydro-geological conditions within the service area, in comparing with their status in the previous period; and
- Raising productivity of major crops - cotton and grains.

Financial sources for encouraging WUA personnel can be the following:

- Funds of the WMOs under specific contractual relations, for example, if unproductive water losses were reduced providing water conservation;
- Funds of water users under implementing all planned measures by the WUA personnel resulting in improvement of soil and hydro-geological conditions and raising productivity of major crops - cotton and grains;

WUAs, as organizations that provide O&M of irrigation and drainage networks, should have appropriate machinery. Machinery and equipment are supplied to WUAs by different ways. In Uzbekistan, under restructuring the shirkat farms (large co-operative farms –former collective-farms) part of machinery were handed over to WUAs. **Short-term and long-term credits on preferential terms** with a “soft” interest rate (less than 5% a year) can be another source of funds for procuring machinery and equipment.

The Ministry of Agriculture and Water Resources, Ministry of Finance, National Bank, and Ministry of Justice of the Republic of Uzbekistan should elaborate the mechanism for granting such credits, specifying a guarantees and interest rates and developing the legal base (the Decree issued by the Government or another normative document).

There is one more way for procuring machinery and equipment – accumulation of funds in the emergency fund. Under conditions of sufficient accumulation of funds in this fund it is possible to procure machinery and equipment for WUAs.

WUAs can provide services of different quality to water users; for example, some water users receive surface fresh water for irrigation while others only brackish drainage water. Water users have different revenues from agricultural activity due to its specialization (some water users grow cotton while others - grains or fruits). In these cases, differentiated tariffs are used for WUA services that are agreed with WUA members. For example, the tariffs for servicing the cotton-growing or grain-growing farms amount to

Uzbek Soum 13,000 per hectare, while the tariff for servicing horticultural farms makes up Uzbek Soum 26,000 per hectare. A similar differentiation of tariffs for WUA services takes place under using surface water and drainage water.

Issues of water use are considered more or less in detail under discussing WUA's functions, and often another important function of WUAs (land reclamation services to water users) is lost sight. This activity is especially topical under conditions when, for example, in Uzbekistan, more than half of irrigated lands are salt-affected. This problem is also topical for other countries in Central Asia.

Drainage networks have different owners: farms and land reclamation agencies. At present, WUAs are servicing the on-farm drainage systems. An amount of O&M works on the on-farm drainage system, in the last analysis, depends on an area serviced and specifies a level of economic relations between WUAs and their members.

WUAs together with farmers, based on an assessment of land reclamation conditions of irrigated lands (water and salt balance of an irrigated area, groundwater table and salinity, soil salinization, water availability for irrigation and leaching operations, salts content in irrigation water, and drainage capacity) develop a set of measures related to improving irrigation practice, land reclamation operations, agricultural practice, and O&M activity, including the following:

- Drawing up the action plan of water use and allocation among water users;
- Adjusting the plan of water allocation among water users according to actual water use quotas;
- Planning works for cleaning and repairing irrigation and drainage networks;
- Scheduling winter-spring leaching operations and irrigations for replenishing soil moisture in the farms serviced by WUAs; and
- Coordinating the terms of agricultural operations and repairing works on the irrigation and drainage network.

Cleaning and repairing works on the irrigation and drainage network are planned based on the report of field inspection and surveys jointly drawn up by representatives of WUA and water users. They also together make decision on a scope of work and executors (WUA using own production capabilities or together with subcontractors etc.).

Implementing of all planned works is distributed between the WUA and water users and approved at the general meeting of the WUA. In the process of implementing the planned works, in case of some departures from the schedule, the WUA together with water users establish appropriate executors' guilt in slower execution or in an incomplete scope of works implemented. Based on results of an audit, an extent of WUA's or water users' guilt and also a size of damage are specified; and disciplinary actions are imposed.

To evaluate the serviceability of drainage system or its components and to plan necessary technical and soil-reclamation interventions, the WUA land reclamation service needs to have the following information:

- Meteorological data (rainfall, potential evaporation, moisture deficit, air temperature etc.)
- Data of field auditing of the technical state of drainage system;
- Drainage discharge and drainage water salinity;
- Amount of irrigation water supply and irrigation water salinity;
- Amount of drainage water reused for irrigation and soil leaching;
- Amount of seepage losses in irrigation canals;
- Data on soil salinization;
- Amount of irrigation water releases;

- Information on necessary land-leveling operations and retiring of agricultural land; and
- Data on crop yields.

Under establishing WUAs, different scenarios and model for restructuring the agricultural sector should be reviewed. For example, the Kyrgyz model of restructuring the agricultural sector resulted in breaking up into smaller units of large collective farms and creating numerous small private farms. As a result, there are 6 WUAs with thousands of private farms with an average size of irrigated area less than one hectare in the command area of Aravan-Akbura Canal. Under these conditions, not only water allocation but also any other services rendered to private farms, including land reclamation, inputs procurement, marketing etc, are difficult. In addition, mechanized cultivation of small plots, less than one hectare, is also quite difficult or even impossible.

In this case, it is possible to adopt the Japanese model of land use, which creates the opportunities for co-operation and keeping large-scale agricultural production under existing of many farms with small irrigated plots (less than one hectare). A core of this model is the establishing of the large cooperatives (2500 to 15,000 hectares in area) that take upon themselves all responsibilities related to O&M of agricultural infrastructure under support of the Government.

In compliance with the contracts, the cooperatives provide to farmers:

- Machinery and equipment necessary for all kinds of land treatment and ameliorative works (tillage, preparation of fields for basin check irrigation, installation of polyethylene baffles within basin checks, land leveling etc.);
- Extension services that provide recommendations on fertilizer application rates, use of herbicides and other agricultural chemicals, as well as information on know-how and introduction of the agricultural passports for fields and farms;
- Seeds of high quality and the most suitable for specific agricultural areas;
- Packaged fertilizers and agricultural chemicals in accordance with recommendations of extension services;
- Marketing of agricultural output: procurement, transportation and sale, including co-ordination of prices with farmers; and
- Irrigation water supply and allocation, waste water disposal, monitoring and O&M of irrigation and drainage network, since practically all the network is inter-farm network.

Farmers enter into an agreement on delivery of their output to cooperatives. Output delivered to a cooperative is evaluated according to internal prices approved by the Council of the cooperative in which the cooperative's services are also taken into account besides a price of producer. Thus, the internal prices include both the process costs and profit of farmers, process costs and profit of the cooperative.

In its turn, the cooperative enters into contractual relations with the outside world (suppliers and customers) based on the business plan approved by the General Assembly of the cooperative and in coordination with the Council of Cooperatives, as well as takes credits from the government and private financial institutions and then repays credits. Thus, the Japanese model successfully combines personal interests of all farmers in improving of land productivity with advantages of large-scale agricultural production.

This approach seems can be successfully developed in Kyrgyzstan, under governmental support. At the same time, water users associations that were already established could be used as the basis for these cooperatives.

What problems exist in new-established WUAs in Central Asian countries?

Unfortunately, the legislative base for establishing and operation of WUAs exists not in all Central Asian countries. The Law on WUAs was not yet adopted in Uzbekistan and Turkmenistan. In other Central Asian countries, the Law on WUAs *makes no provisions for state support in establishing the material and technical basis of WUAs and in rehabilitating on-farm irrigation and drainage systems.*

Issues related to *granting short-term and long-term credits on the preferential terms to WUAs*, which could enable WUAs to procure necessary specialized machinery and equipment and to rehabilitate water infrastructure or to cover running costs, also were not solved.

At present, the quite limited number of specialists having a degree is working in new-established WUAs. For attracting such specialists to WUAs, it is necessary to provide sufficient incentives, for example, allow them to cultivate crops at plots within water protection zones along irrigation canals or develop lands earlier excluded from the irrigation schemes as unsuitable for irrigation, as well as it is possible to create a bonus fund for personnel of WUAs at the expense of deductions from farmers' incomes. In addition, it is necessary to develop the special curricula related to WUAs' activity in the educational institutions covering agricultural and water management topics, as well as to prepare the advanced course on various aspects of WUAs activity in the ICWC Provincial Training Centers.

Not always, where there are land reclamation problems WUAs have a special ameliorative unit. Well-organized and coordinated work of all stakeholders in the field of land reclamation (water users, Hydrogeological & Ameliorative Expedition¹⁰, and Pumping Stations Administration¹¹) depend on proper activity of this unit.

Existing practice of water allocation at the inter-farm level does not envisage the participation of WUAs in this process, representing the interests of their members. Provisions concerning participating WUAs in inter-farm water allocation should be entered into new legislative documents that regulate activity of water management organizations at the level of inter-farm irrigation canals (the Law "On Water and Water Use", regulations and charters of WMOs, CWUC etc.)

Most surprising is that laws "On Water" in the Kyrgyz Republic, "On Water and Water Use" in the Republic of Uzbekistan, and the Water Code in the Republic of Tajikistan do not state the liability of the WMO that inflicts losses to WUAs (WAU members) due to infringing the agreed schedules of irrigation water supply.

A WUA has to establish good relations with water management organizations regarding two aspects of its activity: i) with the Canal Administration (or the Irrigation System Administration) in the field of irrigation water delivery to farms serviced by the WUA; and ii) with Provincial Hydrogeological & Ameliorative Expedition (PHAE) in the field of rendering land reclamation services.

A plan of water use covering all necessary aspects: crop pattern, zoning of irrigated lands according to water requirements, and an efficiency factor of on-farm irrigation system should be the basis for signing the agreements between the Canal Administration (or the Irrigation System Administration) and WUAs. However, under acting the system of water use limits (quotas), amounts of water included into the plan of water use can be decreased according to a certain percent, which is stated under signing the agreement between the WUA and the WMO.

As a rule, the Agreement between the WUA and the WMO contains the following provisions:

- Rights and duties of contracting parties;
- Procedures for monitoring and record keeping of delivering irrigation water and services' quality;

¹⁰ Hydrogeological & Ameliorative Expedition is the unit in the frame of the Ministry of Agriculture and Water Resources responsible mainly for monitoring irrigated land conditions, O&M of drainage systems, and leaching of salt-affected soils within the irrigated area.

¹¹ One of the responsibilities of this organization is O&M of drainage tubewells within the irrigated area.

- Procedures of payment for water services;
- Sanctions and penalties for infringement of agreement obligations for both parties;
- Procedures for settling conflicts and claims of contracting parties; and
- Procedures for termination or prolongation of contractual relations.

At present, there are not contractual relations between WUAs and the Hydrogeological & Ameliorative Expeditions. However, the specific character of maintaining both the inter-farm and on-farm drainage network requires their joint work in the field of drainage water disposal and land reclamation operation.

According to the agreement between WUAs and the PHAE on land reclamation services in the frame of the IWRM-Fergana Project, the following activities are recommended to implement:

At the expense of budgetary funds, the PHAE is under an obligation to:

- Monitor and maintain the inter-farm drainage network in operable condition, providing the design cross-sections and depths to ensure problem-free drainage water disposal beyond the irrigation area;
- Collect and analyze information on irrigated land condition and technical state of inter-farm drainage network, since this information is the basis for scheduling necessary interventions at the inter-farm and on-farm level.

In addition, the contractual relations based on specific types of services for a fee can be established between WUAs and the PHAE.

Contractual relations between WUAs and the PHAE related to land reclamation services should take into consideration:

- Rights and duties of the Client (WUAs)
- Rights and duties of the Contractor (the PHAE);
- An agreement value and procedures for mutual settlements;
- Execution of an agreement;
- Liability of Parties;
- Procedures for disputes resolution;
- An agreement period; and
- Final provisions of an agreement.

Arrangement of water distribution among WUGs

Current reforms in the agricultural sector in Central Asia resulted in arising of new water users represented by private farms. As a result, an attitude of new water users towards issues of water distribution has considerably changed. The right to receive irrigation water in the amount specified in a plan of water use or by water use quotas (limits) is guaranteed for new water users by the state. In addition, all rights of water users and their requirements to WUAs are sustained by appropriate legislative documents, and if they will be infringed the criminal proceedings against WUAs can be instituted or administrative responsibility may be inflicted.

In point of delivering irrigation water to water users according to the irrigation schedule of crops, WUAs have to meet all normative requirements in the sustainable, equitable and well-timed manner. However, the execution of this key task is impossible without involving water users in planning and without implementation of agreed plans by water users by themselves. Moreover, undisciplined water users neither clean their irrigation network in proper time nor meet requirements of the irrigation schedule and nor manage properly water applications on their fields but, at the same time, they attempt to receive more water than envisaged in the agreed plan of water use. Additional field irrigators (mirabs) are necessary for arranging proper and effective water use in the WUGs that consist of tens and, sometimes, hundreds of water users. However, WUA personnel are limited; and WUAs are therefore unable to organize water delivery to an off-take of each water user within the GWU.

Nevertheless, WUA management has to develop, propose to water users and advocate the best options of water distribution that can be put in practice through establishing the WUGs. You can't take a laissez-faire attitude towards water distribution in the GUV, and, all the more, hope that water users themselves are able to organize water distribution within the GWU. Frequently, water users are not acquainted with a water management practice, and many of them even do not know how properly to organize a water application. In addition, stereotypes related to ill organization of water applications (protracted water applications, longer furrows etc.) and improper agricultural practice (ill-timed inter-irrigation soil treatment) are widespread among water users.

Water users and planning water use

First of all, water users have to submit reliable information on planned crop pattern in the command area of their distribution canal for consideration of WUAs. Some water users conceal information on crops growing on row-spacing strips in orchards and about sown areas under secondary crops (after harvesting of cereal crops).

There are also some difficulties related to planning a crop pattern. As known, Uzbekistan employs the state orders on production of cotton and wheat, but some farms are engaged in horticulture or livestock farming; and owing to this situation, often an accuracy of information on a crop pattern makes up 70-80% early in the year.

Numerous armies of water users with irrigated plots over the range of 0.3 to 0.8 ha aggravate this problem in Tajikistan and Kyrgyzstan. It is necessary to keep in mind that the composition of water users is quite diverse – from teachers and physicians up to construction workers who were never busy in agricultural activity. Most of water users are the poor and cannot purchase stock seeds of different crops; and therefore in April, May, and June they sow those seeds which they were able to get.

A severe deficit of water takes place in the command area of the Khoja-Bakirgan Canal in Tajikistan in the period since March until July; and under planning a crop pattern, this important factor should be taken into consideration. However, as often happen in practice, water users, first, sow some kind of water-loving crop, and then wait for water that is not provided for in the plan of water use.

4.5. IWRM in Action through Establishing Effective Groups of Water Users

Land reforms in Central Asia resulted in fragmentation of agricultural lands. A great deal of new private farms arises instead of large collective farms i.e. many small water users arise on the place of one former large water user. Thus, real life demands a transition of current water governance towards more effective hydro-geographical or basin methods of economic management. In addition, the efficiency of water use under new conditions depends to a large extent on water users themselves, from the point of view of both governing water delivery and maintaining their irrigation and drainage systems (Pinkhasov et al., 2005).

Reforms in each Central Asian country have own specific character from the point of view of both their progress rates and concomitants. Nevertheless, it is possible to notice some similar problems in establishing WUAs over the whole region. First of all, WUAs were established and continue to be established mostly according to governmental directives i.e. according to a command “top-down.” Therefore, water users

think about WUAs not as about their own consumer association but as about a new body, which simply collects money independently of the fact that water was delivered or not. As a matter of fact, WUAs are and have to be the organizations of water users. Unfortunately, at present, because of objective and subjective reasons, a WUA, not always, can represent and defend the interests of its water users. In turn, water users, not always, understand for what a WUA is needed and its role. Therefore, there arises an institutional gap between water users and WUAs resulting in a number of problems under water distribution and distortion of IWRM principles. However, there is a solution of these problems. First of all, this is the creation of link in the form of water users groups that can effectively improve relations between water users and WUAs and facilitate the participation of water users in water distribution, WUA governance, and improving operating conditions of irrigation and drainage systems, and finally in water resources management at higher levels.

Practical aspects of establishing water users groups (WUGs)

From time to time, water shortage arises in tail parts of the secondary and tertiary irrigation canals. In such cases, water users try to solve this problem according to the principle: “do-it-yourself”. They attempt to receive water with the help of their friends-irrigators or to undertake other illegal actions. In fact, when such situations arise quite often, conflicts between water users are unavoidable; and they do not trust each other and don’t understand that water is their common resource, and therefore such problems should be jointly settled. For example, the WUA “Japalak” (Osh Province, the Republic of Kyrgyzstan) unites about 5000 water users and covers a total irrigated area of 2010 ha. An average size of their plots amounts to 40 sotoks or 0.4 hectare. It is impossible to conceive what huge organizational costs will be incurred by the WUA “Japalak” if the agreement on irrigated water delivery will be signed with each water user. Moreover, equitable water distribution among all water users and effective water management become an unrealistic task for limited WUA personnel. Therefore, establishing of WUGs for effective water resources management and for facilitation of governing WUAs is proposed. Establishing of WUGs within a WUA provides the following advantages:

- Improving the water distribution process;
- On-farm irrigation canals (tertiary and lower level) is maintain in the operational status;
- Decreasing, or eliminating at all, of conflicts between water users;
- Improving of activity of WUA, since water users themselves become responsible for the operational status of on-farm irrigation network;
- Water users control the process of water distribution;
- A confidence among water users is strengthened;
- Water users specify the rules for water distribution that are understandable and adapted to local conditions;
- Decisions are jointly and democratically made;
- A leader selected by a WUG can represent their interests in a WUA through its Council or General Meeting; and
- Issues of agricultural practice (pest control, tillage, land leveling, crop rotation etc.) can be collectively solved in a more effective manner.

Therefore, when there are many water users, both small and large, on tertiary and lower level canals, water distribution should be established in such a manner that can satisfy everybody. This is possible only following the principles of fairness and co-operation.

An establishment of water users groups (WUGs), which will directly participate in water management and distribution, is the best solution of water distribution problem. At the same time, WUGs can act on a

voluntary basis as a community unit without a formal registration. It is necessary to note that there are problem-free canals regarding water distribution. There, water users have developed own rules and entrust water distribution to experienced irrigators (mirabs) and foremen respected by local inhabitants. On such sites, WUGs are not necessary because they can complicate, and even frustrate, existing procedures of water distribution.

The process of establishing water users groups (WUGs)

A social mobilization is a series of measures that creates the public platform based on the mutual dialogue when each subsequent action depends on results of previous one. Achieved results are studied and taken into consideration under developing next actions in the form of appropriate adjustments [26]. First of all, a chief of WUA should be interested in establishing WUGs. To establish effective WUGs, this chief has to have leadership qualities because he/she should explain advantages of WUGs to people and persuade them to create water users groups. In other words, the chief of WUA will play a role of initiator and facilitator of this process. If the chief of WUA has not sufficient time for this activity he/she can hire employees who after appropriate instruction and training regarding the approaches of establishing WUGs based on hydro-geographical principles will be able to implement this mission. In particular, farmer, who has leadership qualities, a respected aksakal (elder) or person who knows local conditions and has ability for persuasion can become such a facilitator. There is not the need at all to attract water professionals for activity as social facilitators. Above all, such persons should have knowledge of agriculture and desire to work properly. Two or three persons are enough to form a mobile group that could implement the required information-preparatory works and create the enabling environment for initiatives of water users in establishing own WUG. Such an activity consists in a series of steps necessary for creating required conditions.

The first step: to specify problematic areas for establishing WUGs within the WUA territory. Activity should be started in those areas where water users conflict each other especially frequently in the course of water distribution. When a facilitator is not acquainted with local conditions a schematic map of the area serviced by the WUA for developing an action plan of establishing WUGs needs to be plotted with assistance of a chief or specialists of the WUA. Irrigation canals and off-takes where water shortage and conflicts between water users take place should be pointed on this map. As a rule, WUGs are established on tertiary canals.

The second step: field inspection of target canals and off-takes in the area selected for establishing WUGs. During the field inspection the following aspects should be carefully surveyed: i) the technical state of off-takes (as well as availability of a design water intake or “do-it-himself” structure, or absence of any structure), ii) a situation around off-takes including a layout of fields, crop pattern, and conditions of irrigation canal’s channel (for example, erosion of side-slopes, overgrowing with aquatic and semi-aquatic plants, steep gradients etc.). It is preferable to conduct field inspections during water applications and critical periods for water distribution. In the course of field inspections, a facilitator will pass through those sites, where farmers, rural wage earners or tenants are working, meeting with local inhabitants to discuss relevant issues. As far as possible, he should represent himself and get to know local direct or indirect water users. This can be useful under discussing the matters of establishing WUGs with water users and for creating confidential relations.

The third step: initial meetings with water users and identification of active leaders. In the course of field inspections, a facilitator meets with water users and explains to them the objectives of establishing WUGs. He/she asks them about existing problems and their reasons (conflicts related to water distribution, water shortage, interference of water management organizations etc.). A facilitator should get to know water users’ opinions about their WUA, the extent of their acquaintance with specialists of the WUA, and their proposals for how to settle existing problems. At the same time, it is necessary to ask them how neighbor water users solved similar problems. If a facilitator feels a lack of interest in this discussion he has to ask with whom else these issues can be discussed or who can be recommended as the most active and

competent water user. People being interested in improving a water management practice or experienced farmers who rationally use their water resources and receive good crop yields can be always found among water users. Any water user can point out them. After a few meeting, a facilitator can decide who may be included into a so-called group of initiators. WUA specialists, community leaders (aksakals of local communities, chiefs of local administrations etc.) can be also included into this group. The group of initiators has to organize the meetings of water users united by one off-take.

The fourth step: the meeting with all water users. This meeting should be held on date and in place suitable for water users. A facilitator himself can hold this meeting, but it is advisable to attract additional assistants from among other facilitators or local activists and farmers-leaders specified during preliminary acquaintance. Why? Because somebody has to govern the meeting; and it is preferable to select for this role a respected local inhabitant or water user who is a good public speaker. At the same time, somebody should record all the most important details of the discussion. It is necessary to use small school blackboards (if available) or big paper sheets to record and demonstrate key general decisions and proposals of water users. First of all, water users have to tell about actual water distribution related to their off-takes and technical state of irrigation and drainage networks, as well as relations between agricultural water users and other consumers. After specifying the existing problems related to water distribution (all this information should be recorded and demonstrated on small school blackboards or big paper sheets), it is necessary to ask water users what ways do they see to solve these problems? Those proposals which coincide with the concept of WUGs, as well as similar opinions presented by different participants of this meeting, have to be recorded and demonstrated on school blackboards or paper sheets for all. During the meeting, it is easy to specify the most active water users as the potential leaders of WUGs; at the same time, water users can inform on their lessons learnt from solving the problems, and a facilitator, based on this information, should only link them with the idea of establishing WUGs and then gradually come towards the targets of a WUG. At that, a facilitator has to tell about advantages, objectives and the need in establishing WUGs. In the course of his presentation of WUGs' objectives, experienced farmers can exemplify their approaches for improving crop productivity based on rational irrigation. At the end of the meeting, it is necessary to specify a date of the next meeting for setting up WUGs and selecting their leaders.

The fifth step: the meeting for establishing a WUG. This meeting should be held according to agreements reached at the previous meeting. WUA specialists needed to be invited to this meeting in order to learn the experience of establishing WUGs and in the future to be able to establish WUGs on another irrigation module.

During the meeting, the active participants should have an opportunity to tell about their lessons and to confirm the possibility to provide high and sustainable crop yields under effective use of irrigation water. Experienced farmers can give examples of positive effects of applying an optimal irrigation schedule, stressing that both water deficit and over-irrigation are harmful for crops. Participants of the meeting should also mention water management problems, and how they can be solved based on activity of WUGs. A decision on establishing WUGs and electing its leader from among active water users is made based on the findings of discussion. It is not obligatory that a leader of the WUG should be an irrigator, former foreman or experienced farmer, but he/she has to be a respected person among water users and community people. He/she must have leadership qualities in order to organize water users for joint actions to solve common issues - maintaining their off-take in operating conditions and ensuring equitable water distribution. Water users can also discuss the matter of provision of incentives for a WUG leader. Figure 4.15 shows the dynamics of establishing WUGs on the pilot irrigation canals where more than 40% of WUGs were established based on the community initiative under participating water users.

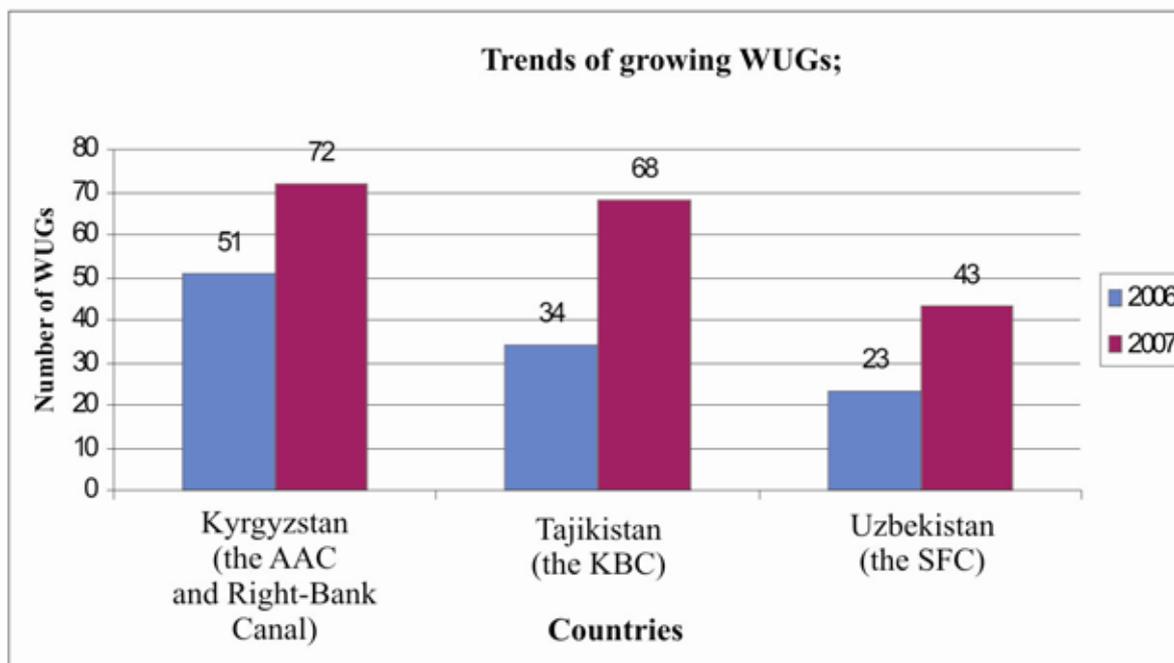


Figure 4.15 Trends of Establishing WUGs on Pilot Canals

A Water Users Group can tackle the following issues:

- Timely water diversion in the head of their lateral (both on tertiary canals and lower level canals where farmers have small irrigated plots and on secondary canals where there are mainly large water users);
- Distribution of water diverted among water users based on the principles of fairness and publicity;
- Collection of information on their lateral to facilitate activity the Water Users Association under drafting the water use plans;
- Involvement of all water users in the water management process including collective works aimed at cleaning and repairing their laterals, as well as regulators;
- If necessary, drawing up of an agreement between the WUG and WUA covering irrigation water supply;
- Problem-solving of agricultural practice and water allocation jointly;
- Collection of applications for irrigation water supply (for their lateral) and submitting an aggregated application to the WUA Administration;
- Close co-operation with WUA specialists, participation at the meetings held by the WUA, business contacts with their representatives in the WUA Council to discuss current problems on their laterals;
- Drafting the water rotation schedule under active participation and close co-operation of all water users, as well as providing transparency of planning and implementing the schedule based on the participatory approach; and
- Assistance to a WUA in collecting of fees for water services from own water users.

Participation of WUGs in the process of water governance in the frame of the WUA

A top priority task for WUA specialists is water allocation at the tertiary and lower level of irrigation canals. Water users needed to be involved in water distribution on these canals through establishing WUGs.

When water users have small irrigated plots, it is rational to transfer their powers related to water distribution to WUG leaders (based on the general authority or the written agreement of water users located on this lateral) [27]. In addition, this simplifies signing the agreement on irrigation water supply between the WUA and water users, since such agreements will be signed with authorized leaders, who enjoy water users' confidence within the group, rather than with individual water users.

Thus, a leader who, on behalf of water users, participates in the processes of water resources planning, management and distribution at the level of WUA, its administration, Council, and general meeting is elected in each WUG. Water users, by the democratic way and according to their own free will, transfer their powers for representing their interest in water management. At that, a WUG leader will be responsible for collection of information required for drawing up the plans of water use (crop patterns and areas under crops in the command area of a lateral, its technical state, including data on an efficiency factor), as well as collection, aggregating, and submitting of applications on behalf of water users, drafting and implementing the schedules of water distribution and rotation, and signing the agreement on irrigation water supply with a WUA.

During the growing season, a WUG leader collects applications of own water users and, after their generalization, submits the aggregated application to the WUA Administration. WUA specialists, based on the aggregated application from a WUG, revise own plan of water use. A WUG leader, based on collected applications and consent of all water users, drafts the water distribution schedule for their lateral.

Thus, the WUA (its irrigators) delivers water up to the head of tertiary canals i.e. to the border of a certain WUG. Then, within the WUG, its leader distributes water according to the schedule agreed by all appropriate water users.

Supporting the initiatives of water users groups

The IWRM-Fergana Project has supported WUG initiatives related to the construction of hydrometric posts at the most problematic sites, promoting their participation in water resources management at the WUA level. Key indicators of selecting sites for construction of hydrometric posts were the following: activeness of water users, existence of established WUG, and close relations between the WUG and WUA. For this purpose, the project procured construction materials (cement and metalwares); however, most of costs were covered by WUGs in the form of labor force and local construction materials (sand, rocks). A Working Commission consisting of water users has selected 20 WUGs (10 on the KBC and 10 on the AAC), using transparent and fair procedures and based on the criteria that meet the requirements of water users. The chief achievements were the following: an increased will of the WUAs to mobilize own financial and labor resources for step-by-step rehabilitation of water infrastructure; enhanced role, prestige, and confidence to WUA among water users; intensification of social mobilization; enhanced management responsiveness; intention of WUAs to establish new WUGs on the problematic sites; and, finally, improving of water distribution.

4.6. A Role of Drainage Infrastructure in the Frame of IWRM

(V.A Dukhovny, H.I Yakubov, P.D Umarov)

The Turan lowland where major irrigation schemes of Central Asia are located is a zone of intensive mobilization and accumulation of salts due to arid climate and geomorphology, as well as hydro-geological conditions formed under the influence of natural hydrostatic head of ground waters.

Intensive water management development during the second half of 20th century was accompanied by the considerable expansion of irrigated areas and large-scale construction of drainage systems. At the beginning, the network of main collector-drains was constructed; and after that, constructing of the systems of open and subsurface drainage, drainage tubewells, and horizontal drainage with booster-wells were developed. At that, most of new-developed lands were characterized by prevalence of saline soils or soils subjected to salinization.

At present, it is necessary to keep and maintain the drainage network, and to develop additional drainage infrastructure in some places, as well as to create an appropriate system of drainage management as a part of integrated water resources management.

In the arid zone, land drainage plays an enormous role as a tool to remove excess surface and subsurface water from the land and to manage of groundwater levels, creating the normal conditions for maintenance of buildings and irrigation structures, for implementing of agricultural operations and crop growth. At that, land drainage prevents the accumulation of salts in the root zone that can adversely affect crop growth and at the same time, creates the conditions for optimal management of soil moisture and groundwater within irrigation schemes as a whole. The fact is that large-scale irrigation causes the mobilization of millions of tons of salts; and proper tools are necessary in order to manage these processes and to support the ecological equilibrium of landscapes and water bodies, especially in lower reaches of the rivers.

Scientifically grounded selection of drainage parameters at the stage of designing allows minimizing the salts exchange between an aeration zone and groundwater due to capillary rise and upwards movement of soluble salts, as well as between irrigated lands and drainage water sinks (local depressions, rivers, wetlands etc.). It is very important to understand that excessive drainage results in not only removal of harmful salts from soils but also useful salts (gypsum) and nutrients, causing damage on soil texture and fertility. Therefore, the optimal water and salt regime in the root zone under minimum water exchange between the aeration zone and groundwater is a tool for maintaining irrigated land fertility.

However, it is not sufficient only to build a drainage system with optimal parameters because it is also important to establish a well-grounded system of joint management of drainage and irrigation in such a way, which can provide minimal salts mobilization and minimum salts exchange between irrigated lands and surface water streams. At present, in Central Asia, under conditions of transition towards the market economy, organizing of proper drainage management faces considerable difficulties due to the following causes:

- Abrupt decrease in the scope of work related to construction and rehabilitation of drainage systems, when drainage infrastructure continues deteriorating;
- A lack of funds for timely repairing, maintaining and developing drainage infrastructure;
- Fragmentation of management and maintenance of drainage systems, especially in transboundary river basins and under arising of thousands of new land and water users; and
- Collapsing the technical base of former organizations responsible for land reclamation; and insufficient efforts for establishing a new institutional framework for drainage management.

4.6.1. Developing Drainage Infrastructure in the Aral Sea Basin: the Past and Present

Intensive development of irrigation in the 20th century, especially, in its second half, including developing virgin lands in Golodnaya, Karshi, Jizak, and Sherabad steppes, in the command areas of Karakum and Kyzylkum irrigation canals, in Central Fergana, in the Asht Irrigation Scheme in Tajikistan made drainage issues especially topical in the region. Irrigation systems turned into irrigation and drainage systems that are the integrated ameliorative systems of irrigation and drainage, which only jointly allow to create conditions for sustainable agricultural production and to maintain land fertility. The rates of constructing these systems were really unique – up to 60,000 ha/year.

As a result of these works, by the beginning of the 1990s, 200,000 km of drainage networks were constructed, including 45,000 of inter-farm and main collector-drains, 155,000 km of on-farm drainage network (including 48,600 km of subsurface field drains), as well as 7,762 drainage tubewells covering the area of 836,600 ha. An area serviced by the horizontal drainage amounts to 4,750,860 ha.

However, if prior to 1990, the rates of constructing the drainage systems were really great, since 1990 they were practically suspended (Fig. 4.16).

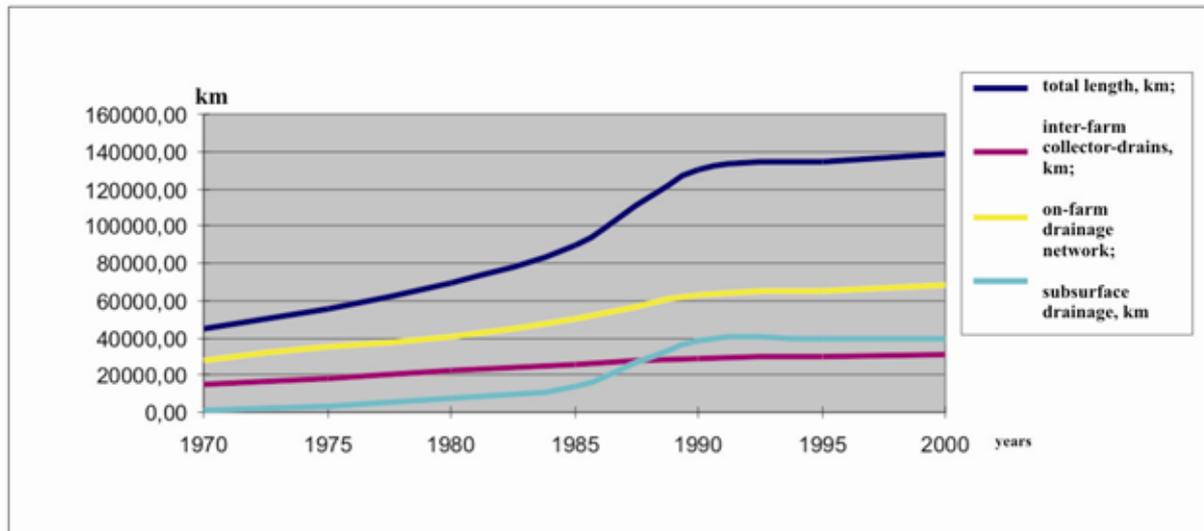


Figure 4.16 Trends of Drainage Development in Central Asia

At the same time, most of areas artificially drained are located in Uzbekistan where the advanced types of land drainage were introduced: subsurface field drains and drainage tubewells with the serviced areas of 550,000 ha and 450,000 ha respectively. Taking into consideration availability of drainage facilities, including the systems of drainage tubewells, per one hectare, irrigated lands in Kazakhstan, Tajikistan, and Uzbekistan can be classified as sufficiently man-made drained. In Turkmenistan, where a specific length of drainage makes up 14.7 m/ha, the irrigated lands can be referred to the category of insufficiently man-made drained. At that, irrigated lands of this country are located in the zone with more complicated hydro-geological and soil conditions.

At the same time, irrigated areas serviced by drainage tubewells (in 2000, this area amounted to 380,400 ha against 450,000 ha in 1990) have quite reduced during last years due to closedown of some tubewells.

Prior to 1991, in all Central Asian countries, main collector-drains, inter-farm collector-drains, drainage tubewells and partly subsurface drainage were on balance (in the books) of the state and were maintained by specialized organizations of the Republican Ministries of Land Reclamation and Water Resources, but on-farm open drainage network and most of subsurface drains were transferred from the books of the state to farms.

Therefore, the inter-farm collector-drains, drainage tubewells and part of subsurface drains were maintained by the Provincial Hydro-Geological & Ameliorative Expeditions or other specialized organizations such as National Drainage Network Administrations financed by the states. On-farm drainage systems were maintained by the farms using own funds.

Owing to economic weakening the water sector and transition of the agricultural sector towards market relations, the state water management organizations don't pay due attention to O&M of the inter-farm drainage systems; at the same time, on-farm drainage network of former collective farms and state farms is not maintained at all. As a result of funds shortage, the scopes of rehabilitation works, cleaning of collector-drains, and repairing and flushing of field drains were abrupt reduced resulting in the catastrophic technical state of drainage systems. Dynamics of two integrated indicators (a readiness factor and costs per unit) shows that consequences are the most adverse for the subsurface drainage systems and on-farm open drains (Table 4.5).

Table 4.5. Assessment of Horizontal Drainage Status in Uzbekistan

Type	Parameters	Prior to 1990	1995	2000
Inter-farm open drainage network	Readiness factor	0.88	0.83	0.71
	Costs, USD/ha	5.4	2.64	2.86
On-farm open drainage network	Readiness factor	0.86	0.80	0.70
	Costs, USD/ha	7.1	2.7	3.0
Subsurface drainage	Readiness factor	0.89	0.78	0.63
	Costs, USD/ha	7.8	2.6	2.1

Much worse situation is observed for drainage tubewells, operation and maintain of which became extremely expensive and unprofitable under new conditions of transition towards the market (Table 4.6).

Table 4.6. Operational Indicators of Tubewell Drainage in the Republic of Uzbekistan (over the period of 1970 to 2002)

Indicator	Year						
	1970	1975	1980	1985	1990	1995	2002
Total number of drainage tubewells, pcs	543	939	1952	3137	4239	3908	3530 (2700)*
Drained area, 000' ha	174.45	198.65	310.62	406.83	447.51	447.86	380.4
Mean Annual OEC	0.47	0.67	0.64	0.58	0.57	0.33	0.24
Pumping-out, mln. m ³	568.01	1116.84	1577.47	2048.4	2203.35	810.2	925.18

Such a situation has resulted in abrupt deteriorating agricultural land conditions during last decade. The irrigated areas with a depth of groundwater table less than 2 m have increased on 21% in the Amu Darya basin and on 65% in the Syr Darya basin. At the same time, the areas with heavy and medium saline soils have increased on 57% and 78% in the basins of Amu Darya River and Syr Darya River respectively. Droughts observed during last decade also contributed to the intensification of soil salinization since water resources were insufficient for implementing proper leaching operations.

Thus, desalinization of soils within the irrigated schemes, which took place prior to 1990, gave way to salts accumulation gradually causing complete soil degradation.

In spite of their efficiency and capacity to provide conditions for establishing optimal water and salt regime of soils on irrigated lands and for reducing total production costs per unit of yield, advanced types of drainage systems (subsurface drainage, drainage tubewells, and horizontal drainage with booster-wells)

were rather expensive and required due quality of O&M, permanent monitoring of land condition and water consumption.

Disintegration of the USSR was accompanied by destruction of all customary O&M norms and rules for the drainage systems; by economic and institutional weakening the water and agricultural sectors and decreasing the state economic potential as a whole. As a result, the rates of reconstruction and developing the drainage systems have reduced practically up to zero; O&M costs were decreased in a few times, and the capacity of land reclamation services has lowered in such degree that it resulted in soil salinization, waterlogging and loss of productivity of irrigated lands. Most surprising is that, when only 30-50% of drainage systems are operable, “cancerous tumor” of salinization did not affect all irrigation lands, although some similar processes are observed. Of course, in the past, under designing the drainage systems, some aspects such as additional drainage capacity of open collector-drains, introduction of water saving technologies, and methods of more rapid desalinization of saline soils were taken into consideration insufficiently. Moreover, excessive drainage capacity was accepted in the design and predictive estimates of drainage facilities density in order to provide more rapid rates of soil desalinization, not considering possible water deficit in the future.

Due to such a reserve capacity, if normal O&M will be provided the existing drainage systems in Central Asia can meet the requirements of management of water and salt balance on irrigated lands in most of regions under providing proper water delivery for leaching operations, excluding the irrigation schemes where drainage capacities are evidently insufficient. At present, practically in all regions of Central Asia, the technical state of existing drainage systems does not meet the requirements of ecological and land reclamation management.

Total economic losses related to soil salinization amount to US\$ 354 million in the Amu Darya River basin and US\$ 254 million in the Syr Darya River basin [6].

4.6.2. A Role of Drainage in IWRM

One of the IWRM components in the water sector in the arid zone is the integration of irrigation and drainage, i.e. consideration of their two-way influence aimed at effective use of water and land resources. In other words, the integration of water and land resources is provided by means of joint management of the water and salt regimes of irrigated lands using the tools of drainage and irrigation.

Irrigated lands can be represented as biologically active “living organism” with its inherent productivity, in which irrigation canals and other components (distributed ditches, irrigated furrows) play a role of “arteries and arterial capillaries,” and drains and collector-drains play a role of “venous capillaries and veins.” External surface of this “living organism” - soils play a role of a skin that absorbs solar radiation and is subjected to climatic changes, but, at the same time, soils are a generator of biological life of plants, supplying to them not only water but also nutrients (fertilizers) through “arterial capillaries.”

If to consider land productivity in its dynamics (Figure 4.17) it is possible to see opportunities for its raising and also lowering.

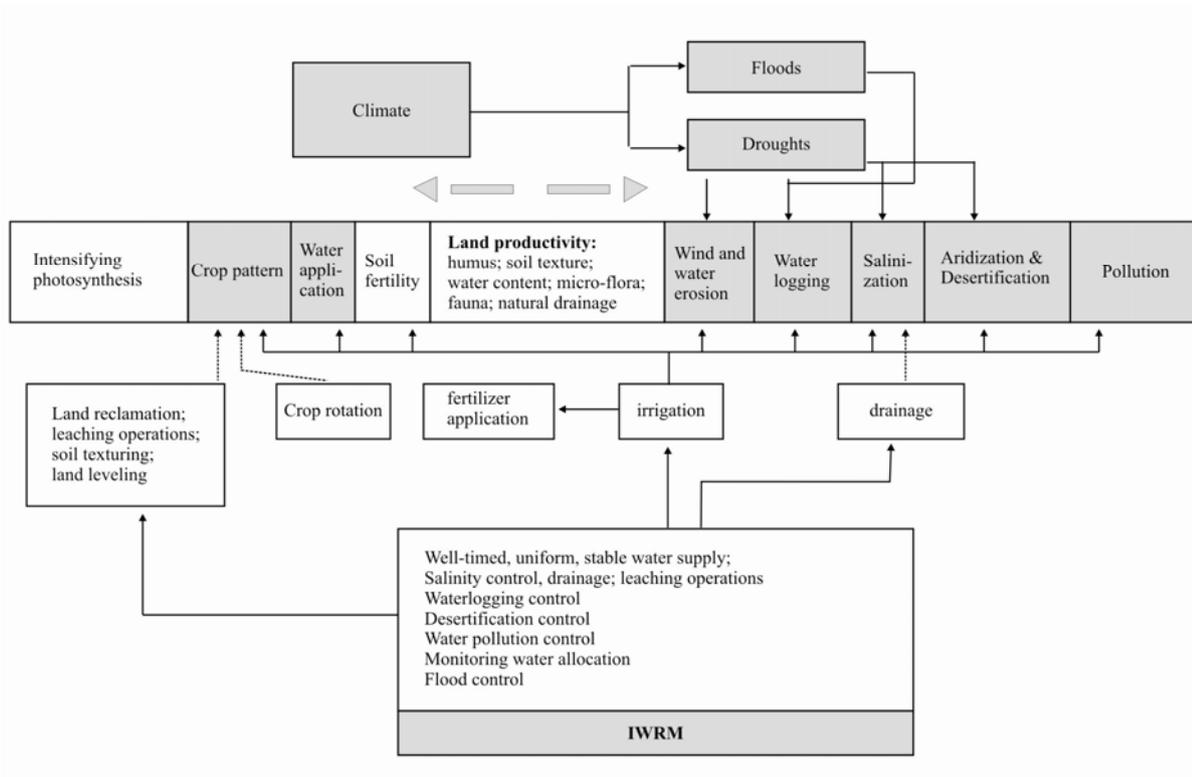


Figure 4.17 Irrigated Land Productivity Factors and IWRM

Key factors that predetermine irrigated land productivity are the following: i) fertilizers including organic manure; ii) maintaining the optimal water regime of soils; iii) structure-forming of soils and keeping of their aggregated structure; and iv) intensification of photosynthesis by means of mulching and other agro-technical measures. On the other hand, lowering of irrigated land productivity can be caused by water erosion, wind erosion, waterlogging, salinization, desertification, and soil pollution.

Thus, factors that predetermine productivity of irrigated lands related to proper management of land reclamation activity, which is the combination of irrigation, drainage, agro-technical improvements, and fertilizer application. In exactly the same way, a decrease in productivity is the consequence of improper management of irrigation and drainage. A correct combination of drainage and irrigation depends on:

- Sustainable and equitable irrigation water supply in sufficient amounts;
- Prevention of waterlogging and salts accumulation in the root zone based on sustainable operation of the drainage system and employing of irrigation with the leaching fraction and leaching operations;
- Prevention of desertification by means of establishing the required water regime using specific methods of wetting, keeping natural soil moisture, accumulating rainfall, and planting drought-resisting trees and bushes;
- Prohibiting pollution of land and water resources;
- Monitoring water distribution; and
- Flood control and prevention.

From this point of view, confunction of drainage and irrigation should be accompanied by such land reclamation measures as deep ripping (up to 1.5 m), improving soil texture applying special amendments (as well as addition of sand to heavy (clayey) soils or clay to sandy soils), and recurrent land leveling.

The joint operation of irrigation and drainage is also important in the light of the following aspect: use of brackish water from collector-drains and drainage tubewells (as one of components of IWRM, which envisages joint usage of all available waters: surface water, ground water, and return water) is possible only when there is sufficient artificial drainage on irrigated lands and, at the same time, irrigation with the leaching fraction is employed. Under considering interaction of soil and plants, upward and downward depth-variation water fluxes controlled by irrigation and drainage, it is necessary to link them with spatial changes resulting from horizontal water fluxes in soil and subsoil depending on a mutual layout of field drains and plots under irrigation. Cascade-located irrigation schemes, which intensively interact with each other, can be a special example.

Apart from three dimensions of interaction of drainage and irrigation (over area, depth, and volume), it is necessary to keep in mind one more dimension – time i.e. in the frame of IWRM an aging of drainage infrastructure and the need of its rehabilitation needed to be considered. The most complicated issue of managing the drainage aspect in the frame of IWRM is the implementation of monitoring and repairing of the drainage systems, since the possibility of meeting the water requirements of crops depends on the sustainability of drainage and irrigation.

Thus, integrating of irrigation and drainage for rational water use and water saving should be based on:

- Science-based selection of design parameters of irrigation and drainage, and their integrating over area, depth and time;
- Correct layout of irrigation furrows and field drains preventing uneven joint effects; and
- Sustainable irrigation water supply that meets the requirements of irrigation with leaching fraction and drainage according to design parameters based on proper management and maintenance of inter-farm and on-farm irrigation and drainage networks.

4.6.3. Selecting the Drainage Parameters and Their Correlation with Irrigation Practice

A role of land drainage in arid regions considerably differs from its role in humid regions. If the latter has to control only waterlogging and surface flooding of the farming lands, drainage in arid and semi-arid regions executes two additional important functions. The first function that is well-known and described in western scientific publications [59, 60] is salinity control and creation of conditions for irrigation without leaching fraction. At the same time, the second function is typical only for water-deficit regions and consists in providing the optimal water and salt regime of soils. This function was studied and widely described in the publications of Soviet scientists [62, 63], but, in our view, it was to some extent ignored by foreign scholars. As known, high evaporation and insufficient natural drainage resulting in rising groundwater table under irrigation and accumulation of soluble salts in the aeration zone are typical features for arid regions. The amount of salts being accumulated within the rootzone and a rate of soil salinization depend on a salt content in groundwater and the intensity of capillary upward flux that, in turn, depends on soil properties, depth of watertable, and soil water gradient. A key indicator of drainage efficiency is the ability of drainage systems to keep groundwater table at a design active depth that is specified by such design parameters as a depth of field drain, design of drain pipeline (a pipe diameter, envelop thickness and materials, and drain gradient), and drain spacing. All these parameters should be considered in relation to their areal layout in a field.

Designing the drainage systems for arid conditions taking into consideration the water-saving aspect and controlling removal of soluble salts, preventing salts accumulation with simultaneous keeping of useful nutrients in soils is based on selecting of the optimal land reclamation regime [6, 63]. This problem is considered in many scientific publications. A kernel of this approach can be briefly described as the search of an optimal ratio of average-weighted watertable over area and maximum capillary height under considering different values of groundwater salinity (Table 4.7).

Figure 4.18 shows that minimizing of salts removal and water consumption per unit volume of salts removed [6] corresponds to optimal costs (reduced costs per one hectare). A correlations between the optimal salt and water regime and cotton yields (Fig. 4.19) that are plotted based on data collected at six pilot stations of the SOUZNIKHI¹² and represented in the same publication shows that sustainable and maximum cotton yields are observed under the optimal water and salt regime of soils.

Table 4.7. Correlation of Groundwater Salinity and a Relative Depth of Groundwater
Table under the Optimal Soil Water and Salt Regime

Groundwater salinity	$\frac{H_{mgs}}{h_c}$	Salt removal, t/ha
1 g/l	0.5	1-2
2-3 g/l	0.6	3-7
5-7 g/l	0.9	5-10
>10-15 g/l	1.2	10-15

were: h_c is a maximum capillary height;
 H_{mgs} is a mean GWT over a growing season.

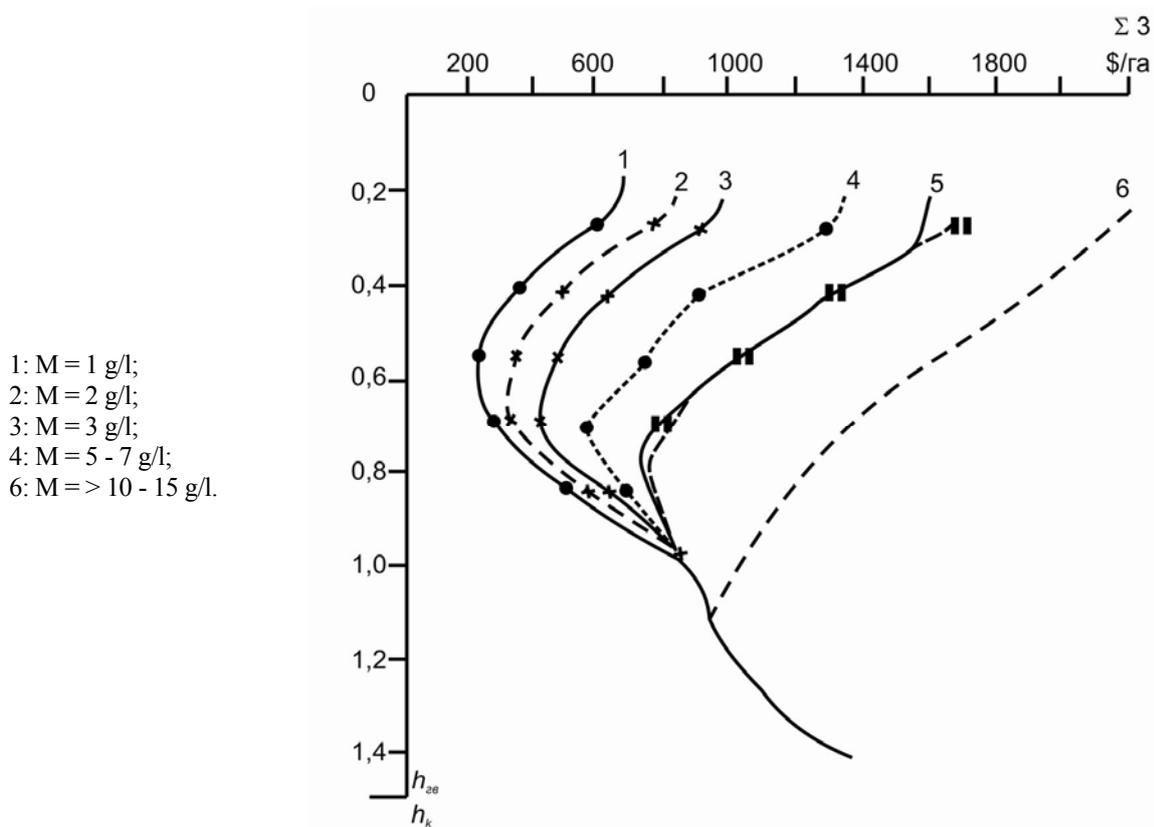


Figure 4.18 Optimizing the GWT regime regarding unit costs taking into account water consumption and crop yield:

¹² Scientific-Research Institute of Cotton Growing

Regimes of soil formation:

- I – hydromorphic;
- II – semi-hydromorphic;
- III – semi-automorphic;
- IV – automorphic.

Pilot Site of SOUZNIKHI:

- 1 – Pakhta-Aral;
- 2 – Bukhara;
- 3 – Golodnaya Steppe;
- 4 – Fedchenko;
- 5 – Akkawak;
- 6 – Khorezm.

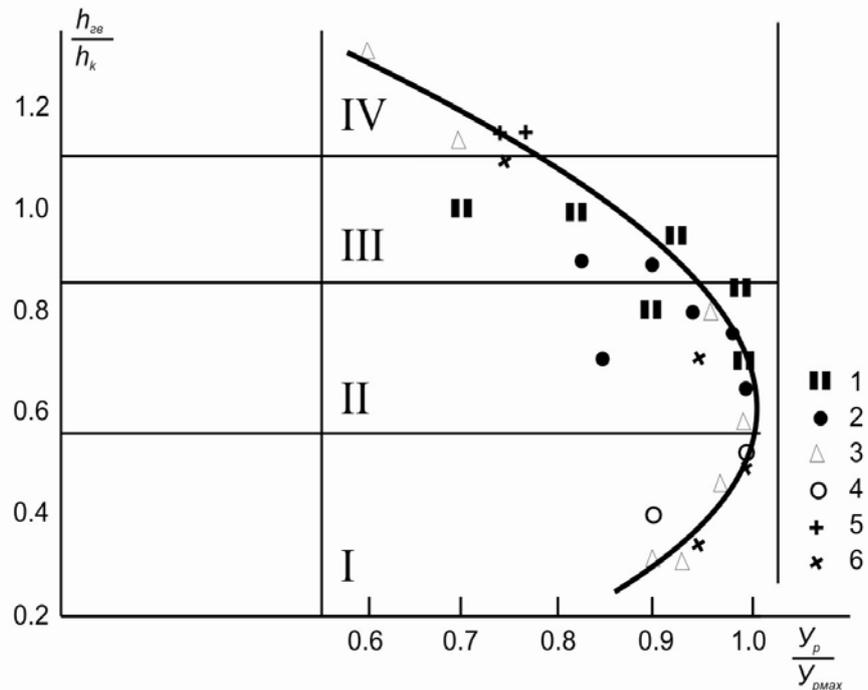


Figure 4.19 Impact of Relative GWT and the Hydro-Ameliorative Regime on Cotton Yield

Without considering other factors, a maximum crop yield corresponds to values of a relative GWT (a ration of an average depth of GWT over the growing season to a capillary height) ranging from 0.5 to 0.75. However, an optimal depth of GWT also depends on groundwater salinity.

A hydraulic head midway between real drains differs from a hydraulic head midway between ideal drains by the entrance head losses that depend on sizes and materials of the envelop, pipe parameters, construction method and by the extra head loss caused by the radial flow when a pipe drains do not reach the impervious layer and the flow lines converge towards drains, as well as an underground water head, if necessary, should be also taken into consideration. Due to the above factors, an actual hydraulic head midway between real drains can be less by 30 to 100 cm. In case of leaching operations or check irrigation, when discharge of drains is abruptly increasing, a so-called “effective drainage depth” can be decreased as well.

It is necessary to keep in mind that the design scheme of subsurface drainage (various design formulas used in our and foreign practice) considers a drain spacing for one specific transverse fragment that is perpendicular to the drain pipeline rather than for an irrigated field as a whole. For assessing the actual situation on the irrigated field some additional transverse fragments have to be considered, and then to evaluate a mean depth of groundwater table over the whole field. However, even under such an approach, it is additionally necessary to take into consideration the influence of deep collector-drain causing the specific drawdown curve in the direction along subsurface drains (Figure 4.20).

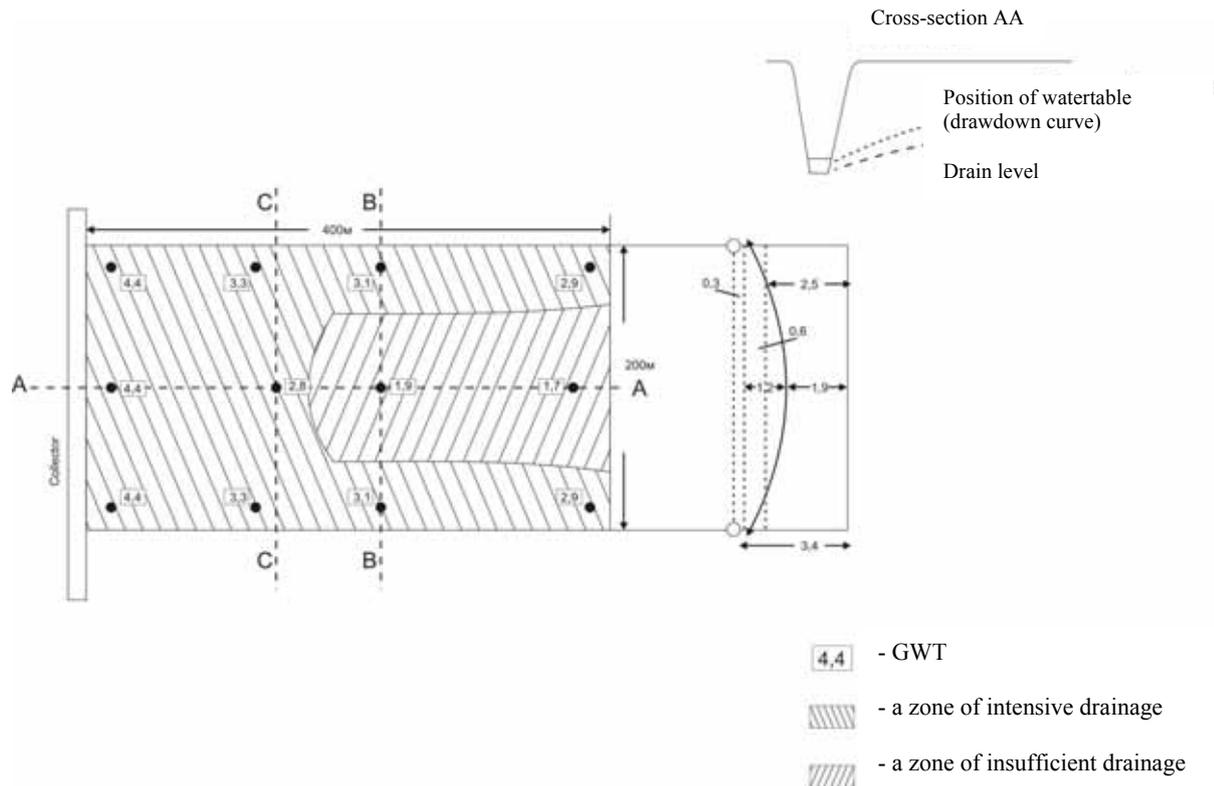


Figure 4.20 Forming GWT on Good-Leveled Fields with Well-Designed Drainage System

Hence, the following interesting facts can be mentioned:

- In the Golodnaya Steppe, where loess soils are characterized by high capillary properties (a capillary rise (h_c) equals 3 m and even more), a depth of GWT averaged over the growing season has to be 2.7 m under groundwater salinity ranging from 5 to 8 g/l; and correspondingly an installation depth of subsurface drains should be 3.0-3.5 m. The correctness of such technical solution was proved by all the practice of land reclamation in the Golodnaya Steppe where land desalinization was provided under gross water consumption of 9,500 to 10,500 m³/ha;
- In lower reaches of Central Asian rivers, in particular in Khorezm Province, stratified soils with thick sand layer (a capillary rise equals 1.6 m), a depth of GWT averaged over the growing season has to be 1.1 m under groundwater salinity ranging from 3 to 5 g/l; and correspondingly a depth of subsurface drains should be 1.5 -2.0 m.
- On irrigated lands with sandy soils ($h_c = 0.5$ m, for example, in the pilot farm of SANIIRI in Khorezm Province), the drainage system with subsurface drains 1.5 m deep has created the automorphic regime causing the need of frequent water applications

Just that very case can explain the success of drainage practice in Egypt on sandy soils of the Nile River delta. There are different soils on drainage sites in India and Pakistan, but it is necessary to keep in mind that the monsoon climate with considerable rainfalls creates the conditions for intense leaching of soils over the vast area of drainage projects in Pakistan and in the state of Haryana in India.

At the same time, we can refer to data collected at their pilot drainage site in Iraq (personal communication of V. Dukhovny with Mr. Hulbols), where in the Dajilakh Irrigation Scheme the leaching regime of soils was provided based on shallow drainage (a drain depth of 1.2 m) only under gross water consumption of 16,000 -17,000 m³/ha.

Let us consider, for example, a combination of the transverse pattern of furrow irrigation with non-regulated flow in a head of furrows with the transverse network of field subsurface drains. Assuming for estimate the most advanced strip AB (Fig. 21) along the axis of drain spacing, we consider contributors of the salt balance within the aeration zone and their distribution over a length of the strip AB from a collector-drain to an irrigated distribution flume¹³.

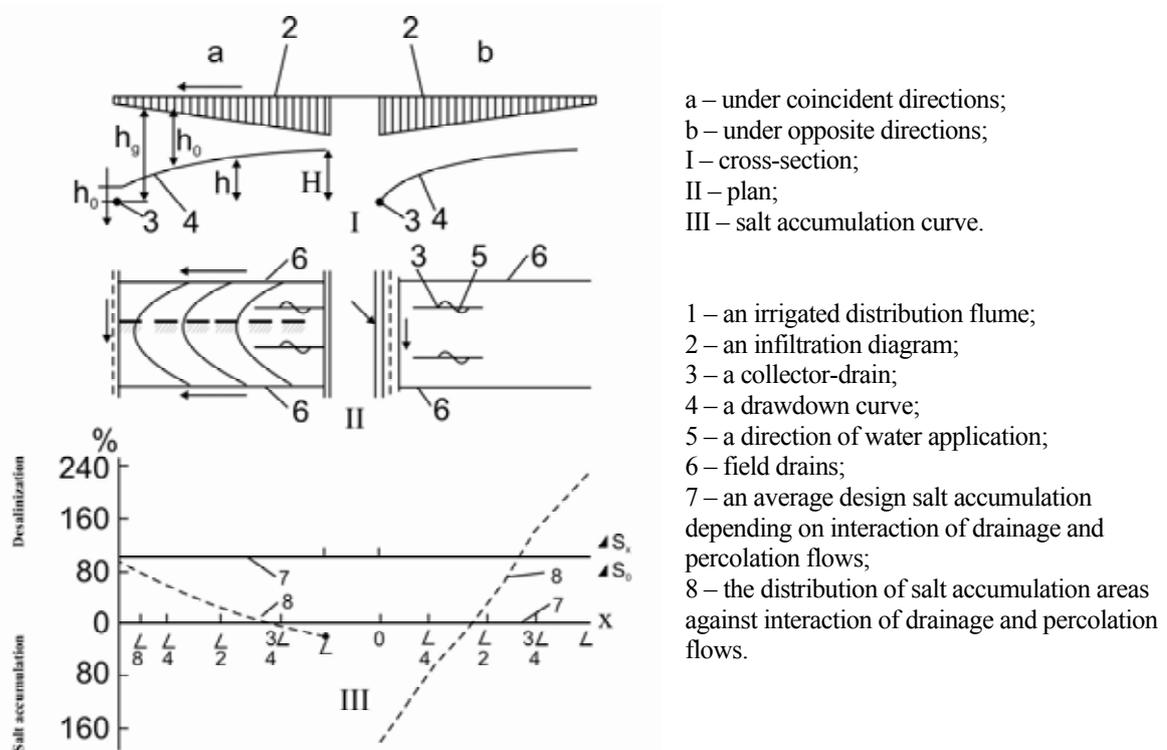


Figure 4.21 Desalinization Effect under Different Combinations of Directions of Water Application and Field Drains:

Assuming the widespread pattern of field drains lengthwise an irrigated plot 400 m long, a design drain depth of 3.5 m and drain spacing of 200 m, we have assessed the extent of desalinization effect against groundwater salinity up to 8 g/l and irrigation water salinity of 1 g/l. Long furrows, direction of which coincides with field drain gradient, are employed for a water application. As shown in Fig.6a, the decrease in percolation intensity under moving from a drain head is overlapping on the increase in a groundwater depth. Since a minimum groundwater table is observed near an irrigated flume, velocities of convection transport are minimal here, but greater percolation values in accordance with the percolation diagram compensate them. In the direction towards an outlet of field drain, where a maximum groundwater table is observed, water percolation values in accordance with the percolation diagram are tending to zero. As a result, the desalinization is provided over the 90 percentage of field area, having a considerable margin. Under the contrary pattern, where water applications are conducted in the direction from a drain outlet towards its head, percolation intensity over the 50 percentage of field area does not create necessary velocities of convection transfer of salts resulting in the lack of leaching affect over this area that should be delineated (leaching requirements have to be increased 1.8 times here!!!).

As shown in our publication [5], the duration of water applications and the extent of their covering the area that is simultaneously drained and irrigated are also significant for maintaining uniform soil moistening and water percolation downwards. Forming the big local mound in the watertable does not occur if the duration of water application is ranging from 12 to 24 days, but elongating of water application terms and a high percentage of a simultaneously irrigated area within the drainage plot (more than 50%) cause the rise of

¹³ Precast lateral lifted above ground for irrigation water delivery to fields.

watertable by 0.5 to 1.0 m and create an additional load on the drainage system (a drainage rate increases two times); in addition, at the same time, useful salts and nutrients are leached and carried away from soils.

From this point of view, introducing the water rotation, control of water application arrangement according to the daily schedule recommended by the SIC ICWC [24] and deconcentration of simultaneously irrigated areas facilitate more uniform soil moistening, desalinization and enhancing soil fertility. More attention should be paid to these matters under introducing the field passports and recommended schemes of water applications.

Organization of Land Reclamation and O&M Works

Problem-free land reclamation activity depends on many factors predetermined by natural conditions within the irrigation scheme and by its irrigation and drainage components as well. Different organizations and even sometimes different departments “have in their hand” the sustainable operation of these territories and simultaneously the irrigation and drainage systems. At the same time, only the coordinated actions of all actors, on which proper irrigation water supply and drainage depend, can provide high crop yields under minimum water consumption based on uniform effects of irrigation and drainage (Fig. 4.22).

Even earlier, under the administrative system of governing irrigation and drainage, it was difficult to provide the coordination and integration of all actors. In the Soviet time, the state water management organizations under supervision of the Provincial Hydro-Ameliorative Expeditions (PHAE) have incurred all costs related to O&M of the drainage systems. Now this task is more complicated due to many causes. However, new forms and methods of the integration have to be searched out under present conditions.

After independence, practically all Central Asian countries considerably abated the activity related to maintaining the drainage systems, especially at the on-farm level. The Republic of Uzbekistan maintains the satisfactory operating conditions of inter-farm and main collector-drains, but has also reduced the scope of O&M works on the on-farm drainage network. As a result, during last 15 years, the operability of drainage systems abruptly dropped. In conjunction with deficit of water resources needed for leaching salt-affected soils, this has resulted in restoration of irrigated land salinization. Up to now, this process is not stopped and continues to strengthen: about 60% of irrigated areas are subjected to salinization in Uzbekistan; 70% in South Kazakhstan and 80% in Turkmenistan.

The problem of organizing O&M of former on-farm drainage systems became more acute after restructuring collective farms and state farms. Without touching the peculiarities of operating the irrigation network that were presented in other sections in detail, we will consider management of drainage systems including drainage infrastructure and issues related to drainage water and salts disposal out of the irrigation schemes.

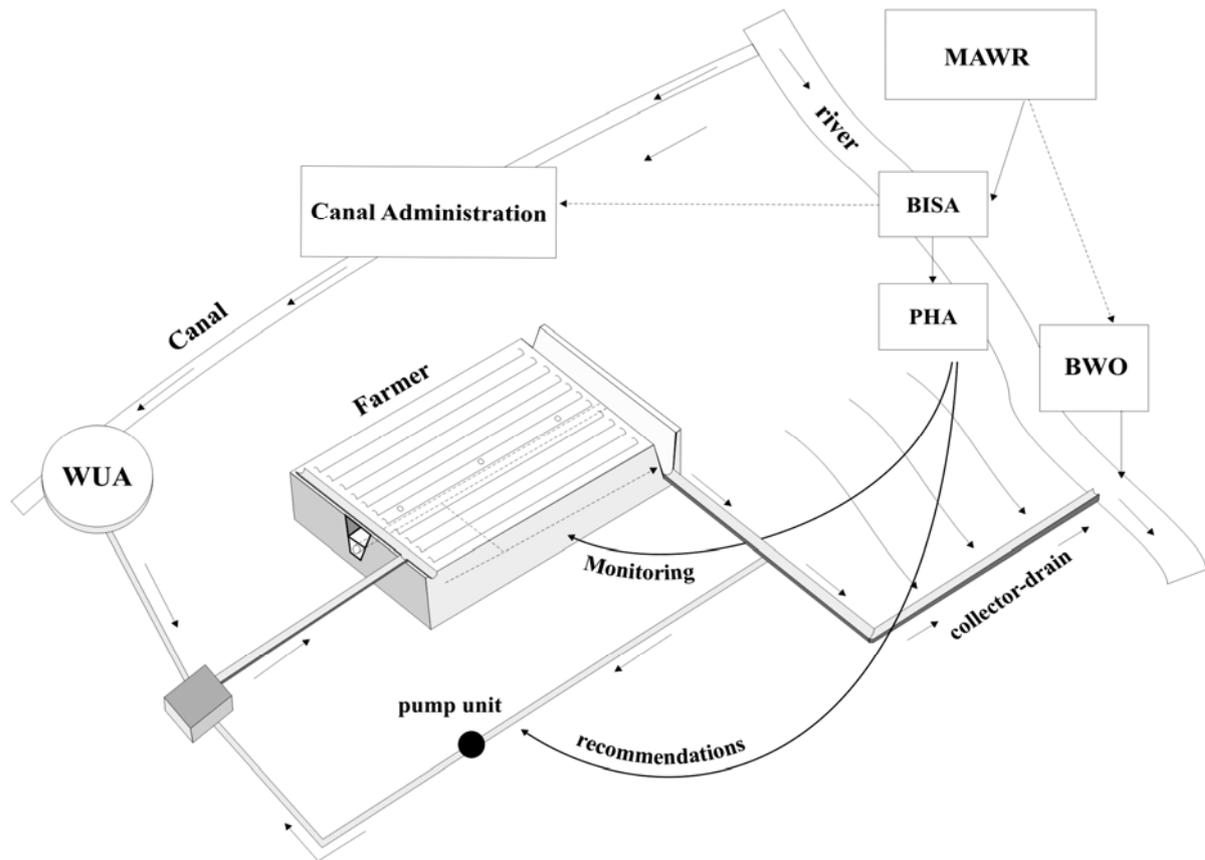


Figure 4.22 The Problem-Free Land Reclamation System

Sustainability of land productivity depends on the following key factors:

- Timely watering of soils and crops depending on their water requirements using the proper method of irrigation and providing uniform water distribution over a field;
- Preventing soil salinization above admissible limits;
- Preventing also waterlogging the rootzone, maintaining soil moisture relevant to specific crops and soil characteristics and properties; and
- Maintaining uniform topsoil quality relevant for supporting the proper crop growth and a field micro-relief to prevent over-application of water and flooding low places and under-application of water on higher places in the process of irrigations.

Keeping in mind numerous technical and agrarian peculiarities of soil salinization processes, a farmer can not in the least know the methods for their specifying, but it is very important in order that partners of farmers such as WUAs and Land Reclamation Bureaus (PHAE) could provide them with required information, on regular basis, and simultaneously execute their commitments regarding land reclamation activity.

On what reasons the implementation of each above requirement depends? And who should provide these ameliorative conditions, without which high crop yields are impossible?

Irrigation water delivery to a field and crops depends on the following aspects:

- Operational condition of the intra-farm irrigation network (the executor: a farmer);
- Submitting the applications covering the current year and season and their adjustment according to the water use plan approved by the WUA based on the existing norms and allocated limits for water use (the executor: a WUA);
- Good preparation of a field; and proper water distribution within the farm (the executor: a farmer);
- Installation of a water meter on the off-take to farmer's field (the executor: a farmer);
- Operational condition of the conveyance canal to a farm (the executor: a WUA with participating a farmer);
- Maintaining sustainable management of irrigation water delivery and distribution within the irrigation network under its responsibility (the executor: a WUA);
- Maintaining uniform, stable and sustainable water delivery to WUAs' irrigation canals according to their water use plans and agreed and adjusted applications (the executor: the WMO);
- Timely payment for WUA's water services (the executor: a farmer);

Preventing soil salinization above the permissible limits in farms can be provided by:

- Field surveying and soil sampling; and then plotting of a soil salinization map of farm fields with the legend containing the advisable norms of leaching operations for a farmer (the executor: the PHAE);
- Studying opportunities for using drainage water for leaching operations (the executor: the PHAE at the expense of the state budget or developing more detailed recommendations according to the decision of WUA and farmers at the expense of farmers);
- Follow-up annual soil sampling and modification of soil salinization maps by the PHAE;
- Construction of necessary additional drainage facilities by the WMO under supervision of the PHAE (at the expense of budgetary funds);
- O&M of field drains and collector-drains within own farm with an annual detailed survey and current inspection every ten days (the executor: a farmer);
- Maintaining the inter-farm drainage network providing its design depth with appropriate preventive and emergency repairing of the collector-drains and field drains (the executor: WUAs);
- Cleaning and repairing the collector-drains and field drains based on the contractual relations with WUAs (the executor: the WMO under supervising by the PHAE);
- Drainage water disposal out of the WUA's area by gravity or using the pumping units for maintaining the design depth of groundwater table over the area of WUA (the executor: the WMO with participation of the PHAE, at the expense of budgetary funds);
- O&M of drainage tubewells are implemented by specialized organizations (PSA) or the PHAE at the expense of budgetary funds in case of the intercepting drainage and with shared financing by farmers in case of regulating the groundwater table over the farm areas; and
- Water delivery for leaching operations in necessary amounts (the executor: the WUA and WMO).

Maintaining a necessary depth of groundwater table can be provided by means of:

- Monitoring and plotting a depth-to-watertable map for farms and developing measures for areas with the inadmissible groundwater table with the purpose of its lowering (the executor: the PHAE);
- Hereinafter, all positions of the previous paragraph is repeated in the same sequence and with the same executors

Creating the uniform background for providing soil fertility over the irrigated area requires the following:

- Assessing the current state of topsoil fertility in farms by means of remote sensing and on-ground surveys implemented by the extension services or specialized organizations based on the contract with farms;
- Implementing the land leveling by employing long-wheelbase scrapers or laser land leveling equipment funded at the expense of farmers, credits or donors' grants;
- Improving the soil texture by means of deep ripping, addition of sand, clay or other amendments (the executor: a farmer);

A field is the area of farm's responsibility. Farmers should monitor the technical state of field drains and collector-drains, and prevent releasing of irrigation water into the drainage network causing its erosion and damage. Farmers also have to clean the collector-drains, to flush pipelines of subsurface drains (by the gravity method) and to mow weeds overgrowing collector-drains within the own plots.

At the same time, farmers must timely prepare their fields for leaching operations and water applications and then implement them according to the established schedule. If possible, farmers should use return water, mixing it with irrigation water based on the permission and recommendations of the PHAE.

The drainage network within the WUA's area is the field of responsibility of a WUA that should maintain collector-drains, sign the agreements on the technical servicing of on-farm drainage systems, monitor and account the drainage discharge, and involve farmers in necessary works on the drainage network using the "khashar"¹⁴ method. In addition, a WUA plans the usage of return water and delivers it for irrigation (sometimes a WUA organizes use of drainage water on the centralized base). However, a WUA itself cannot execute all necessary works within its area; and part of works should be implemented by the specialized organizations.

At that, first of all, funds should be available and, secondly, specialized machinery or the contractors that can execute necessary works based on the agreement are also needed. At the same time, there is no way to turn the works related to cleaning the collector-drains or repairing and flushing subsurface drains into the contractual intervention.

4.7 The End User of Water and the Extension Service for Farmers

(Sh.Sh. Mukhamedjanov, A.G. Galustyan, S.A. Nerozin)

Depending on vectors of the agrarian policy, reforms in the agrarian sector have specified the different economic environment for developing agriculture in Central Asian countries. For example, in Kyrgyzstan, the agricultural lands have been completely transferred for private use in the form of small plots under the

¹⁴ "Khashar" is voluntary participation of the population in socially necessary works profitable for all or as aiding a member of their community.

absolute self-determination of directions in agricultural activity. In Uzbekistan, private farms were established based on the long-term land leasing with the state order on crops and fixed prices on agricultural output specified by the state. In Tajikistan, the collective farms are mainly kept and only some private farms are being established; and although there is not the formal state order on crops, at the same time, farmers cannot manage their plots and output at own discretion.

However, in spite of different ways selected for reforms, all three republics face the similar problem due to the reforms implemented. Prior to reforms, all large collective farms were managed by a chairman and specialists (agronomist, irrigator, economist etc.) with higher education in agriculture. All farm operations were implemented under their direction; and common agricultural workers only executed their instructions. Now, each peasant himself manages all processes on small areas; and the key problem is the lack of necessary knowledge within the required norms (soil treatment, fertilizer application, pest control, irrigation methods and land reclamation practice etc.). Moreover, peasants face problems related to legal and economic aspects. All this adversely affects crop productivity and profitability. The governments keep track, somehow or other, these problems; but decisions made for their solving are not yet effective. At the same time, under solving the existing problems each country proceeds from own economic and political conditions and interests.

Monitoring conducted in the frame of the project over territories belonging to three republics in the Fergana Valley has shown that private farms differ in areas of allocated plots and in crop patterns. In Uzbekistan, private farms having the sown area of ten hectares and more cultivate mainly cotton and winter wheat because the state order in force does not allow farmers to select crops independently. A set of crops is more diverse in Tajikistan and Kyrgyzstan. Small plots allocated to farmers in Kyrgyzstan do not allow them to manage their agricultural production efficiently and gain good profit. There is more complicated situation in Tajikistan where dekhkan farms were created. Here, the members of dekhkan farms have practically no voting right and do not participate in the decision-making process, being only a labor force under subordinating to the director of the dekhkan farm.

In spite of some differences in reforming the agricultural sector, the overall situation of helplessness is typical for farmers in these countries. After receiving their plots but without infrastructure developed for new conditions, farmer faced the need to solve financial, legal, technical and administrative issues but most of them never solved these problems in the past. Under considering the process of restructuring the agricultural sector and establishing the private farms in each country, the community of problems, on the one hand, and specific differences, on the other hand, become obvious and understandable.

In 2002, some shortcomings in agricultural activity in private farms were revealed in the course of monitoring at the demonstration sites that was conducted in the framework of the IWRM-Fergana Project. The low efficiency of irrigation water and land use was marked practically in all farms under studying in the region. Total losses of irrigation water on the field (deep percolation and surface releases) reach 55% of irrigation water supply at a field border and exceed the normative values 1.5 to 2 times. Water productivity in some farms amounts to 0.14 to 0.19 kg/m³.

Our field survey of the irrigation and agricultural practice has shown that the key factors of decrease in land productivity, apart from the lack of inputs and machinery, are low professional skill and non-normative use of all resources, although farmers in the territories belonging to three republics in the Fergana Valley did not mention the low level of agricultural knowledge. The fact is that the farmers, even those who worked long time in former collective farms and state farms and participated in different farm works, including water applications, have carried out only instructions of an agronomist, irrigator or skilled foreman. At present, a farmer himself should solve all issues because he does not have "consultants" as before. A less skilled farmer tries to make his job in the manner employed by his more skilled neighbor or asks an advice of the elders. However, as our study has shown, most of farmers make considerable mistakes in the process of cultivating crops. Most of farmers cannot correctly specify the terms for water applications or select the correct technological pattern for irrigation resulting in difficulties with water distribution over their fields and overwetting of some sites and insufficient wetting of others; at the same time practically all farmers use the overrated water application norms. Most of farmers do not have technical knowledge on natural factors and specific land conditions within their farms that needed to be accounted under planning water applications. Apart from the irrigation practice, most of problems are related to the lack of any knowledge on norms and terms of fertilizer applications, pest and crop disease control. Phosphate fertilizers are not practically applied in Tajikistan and Kyrgyzstan in spite of an insufficient content of phosphates in soils. Application of nitrogen and potash fertilizers is not timely and does not meet the required norms. Based on

analysis of collected data it is necessary to note that private farms, lacking any state support, have a lot of problems of technical and organizational nature. Key problems faced by farmers in the process of their agricultural activity are similar to problems that are revealed at the demonstration sites. First of all, it is necessary to note the following problems:

- irrigated water supply does not meet the established norms;
- ill-founded terms of water applications;
- incorrectly selected technological schemes of water applications (too long furrows and often water application along the full length of a field);
- incorrect selecting the sorts of fertilizers and rates of their application; and
- lack of knowledge on pest control and preventing crop diseases.

Based on assessment and analyzing of data collected in the process of monitoring, the project consulting team has prepared the recommendations on improving the land and water productivity. Since 2003, the project executors attempted to manage the agricultural production based on these recommendations. As a result of the project activity and impacts on all components of the agricultural production, the situation was changed. In 2003 and 2004, overall productivity at the demonstration sites has increased ranging from 0.29 to 1.4 kg/m³ over farms. During these years the increase in overall productivity amounted to 21 to 135% in comparing with 2002, including reducing irrigation water consumption by 16 to 83% and the rise of crop yield by 11 to 72%. Analyzing the actual use of irrigation water shows that most of farms have the real possibilities for improving the efficiency of water use. Increase in the efficiency can be provided without considerable investments into interventions at the field level and planning water distribution at the level of private farms. At that, development of the simplified and understandable methods of planning and use of irrigation water at the field level, as well as dissemination of learnt experience among other private farms are very important.

It is necessary to note that a lack of farmers' knowledge on correct planning of water use results in considerable lowering the level of their land productivity. To improve water and land resources use at the farm level through disseminating the project experience and introduction of existing advanced technologies, development of the extension service and the training of local consultants are needed.

The experience learnt at demonstration sites in the frame of the IWRM-Fergana Project shows that there are great opportunities for improving irrigation water use and productivity. It is obviously that the training of farmers may result in the considerable improvement of agricultural production. In 2005 and subsequent years, the project activity was aimed at improving farmers' knowledge and introducing the advanced technologies facilitating water saving and increase in land and water productivity. Dissemination of the project experience among farmers was organized through the training and consultation process, as well as by means of conducting the advanced courses for specialist of water agencies and extension services that are servicing private farms. Liaison with the local organizations and extension services, activity of which is aimed at supporting farmers, was established in each province of the Fergana Valley. However, most of extension services render services to farmers only in case of their request. Activity related to consulting services is conducted by organizations having the consulting specialization and by non-specialized state organizations.

In Kyrgyzstan, where the process of reforming is more advanced than in other countries in the region, consulting services for farmers are rendered through the non-governmental organizations financed by the World Bank and the EBRD with partial payment of these services by the government and farmers themselves. In Tajikistan, most of extension services are rendered through the non-governmental organizations financed by international donors. In Uzbekistan, in spite of lack of the institutional framework for rendering rural consulting services, local authorities and organizations under the Ministry of Agriculture and Water Resources monitor timely and proper execution of land treatment and irrigation by farmers.

Regarding above issues, the IWRM-Fergana Project (the Project) established the co-operation with the Rural Extension Service (RES) and the Agricultural Training and Consulting Center (TES Center in Osh).

In Tajikistan, the Project cooperates with the NGO “Development Process Supporting Agency NAU” (DPSA-NAU) that during seven years is rendering the agricultural consulting services to local farmers, as well as with the CECI¹⁵ Project funded by the Canadian Government. In Uzbekistan, the decision was made to initiate training activity at the field demonstration sites under the umbrella of the MAWR and to establish the specialized unit in the frame of BISA with functions of the extension service for private farmers.

In 2006 and 2007, the training seminars to disseminate the experience learnt in the frame of project activity were held in all provinces. In addition, the operational manuals covering various project topics, forms for entering collected data into the database, and booklets with the detailed description of all necessary land treatment and irrigation methods were prepared and distributed among the local consultants. Field training workshops for farmers were held by trainers of demonstration fields (polygons) in Andijan and Fergana provinces in Uzbekistan, by trainers of the CECI Project and DPSA-NAU in Tajikistan, and by trainers of the RES in Kyrgyzstan.

At the same time, the promising results were achieved on demonstration fields of the Project in each province. Farmers, on whose plots the demonstration fields were established under supervision of field trainers and local project specialists, used irrigated water according to the recommended norms and received crop yields considerably higher than an average crop yields in neighboring private farms. Water productivity amounted to 0.46 kg/m³ on average, reaching 0.8 kg/m³ in some private farms.

Trainers of the extension services, using the operational manuals and booklets, made the presentations for farmers that covered methods of water metering and accounting and effective technologies of irrigation water use on the fields. Joint activity of local project specialists and trainers of the extension services promoted the farmers’ awareness regarding the value of proposed technologies for improving their land productivity and profitability.

Since 2005 until 2007, the following handbooks have been prepared and distributed among local consultants and trainers: “Selection of a technological scheme for irrigations”; “What is the irrigation schedule?”; “Specifying the irrigation rate and method for cotton and winter wheat based on the IWRM-Fergana Project’s findings”; “Selection of water measuring devices & guidelines on their construction, operation and maintenance”; as well as “The consultative assistance to farmers”, comprising the procedures for consulting services based on a visual assessment, questionnaires and surveying private farms. Special forms were drawn up for collecting necessary information, which is used to identify the problems of private farms and to formulate recommendations to farmers. Practical guidelines on water use in private farms, comprising data on daily evaporation and the water metering and accounting methods, was drawn up for specialists and farmers enabling them to schedule irrigations with specifying date and the rate of each water application. In 2007, the handbook “Methodology of work with water user groups having small plots (Case Study of the Sokolok Canal)” was drawn up in Kyrgyzstan.

In 2006 and 2007, the training seminars were held in each province covered by the Project for training trainers and local consultants on topics related to efficient use of irrigation water and the methods for improving its productivity (Table 4.8). 20 trainers of the DPSA-NAU¹⁶ and 10 trainers and local consultants of the CECI Project were trained in **Soghd Province** among them **8 field trainers** of the DPSA-NAU who work directly with farmers on the demonstration sites and **5 regional trainers** of the DPSA-NAU who works with field trainers and local specialists. Other 8 participants of the training seminar are specialists-consultants who are employees of the central office developing new technologies and assessing the situation in private farms and at the demonstration sites. Activity of the DPSA-NAU covers five administrative districts: Kanibadam, Spitamen, Matchin, Asht and Zafarabad. Demonstration sites, private farms or the associations of dekhkan farms where trainers of this agency are working were established in each district. The agency cooperates with 76 private farms and the associations of dekhkan farms that encompass the irrigated area of 8,564 ha. Apart from participation in the training courses, the specialists of this agency together with specialists of the IWRM-Fergana Project advised farmers.

¹⁵ CECI – the Committee on Economic Cooperation and Integration

¹⁶ DPSA-NAU is the Developing Process Supporting Agency NAU (Tajikistan)

Table 4.8. Coverage of Private Farms by the IWRM-Fergana Project through Training the Trainers

Name of Province and Consulting Service	Number of trainers and farmers participated in training	Number of private farms serviced by trainers	Area coverage		Total
			Through trainers and farmers	Through Khokimiats & WMO	
Soghd Province					
DPSA-NAU & CECI Project	20	76	8,564		8,564
Private farms	264	264	3,000		3,000
Fergana Province					
BISA & WUA "Akbarabad"	16	240	2,400	3000	5,400
Private farms	605	605	32,457		32,457
Andijan Province					
BISA & "Bulakboshi"	14	210	2,100	3000	5,100
Private farms	800	800	30,218		30,218
Osh Province					
RES	7	200	2,000		2,000
Total	1,726	2,395	80,739	6000	86,739

40 trainers representing the BISA were trained in **Fergana and Andijan provinces**. Each trainer is assigned to one administrative district and serves one pilot site and 15 private farms located around the pilot site. As a whole, trainers serve 1400 private farms in the Fergana and Andijan provinces.

Since November 2007, large-scale activity related to training farmers was conducted by local project specialists in command areas of the pilot canals in Soghd, Fergana and Andijan provinces. Altogether, the project specialists have served 264 farmers in Soghd Province, 605 farmers in Fergana Province and 800 farmers in Andijan Province. The project encompasses: 5 administrative districts and 26 WUAs with the total area of private farms more than 30,000 ha in Andijan Province; 4 administrative districts and 19 WUAs with the total area of private farms more than 32,000 ha in Fergana Province; and 2 administrative districts and 4 WUAs with the total area of private farms more than 3000 ha in Soghd Province.

7 district consultants representing the RES assigned to seven administrative districts and **10 trainers and specialists** of the TES Center were trained in **Osh Province**. These consultants are engaged in the introduction of new crop varieties and the advanced agricultural technologies at the demonstration sites in each administrative district. They also conduct field training and seminars at the demonstration sites for the neighboring farmers (**up to 20 to 30 farmers**). As a whole, the RES serves about **200 private farms**. Provincial consultants of the RES together with specialists of the IWRM-Fergana Project conduct the field seminars for farmers on the demonstration fields that were established by them.

In Uzbekistan (Andijan and Fergana provinces), apart from activity on the demonstration fields, the trainers are monitoring neighboring private farms. Knowledge acquired at the training courses is the basis for helping farmers to improve their land productivity. In Osh Province, based on knowledge acquired at the training courses and the prepared manuals, the RES consultants provide to farmers the technical assistance related to introducing the water-metering methods and advanced water application technique. *It is necessary to note that if the technique of water applications was learnt quite well by the RES's consultants, planning of water use (scheduling of water applications and specifying of water requirements) remain the topical problem for them.*

Based on the recommendations and manuals developed for specialists and trainers of the extension services with respect to effective use of irrigation water and land treatment, the regional and provincial project executors have prepared and disseminated the booklets for farmers. These booklets were prepared prior to the beginning of each agricultural operation and handed over to farmers through consultants or trainers of the extension services. The booklets were published in local languages; and all their recommendations were presented in the simple manner understandable for farmers. In 2005, the practice of preparing and disseminating the booklets was introduced by the provincial project consultants in selected 20-30 private farms in each province. Farmers have shown interest in booklets, not only those who do not have sufficient experience in agricultural practice but also the quite experienced farmers. Disseminating the project experience through the booklets allowed covering a lot of farmers during short time without inviting them to visit the special training courses.

In 2005, after analyzing the experience of disseminating the booklets, the regional project group together with provincial executors made a decision to extend the coverage of private farms through the dissemination of booklets by trainers of the extension services since 2006. Especially effective dissemination of booklets took place in the Uzbek part of the project area where apart from dissemination through trainers of the demonstration fields, the provincial executors provided the dissemination of booklets among farmers through the Khakimiats¹⁷ in the course of monthly meetings in Kuva, Tashlak, and Akhunbabaev districts in Fergana Province. In addition, the monthly dissemination of booklets among farmers in Kuva District was organized through agronomists assigned by the Khokimiat (Table 4.9).

Table 4.9. Dissemination of Booklets through Existing Extension Services, Local Authorities and Water Management Organizations

Name of province and consulting service	Number of private farms that received booklets	Number of booklets distributed among farmers
Soghd Province		
DPSA-NAU	76	380
CECI Project	72	360
Fergana Province		
BISA & WUA "Akbarabad"	350	1750
Khokimiat	600	3000
Andijan Province		
BISA & "Bulakboshi"	420	2100
Total	1518	7590

¹⁷ Khokimiat is the administrative body (local authorities) of district, city or province.

Disseminating booklets among farmers was also conducted at the training seminars in the Water User Associations located in the command areas of the pilot canals (the SFC in Uzbekistan and KBC in Tajikistan), see the table below.

Table 4.10. Dissemination of Booklets among Farmers at Training Seminars

Province	District	WUA	Number of booklets distributed among farmers
<i>Andijan</i>	Kurgantepa	Sobirjon suv bulogi	204
		Mashrapboy sahovati	
		Khamraboiev sahovati	
	Jalakuduk	Amir Timur	340
		Jalakuduk vodiy imkoni	220
		Pakhtakor gidrotech	216
	Kadjiabad	Chinmakhram	344
		Madiyarov	
		Khodjaobkash	272
		Garagura	
<i>Fergana</i>	Kuva	Tolmazr chashmasy	252
		Musajon Ismoilov	216
		Omad Zilol	276
		Zilol suv fayzi	200
		Polvontosh Bakhor	196
<i>Soghd</i>	Rasulov	Madanyat	132
		Zerafshan	132
		Tajikabad	132
		Samatov	132
Total			3,264

The project experience proves that after reforming the agricultural and water sector in Central Asia, there is the pressing need in establishing appropriate extension services that could assist farmers to solve their day-to-day problems related to agricultural production and water use. At the same time, under establishing the extension services, existing condition and opportunities for development of the agrarian and water sector as well as the status of infrastructure should be taken into account.

The strategy for establishing the extension service. Establishing the extension service as a self-contained agency may be inefficient today due to socio-economic and institutional conditions in all three states and the lack of financial support. Therefore, a more effective way is the establishment the extension service based on or in the frame of existing organizations, activity of which is related to the agricultural and water sector and aimed at the assistance to farmers. What organizations can become the base for developing extension services in the rural area today?

Firstly, the **Provincial Water Management Organizations (PWMOs)**, which have not lost their key role in agricultural production, are active in all states whose provinces are located in the Fergana Valley. The PWMOs are planning delivering and use of irrigation water for meeting the needs of agricultural production. Their divisions managing the water use process have links with canal administrations and WUAs as primary agricultural water users. The planning of water use by all primary water users is being annually implemented based on analyzing the crop pattern. Just like water users, the PWMO holds its interest in effective use of limited water resources allocated to the province.

Secondly, **Water User Associations** (single nongovernmental organizations that are operating in the close interaction with land and water users) are intensively developing in the region. Principal activity of WUAs consists in distribution of water among water users based on the water use plans taking into consideration the crop pattern. Due to its activity, WUAs possess necessary information regarding water users: an irrigated area, crop pattern and crop yields, planned and actual amounts of water use, and land condition. Economic capability of water users is important for WUAs from the point of view of collecting fees for water services. In this case, the higher production output and incomes the more opportunities of WUAs to pay the canal administration for water delivered. WUAs hold an interest in effective use of water and land resources and also in awareness of each water user regarding the importance of rational use of water and other agricultural inputs enhancing irrigation water productivity. Specialists of WUAs contact with each water user prior to the growing season at the stage of drawing up the water use plan and during the growing season in the process of water distribution. Somehow or other, specialists of WUAs provides specific advices and recommendations to water users concerning water use and enhancing irrigated land productivity. Establishing the extension services with the staff of necessary specialists (agronomist, lawyer, economist etc.) enables to provide comprehensive consultations to water users regarding all matters of agricultural production.

Keeping in mind the above, the establishing of extension services under the umbrella of the provincial WMOs and existing WUAs is the most practical and effective way in all regions of the Fergana Valley under the sovereignty of three states, may be, with some exception for Tajikistan where WUAs were established over a small part of the country. The fact that these organizations already have specialists in the field of hydraulic measurements and water management speaks in favor of the establishing of extension services under their umbrella, because the lack of specialists is the key problem for establishing extension services independently from a type of department or organization. Although some WUAs in Uzbekistan do not have the complete staff of specialists (sometimes a WUA has only the director and book-keeper) the process of staffing and strengthening WUAs is in progress. The establishing of extension services in the frame of WUAs is the most promising in Kyrgyzstan where practically all WUAs were staffed with necessary personnel and have the experience of planning and water distribution among farmers.

4.7.1 Developing the Extension Services in Kyrgyzstan

In Kyrgyzstan, first of all, the extension services in the field of water use and agricultural methods are developing based on the existing consulting organizations. The second way is the establishing of extension services in the frame of each WUA with headquartering at the PWMO where the provincial unit for supporting WUAs and consulting services is organized (Fig. 4.23).

The provincial unit for supporting WUAs is responsible for the following activities:

- developing and coordination of training programs and manuals, as well as plans of joint activity of the extension service and water users associations;

- training specialists of WUAs and consultants of the extension services by advanced methods to enhance the efficiency of irrigation water use and land productivity;
- collecting data on private farms and WUAs;
- assessment and analyzing the existing problems in private farms, water requirements of cultivated crops depending on soil conditions, and the extent of water availability of irrigation canals and WUAs;
- preparing thematic booklets for farmers and district specialists;
- data input into the database and knowledge base; and
- methodological supporting the specialists of WUAs in their consulting work with farmers within the area serviced by these WUAs;

WUA specialists carry out the following activities in the area serviced by the WUA:

- monitoring the indicators of land and water productivity in private farms;
- consulting services to farmers regarding preparation of land for sowing, scheduling irrigations, selection of optimal irrigation pattern, implementing agricultural methods according to the process map of crop growing;
- studying the bottlenecks and shortcomings in agricultural practice and water use; and
- dissemination of thematic booklets in national language prior to execution of each farming operation namely before tillage, sowing, arranging irrigation sites (system of water applications), irrigations, fertilizer application etc.

4.7.2 Developing the Extension Services in Tajikistan

In Tajikistan, the extension service department is established in the **Provincial Water Management Organization** for consulting services to farmers on matters of efficient irrigation water use and for training the consultants of existing consulting organizations (Fig. 4.24).

At present, the insufficient development of the WUAs in Tajikistan and the existence of large dekhkan farms (collective farms) do not allow establishing the extension services only in the frame of WUAs. In addition, the extension services aimed at improving activity in the agrarian sector are being intensively developed in the province under consideration.

Existing extension services in this province are mainly focused on economic, legal and land treatment issues. The extension services for farmers and WUAs focused on water management and irrigation are practically absent. Such an extension service can be organized as the NGO under the umbrella of PWMO. Local specialists who are engaged in implementing the IWRM-Fergana Project can staff this organization since they already participate in activity of various CECI projects in the agrarian sector, DPSA-NAU and WUAs.

In our opinion, the key staff of extension service should consist of three specialists (irrigation engineer, agronomist and entomologist); and besides them, economist and lawyer can be included into the staff. This extension service will cover all private farms and WUAs over the whole province under cooperating with all pilot projects and their consultants and coordinating by the Khakimiat and Ministry of Agriculture.

The extension service will be responsible for implementing the following activities:

- Conducting the training seminars for farmers and specialists of WUAs;
- Preparing the manuals on rational scheduling the water allocation process, effective use of irrigation water at the field level, enhancing water and land productivity, establishing the irrigation water accounting system;
- Monitoring irrigation water use and agricultural methods in private farms;
- Drafting the thematic booklets and their dissemination among farmers at the training seminars and through various agricultural and water agencies;
- Training trainers of the extension services and pilot projects who work directly with farmers and WUAs;
- Technical assistance to specialists of the extension services and pilot projects who work directly with farmers and WUAs;
- Analyzing and assessment of monitoring data on irrigation water use and its productivity; and
- Establishing the information database comprising data on private farms, normative indicators, existing “bottlenecks” for analyzing and assessment of the current status of water use and irrigation water productivity.

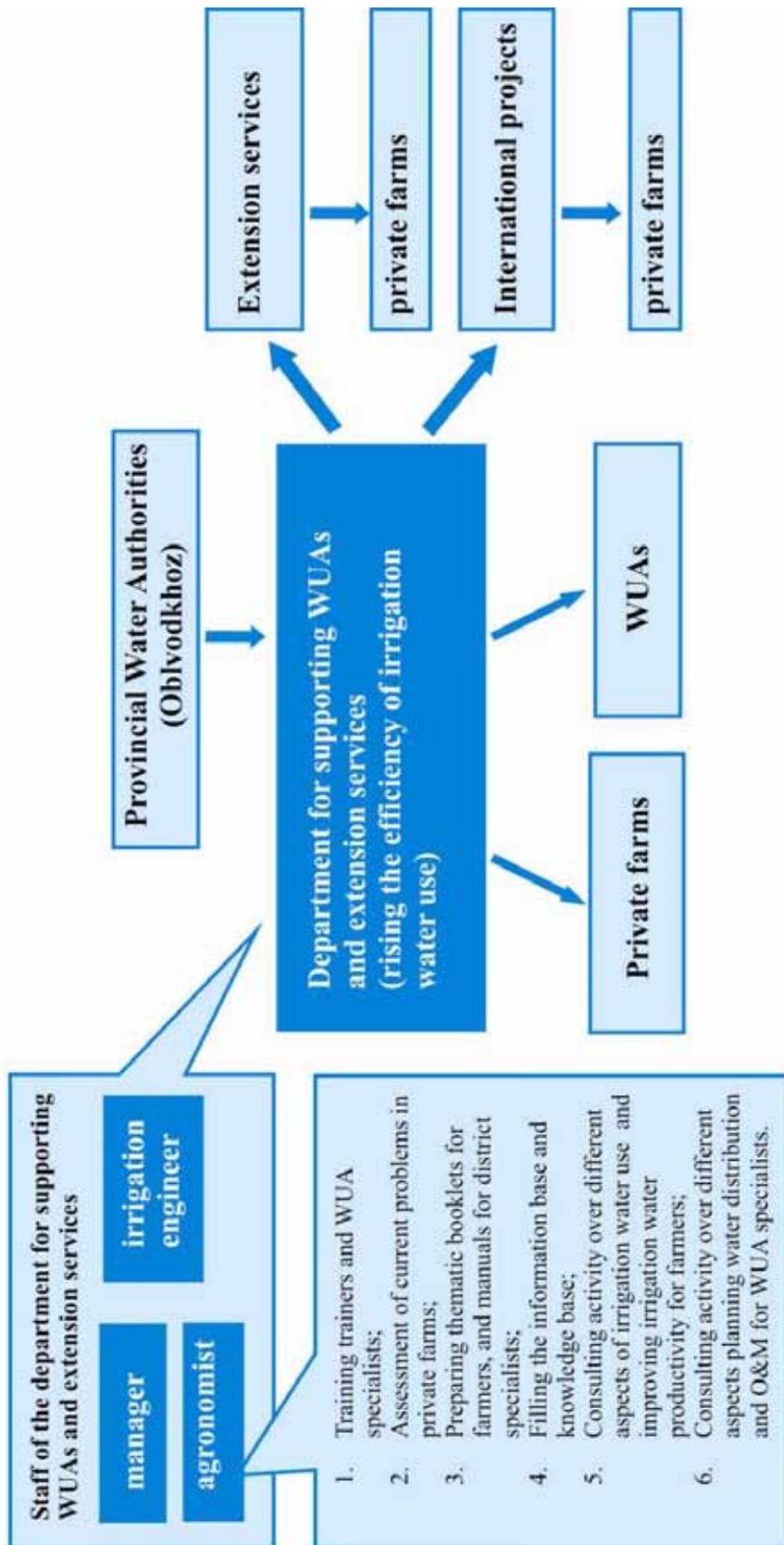


Figure 4.24 Institutional Framework of Extension Services in Tajikistan

4.7.3 Developing the Extension Services in Uzbekistan

In Uzbekistan, the extension services are developing in the frame of Basin Irrigation System Administrations (BISA). A department for supporting WUAs and consulting services for farmers in the field of effective use of water and land resources is established at the BISAs (Fig. 4.25). This department is the central office with district affiliates under WMOs. Different specialists such as irrigation engineer, agronomist, lawyer, entomologist and others are working at the central office and are responsible for the following activities:

- training district specialists by advanced methods to enhance the efficiency of irrigation water use and land productivity;
- assessment and analyzing the existing “bottlenecks” in private farms, water requirements of cultivated crops depending on soil conditions, and the extent of water availability of irrigation canals and WUAs;
- drafting the thematic booklets for farmers and the manuals for district specialists;
- data input into the database and knowledge base;

Two specialists (irrigation engineer and agronomist) are working in each district affiliate. At the district level, consulting activity is conducted based on demonstration sites of the BISA and existing WUAs in which specialists of WUAs form the consulting group. Irrigation engineer and agronomist organize the following activities over the whole district:

- monitoring the indicators of land and water productivity at demonstration sites (so-called “demonstration polygons”) and in private farms neighboring with demonstration sites;
- consulting services to farmers regarding preparation of land for sowing, scheduling irrigations, selection of optimal irrigation pattern, implementing agricultural methods according to the process map of crop growing;
- studying the bottlenecks and shortcomings in agricultural practice and water use;
- dissemination of thematic booklets in national language prior to execution of each farming operation namely before tillage, sowing, arranging irrigation sites (system of water applications), irrigations, fertilizer application etc.
- transferring data collected at demonstration plots and in private farms to the central office for their analyzing and data entry into the information database of the consulting service; and
- methodological assistance to specialists of WUAs in their consulting work with farmers.

WUA’s specialists implement the works in private farms within the area serviced by a WUA like activity of district office’s specialists at the district level:

- monitoring the indicators of land and water productivity in private farms located within the area serviced by a WUA;
- rendering the consulting services to farmers regarding preparation of land for sowing, scheduling irrigations, selection of optimal furrow irrigation system, implementing agricultural operations according to the process map of crop growing;
- studying the bottlenecks and shortcomings in agricultural practice and water use; and

- dissemination of thematic booklets in national language prior to execution of each farming operation namely before tillage, sowing, arranging irrigation sites (system of water applications), irrigations, fertilizer application etc.

Establishing the advisory schools under WUAs is one of effective methods of the extension service activity. Organizing the training seminars for farmers' groups covering issues of efficient agricultural practice and irrigation water use might be one of directions of their activity. Consulting services to farmers including a key role of advisory schools should be included into WUAs' charter. In cooperation with and under participating of WUA's administration, two specialists can manage all activity of the advisory school including preparation of the seminars' program, invitation of lecturers for specific seminar topics, conducting of the training seminars, preparing the thematic booklets, and assessing current problems in farms related to technical and institutional aspects.

Basic provisions and principles of extension service's activity: During the first phase of reforming the agricultural and water sector, extension services should take into consideration interests of all land users, including farmers, and cover the following aspects related to improving water and land productivity:

- Information and legal supporting the farmers and enhancing their knowledge;
- Planning the agricultural practice to provide a maximum profit per a unit area;
- Selection of the most profitable crops for this region and specific time periods;
- Recommendations to reduce production costs;
- Advising the farmers in respect to achieving potential productivity (based on the field passports);
- Assistance in marketing, input supply and output processing;

Activity of extension services should be aimed at satisfying the present and future needs of farmers. An extension service has to study the specific conditions of private farms and provide appropriate recommendations based on new advanced technologies, selecting all the best and demonstrating their adaptability for specified conditions. An extension service communicates with the research institutions and makes orders for investigations in which farmers hold an interest in.

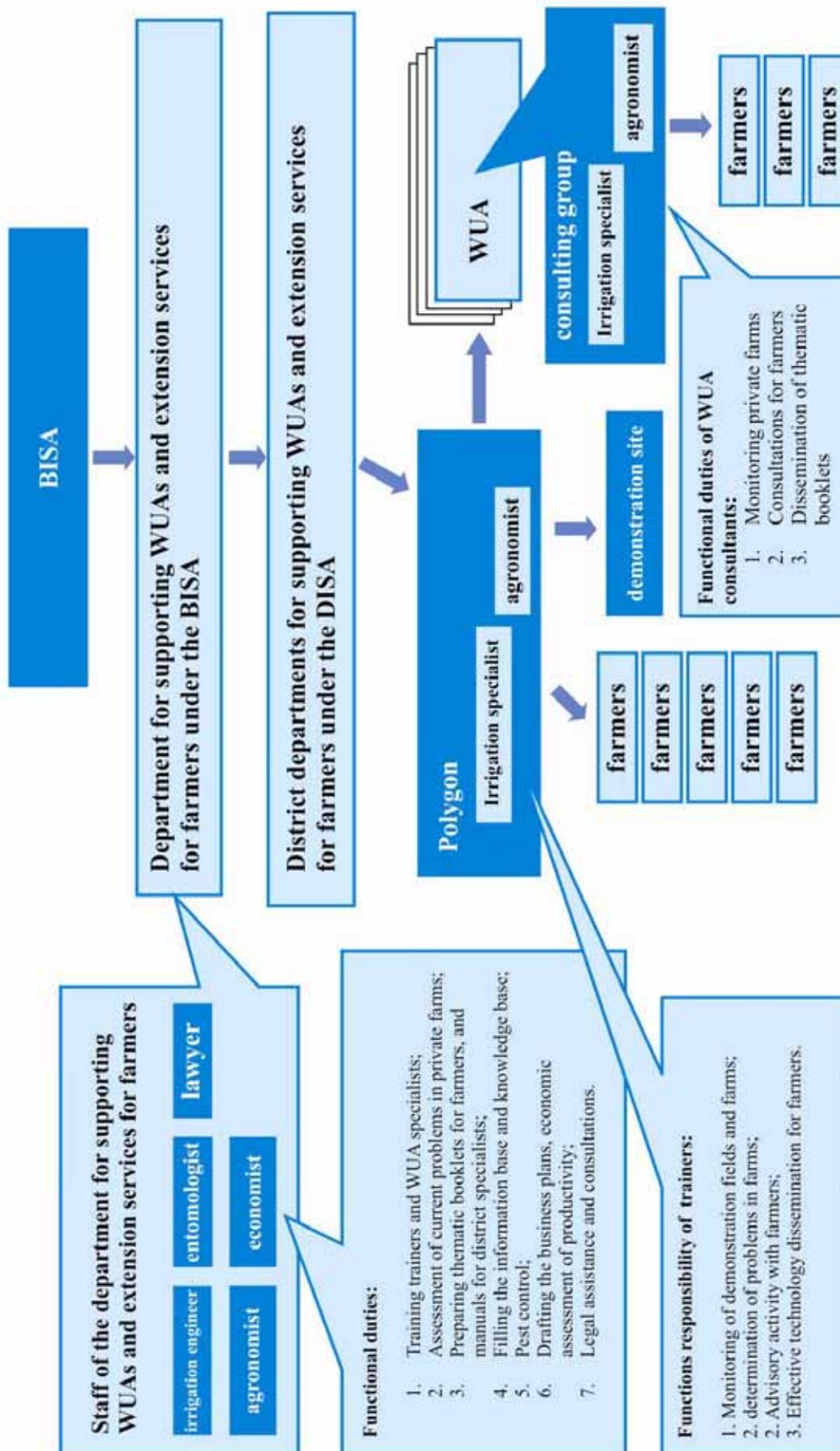


Figure 4.25 Institutional Framework of Extension Services in Uzbekiati

Basic principles guiding activity of an extension service: Under providing the professional consultations, an extension service is guided by the following principles:

- Consulting activity is aimed at satisfying the present and future needs of farmers-water users;
- An extension service itself has to initiate establishing of contacts with each farmer by the direct or indirect way;
- Comprehensive studying of conditions in private farms and providing appropriate recommendations;
- An extension service shouldn't be satisfied by transferring the recommendations as the need arises. It has to search new technologies, select the best of them and demonstrate their adaptability for specified conditions;
- An extension service communicates with the research institutions and makes orders for investigations in which farmers hold an interest in;
- Experienced farmers have to be involved in activity of extension services.
- To provide a farmer with necessary manuals, recommendations and information without dictating own solutions;
- Focusing on carefully selected top-priority objectives with purpose to save the limited resources;
- Searching an alternative crop pattern for the command area of irrigation canal that will not result in increasing its carrying capacity;
- Planning water use based on the principle of equitable sharing of water among water consumers; and
- Be guided by water saving principles at different levels of the irrigation system;

Liaisons of an extension service: An extension service has to encourage liaison with:

- sectoral consulting services under the Ministry of Agriculture and Water Resources at the national, provincial and district level, having the right of free access to necessary information and receiving the assistance in solving relevant issues;
- scientific-research institutions for acquiring new technologies and designs and ordering the research-and-development activities;
- the marketing service to facilitate sale of agricultural output within the country and abroad; and
- legal institutions;

General: *An extension service, as the consulting organization, should also carry out the following works:*

- studying, adoption and introduction of the best centuries-old methods of agricultural practice;
- search and introduction of the best scientific achievements in irrigation and farming techniques;
- detailed studying the conditions in private farms;
- advising farmers how to improve irrigation water and land productivity;
- consultations regarding farming techniques;

- consultations related to choosing crops and crop patterns taking into account the carrying capacity of the main canal and the uniformity of water distribution among water consumers;
- providing information on international and domestic markets and access to them for farmers; and
- consultations regarding water saving and rational use of irrigation water.

Basic tasks of an extension service: the following activities should be undertaken for information support of the farmers and rise in their awareness of the existing methods for increasing crop productivity using proper irrigation rates and irrigation methods for different crops on their plots:

Key actions of an extension service: Gathering background information on private farms is conducted in each district with assistance of local consultants. As far as possible, private farms are grouped according to their principal activity typical for this district and location.

Dissemination of project experience and thematic booklets among farmers, and conducting the training seminars on the following topics:

- Irrigation scheduling in line with the crop water requirement zoning;
- Methods of flow measurement and water-metering devices;
- Irrigation techniques and field irrigation systems in private farms;
- Crop diseases and pest control;
- Zoned stock seeds; and
- Extension services and their activity.

Gathering background information:

- Data on private farms: principal activity, gross area and irrigated area, crop pattern, length of irrigation and drainage networks, soil type, groundwater table depth, and soil salinization;
- Data on irrigation water supply to farms for the last three years, if available; when such information is absent then gathering data on the number of water applications and their dates (irrigation duration in hours);
- Data on belonging an area under consideration to any crop water requirement zone;
- Data on fertilizer applications (application rates, terms etc.);
- Data on crop diseases and pests (terms of their appearance);
- Information on all farming operations;
- Data on major crop yields over the last three years; and
- Data on production costs over the last three years;

Analysis and assessment of:

- Efficiency of irrigation water use under irrigating crops;
- Farming practice including pest and crop diseases control;
- Soil fertility and soil status as a whole; and

- Economy of agricultural activity.

Methodological recommendations and their application regarding:

- Establishing the measuring system and record keeping of irrigation water at the border of private farms;
- Methods of irrigation water use;
- Improving the efficiency and productivity of land and water;
- Types and rates of fertilizer application;
- Pest control;
- Optimal scheduling farming operations; and
- Rising of crop yield.

Assessment of water availability and sustainability of irrigation water supply at different levels of the irrigation system and within WUAs should be made. Demonstration sites for developing and testing methodological approaches to solving formerly revealed problems in private farms are established.

4.8 Social Mobilization as the Base for Successful Progression of IWRM

(Dr. H. Manthrithilake, J. Kazbekov, O. Anarbekov)

Social mobilization is the process, through which all stakeholders are involved in water resources management and decision-making related to governance and proper maintenance of water infrastructure [7] and which can be established in the form of the consultative platform where all stakeholders try to reach overall understanding of their needs and problems in the field of water management and are conducting a regular and comprehensive dialog for co-ordination of collective actions with purpose to reform and improve water resources governance by means of establishing community-based associations for water resources management such as WUAs, CWUU, and the joint governmental and community-based partnerships like the Canal Water Committee (CWC).

Social mobilization is the continuous process, in the course of which field consultants and initiators of social mobilization meet with farmers, representatives of water management organizations and local authorities and other stakeholders to disclose to them the institutional framework of IWRM, measures for improving governance of pilot canals, procedures for establishing community-based associations that will participate in future management of irrigation systems when their role and votes will be of decisive importance, as well as the essence of transferring powers from the state towards water users and the need to keep a role of the government in water resources management. This process is a so-called “bilateral dialog” when opinions and new ideas of all stakeholders are taken into consideration and documented to be the basis for adjustment of the public participation policy.

The experience of SMID¹⁸ obtained at Phase III of the IWRM-Fergana Project is presented in this section. A new SMID policy with the more intensive and extended coverage of stakeholders differs from the approach used during Phase II when SMID has included only establishing single community-based organizations such as pilot WUAs, Canal Water Users Unions and Committees. In particular, the measures in the frame of SMID are aimed at strengthening earlier established institutions engaged in water management and disseminating the experience of pilot projects over the extended area with the ultimate goal to provide the sustainability of newly-established organizations.

¹⁸ SMID – social mobilization and institutional development

The SMID policy for Phase III of the IWRM-Fergana Project and the organizational arrangement of field works related to social mobilization are given in Fig. 4.26. To provide the single approach and efficiency of SMID it was decided to increase the number of field consultants-initiators and to appoint a Task Manager for overall management of project activity and its coordination with all key actors and stakeholders based on regular and comprehensive dialog, implementing project tasks planned for Phase III.

At the beginning of each year, project team has consulted with stakeholders of each pilot canal regarding the matters related to the correct, effective and intense arrangement of SMID activity. All proposals and recommendations were being documented, and then, based on analyzing the proposals on improving project activity, the SMID policy appropriate for each pilot canal was developed. Workshops where each project consultant had the opportunity to express his opinion regarding the proposed SMID action plan (the field and practical experience of initiators was always quite useful) were held after completing the draft action plans in each country that participates in the project implementation. Based on the general action plan that was adjusted after discussions at workshops, each group of initiators has developed their individual plans for a current year that were a tool of monitoring and assessing group's activity.

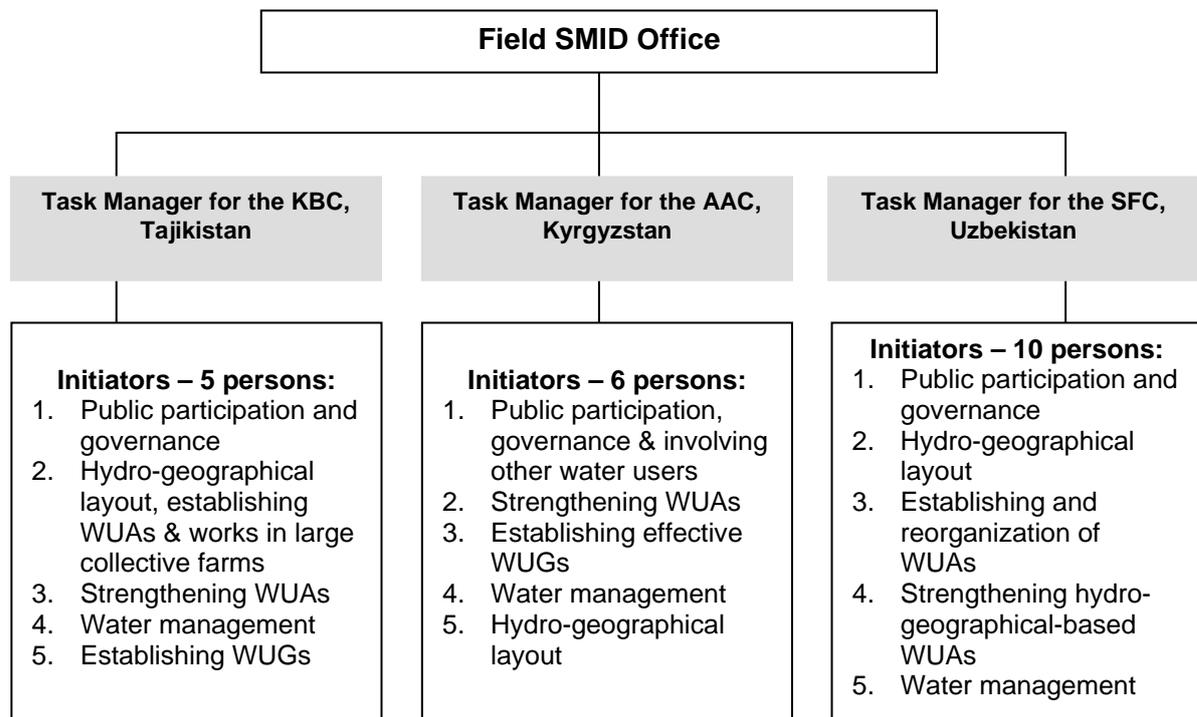


Figure 4.26 Organizational Arrangements of SMID Field Works

A strategy of SMID can differ in each country that participates in the project implementation due to local peculiarities, water management set-up and socio-economic conditions, but is built up based on the following integral framework:

Hydro-geographical layout of potential WUA:

- Meetings with representatives of WMOs, local authorities and water users for general presentation and specifying the service area;
- Inspection of the service area for identification of problematic sites and visiting local WMOs, local authorities, and primary water users (existing WUAs) and water users;
- Preliminary consultation with water users for outlining the area of potential WUA;

- Drafting a map of potential WUAs along the secondary canals; and discussion and approval of the plan for establishing WUA at the meeting with CWUC members; and
- Involving the CWUC members, chiefs of hydro-operational sites, representatives of District Water Administration and primary water users in discussing this map.

SMID for establishing new WUAs based on the hydro-geographical principle or re-organizing existing WUAs established based on the administrative principle:

- Meetings with key parties i.e. managers of primary water users (shirkat farms, WUAs established according to the administrative principle etc.) are organized for presentation of the plan of establishing a WUA that will be arranged according to the hydro-geographical principle;
- Establishing the relations with secondary water users within WUAs established according to the administrative principle and shirkat farms and explanation the essence of restructuring their WUAs and a role of new type of WUAs in solving present problems;
- Developing the plan of restructuring WUAs established according to the administrative principle by means of revising the agreements on irrigation water delivery with neighboring WUAs, solving the problems related to transferring a property of former owners, consultations with local legal bodies regarding the planned restructuring (or with project legal consultants), studying the water users' attitude to restructuring their WUAs and discussing the issues concerning changes in the management staff, fee rates for irrigation services etc.;
- Coordinating the plan of restructuring WUAs established according to the administrative principle with decision-makers (BISA, District WMO, and local authorities) based on the official letters of support and the minutes of joint meetings of two or more WUAs;
- Consulting assistance to directors of WUAs established according to the administrative principle and chairmen of their Councils with respect to restructuring their WUAs in the course of regular meetings;
- Assistance to the group of initiators in organizing the general meetings of WUAs for discussing their restructuring and in gathering the documents necessary for official registration of new WUAs; and
- Assistance to the WUA administration in completing the constituent instruments of the restructured WUA for re-registration (or registration of a new WUA) by the justice bodies.

Strengthening WUAs established according to the hydro-geographical principle¹⁹:

- On-the-job training to improve water resources management in such fields as drawing up the plan of water use and its implementation (i.e. water distribution among water users, calculating crop water requirements, water accounting and assessment of WUA activity in water management);
- Institutional improvements (practical assistance to WUA administration in documenting of production activity (the registration book of WUA members and non-members receiving water from the WUA, the registration book of applications for irrigation water supply and their execution, certificates of water delivery and acceptance etc.), in establishing relations with local authorities, tax administration and public utilities, as well as assistance in providing the normative and methodical documents, introducing of advanced methods of management such as developing business plans etc.); and
- Enhancing WUA Council's activity (assistance to WUA Council in documenting its activity: minutes of general meetings, sessions of the Auditing Committee and Council, decisions of the Arbitration

¹⁹ At that, only the methods tested in pilot WUAs are employed.

Commission, as well as in establishing the working relations with the CWUC and organizing the meetings with water users; settling disputes and conflicts at the Council's sessions etc.).

Establishing WUGs²⁰:

- Identification of problematic areas within the WUA;
- Field inspection of problematic areas and off-takes;
- Meeting with water users and specifying active water users;
- Leading a discussion with water users; and
- Holding the general meeting of water users for establishing a WUG under active assistance of so-called the group of initiators.

Social mobilization policies in the region:

Kyrgyzstan

1. Restructuring WUAs in the Aravan – Akbura Canal command area according to the hydro-geographical (hydrological) principle;
2. Establishing WUGs:
 - Formalization of WUGs through signing the agreement on irrigation water supply by a leader of WUGs and the WUA (water users of single off-take authorize a leader of WUG, through signing the general agreement, to receive water from the WUA);
 - Plans of water use are drawn up for each WUG (a single off-take) as the legal base for signing the agreement on irrigation water supply between a WUG and WUA with two principle provisions: an amount of water delivered by the WUA according to the plan of water use and total cost of planned amount of irrigation water supply; and
 - Differential payment (according to water volumes) for each WUG (per off-takes).
3. Strengthening existing WUAs.

Uzbekistan

1. Planning the potential WUA layout and arrangement according to the hydro-geographical principle²¹;
2. Establishing new WUAs according to the hydro-geographical principle or re-arranging WUAs according to the administrative principle;
3. Capacity building the existing WUAs established according to the hydro-geographical principle in the SFC command area; and
4. Establishing WUGs within the problematic areas;

Tajikistan

²⁰ Active leaders of WUGs established at problematic sites are the candidates for membership in the WUA Council and are an important actors of the group of initiators engaged in establishing a future WUA

²¹ Discussion and approval of this plan take place at the sessions of CWUC and CA.

5. Planning the potential WUA layout and arrangement according to the hydro-geographical principle;
6. Capacity building the existing WUAs established according to the hydro-geographical principle in the KBC command area;
7. Establishing WUGs and their formalization; and
8. SMID measures in line with the WUA concept and water management in non-restructuring farms based on IWRM principles.

Water governance and public participation: A group of local initiators, using working meetings, training seminars and round tables, has initiated the dialog with all stakeholders for selecting optimal options for restructuring the institutional framework of water sector within the command areas of the pilot canals to provide efficient water resources management at all levels of irrigation systems resulting in the rise of water productivity in the long run. All-round social mobilization and measures aimed at institutional development have facilitated the involvement of all types of water users in the process of restructuring the WRM framework in line with IWRM principles. The integration process comprises the following activities:

- Top-down integration of different levels of water resources management hierarchy from the main canal, WUAs and WUGs towards farmers (Figure 4.27);
- Mobilization campaigns covering the horizontal integration of economic sectors and allowing to integrate the cross-sectoral interests in the process of governing the pilot canals (industry, water supply, ecology etc.);
- Differentiation of functions related to water governance and management within the single institutional framework established for management of pilot canals.

Information on these activities is disseminated among water users on the regular basis. The Project has practically assisted in formal registration of all CWCs in three countries, as well as in gathering necessary legal documents, mobilization of water users and holding the constituent assemblies.

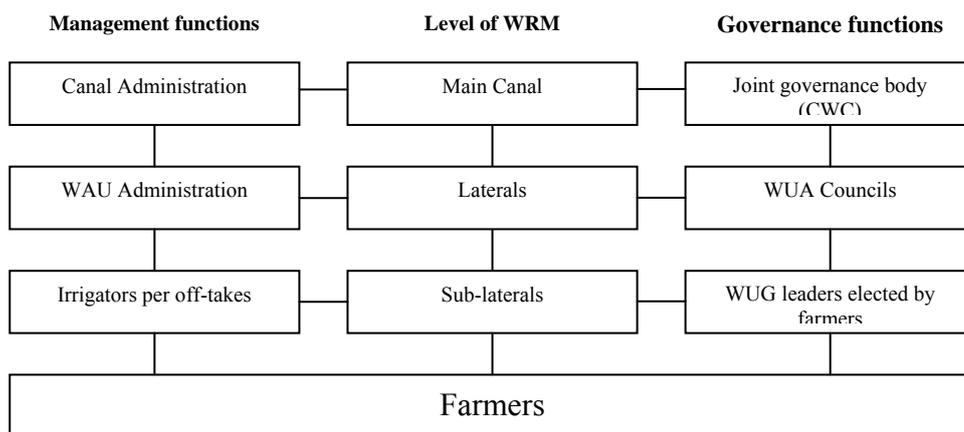


Figure 4.27. Differentiating of the functions of governance and management at different levels of the pilot irrigation systems

To provide the efficient work of CWC, active field divisions of the CWC at nine hydro-operational sites were created initially on the SFC and additionally on the Shakhrikhansay stream in 2007. The Project promotes activities supporting the sustainability of CWC in institutional and financial aspects. In particular, all CWCs have developed the business plans with the project's assistance. In Uzbekistan and Tajikistan, CWCs participate in SMID activity to re-arrange WUAs established based on the administrative principle.

Table 4.11. Information on Social Mobilization & Institutional Development Activity

Topic of SMID activity		Pilot Canal					
		AAC		KBC		SFC	
		Number of meetings	Number of participants	Number of meetings	Number of participants	Number of meetings	Number of participants
1.	IWRM project: institutional changes	9	245	8	229	12	281
2.	A role of public participation in improving water resources management	11	155	13	106	21	387
3.	Functions of irrigation canal management and the hydro-geographical principle	8	96	6	72	14	156
4.	Canal Water User Union as self-reliant body of water users	3	43	4	37	8	93
5.	Difference in concepts «Governance» and «Management»	2	14	3	23	9	72
6.	Transferring powers in governance of the canals to joint governmental and community-based body: functions of the CWC	5	56	7	38	10	166
7.	Re-organization WUAs according to the hydro-geographical principle and their membership in the CWC	-	-	6	54	17	189
8.	Cross-sectoral integration – involving all water users in water governance	24	83	5	25	4	73
9.	Establishing the field divisions of the CWC at hydro-operation sites and their composition	-	-	-	-	20	364
Total		62	692	52	584	115	1781

In Tajikistan, since large commercial agricultural enterprises are the founders of the CWCs, activity related to involving WUAs as members of the CWCs is conducted. All CWCs receive the technical assistance in preparing necessary key documents.

Mobilization related to transferring the powers of water governance to the joint body established on the AAC, KBC and SFC was conducted; at the same time options and procedures for transferring governance functions on the pilot irrigation canals were discussed. The IWRM-Fergana Project has promoted creating “the critical mass” of key stakeholders for signing the appropriate agreements and adapting them to local conditions. Agreements on establishing CWCs on the AAC and KBC and transferring to them appropriate powers were already signed. Background of establishing the similar body on the SFC was created; and the mobilization process is in progress. The groups of initiators practically assist dissemination and elucidation of the CWC decisions among water users.

Social mobilization for involving non-agricultural water users were also conducted in the command areas of AAC, KBC and SFC (identification of all water users was carried out for these purposes). The meetings with non-agricultural water users for discussion of their membership in the CWC, provisions of the agreement on water supply with the Canal Administration and methods of payment for water services were organized according to the established schedule. In the AAC command area, the following non-agricultural water users were covered by the social mobilization campaign: the territorial administration of Dostuk Settlement, administrations of two brickyards, construction company “Zelenstroy” and hippodrome, community committees of residential quarters No 4, 5, 6, 7 and 8. Mobilizing the community committees of residential areas “Bobolashkar” and “Ishkavan” is in progress. At the same time, other water users are also invited for participation in the regular sessions of CWC. In the KBC command area, mobilization activity related to involving the water supply company of Chkalovsk City, as the main water consumer, in the work of CWC was initiated.

SMID based on the cooperation with local educational institutions: To ensure the long-term sustainability of the IWRM-Fergana Project’s results it was decided to share the positive experience learnt from the project with local educational institutions engaged in training specialists for the water sector. For achieving this goal, working relations were established and appropriate Memorandums of Understanding were signed with institutions of higher education and technical colleges (Markhamat Hydro-Ameliorative College; Osh Agricultural Institute; Khodjent Affiliate of the Tajik State University). Visits to the demonstration sites and seminars for know-how activity were held; in addition, technical publications and the project reports were handed over to educational institutions; and the working groups of teachers were established for adapting project know-how in their curricula.

In 2007, above-mentioned educational institutions included additional courses covering IWRM topics in their curricula (50 academic hours: 20 academic hours of theory and 30 academic hours of practice); and 50 students of second and third years of study had practical training at pilot sites, working together with initiators and specialists of WUAs. Working relations were also established with Bishkek and Dushanbe Agrarian Universities with signing appropriate Memorandums of Understanding regarding the future cooperation and handing over of project documents and know-how.

Since 2007, mobilization activity related to dissemination of project experience was initiated on the Right-Bank Canal in Kyrgyzstan. Studying the hydrographical net within the command area of this canal is in progress. Contacts with decision-makers concerning establishing the single canal management system are also initiated. At the same time, measures for raising awareness of key stakeholders regarding establishing the CWC are undertaken.

Positive experience of social mobilization obtained at pilot sites is disseminated on two pilot areas of STR²² (Shakhimardansay and Khodjabakirgansay). According to the project strategy of social mobilization, disseminating of IWRM principles will be arranged at the following levels: the irrigation system (STR and irrigation system), WUAs (and local communities) and grass-root level (disseminating of the projects methods through local consultants).

Development of WUAs through social mobilization: If social mobilization activity during Phase II was aimed at establishing single pilot WUAs, then during Phase III social mobilization was addressed to dissemination of experience obtained at pilot sites over the whole command areas of pilot canals where first WUAs were predominantly established by the administrative method. Therefore all mobilization activities were aimed at all-round development of WUAs in the command areas of pilot canals. SMID field teams consisting of specialists trained in the new strategy of developing WUAs were formed for this purpose.

²² STR – small transboundary rivers

SMID strategies differed over countries due to peculiarities of local water management and socio-economic conditions. The mobilization process included such interventions as establishing WUAs based on the hydro-geographical principle, re-organization of WUAs established by the administrative method, capacity building of WUAs including training of their personnel (institutional aspects, water resources management within WUAs, drawing up business plans), strengthening activity of WUA Councils and their participation in works of the CWCs, establishing active WUGs. Members of CWUCs, specialists of the BISA and local administrations, chairmen of community-based committees of rural settlements and villages, WUA managers, personnel of hydro-operational sites and water users (farmers) themselves were involved in establishing or re-organization of WUAs according to the hydro-geographical principle. All interventions were jointly coordinated by the provincial executors and field consultants of the SIC ICWC (Table 4.12).

Table 4.12. Social Mobilization for Developing WUAs

Social mobilization and Interventions		Irrigation Canal			
		AAC	PMC	KBC	SFC
1.	Number of WUAs established according to the hydro-geographical principle	6	16	5	12
2.	Number of WUAs established according to the administrative principle where the SM is in progress	-	-	5	64
3.	WUGs established due to activity of groups of initiators	26	2	35	18
4.	WUGs established by WUAs	37	7	33	25
5.	WUA development strategy	Re-arranging WUA according to the hydro-geographical principle; Establishing WUGs and promoting of Council activity; Formalization of WUGs through signing the agreements; Training in water management, drafting business plans, and documenting WUA activity.		Mapping of potential WUAs; Mobilization in non-restructured farms; involving the CWC; Establishing WUGs in the problematic areas; Training in water management, drafting business plans, and documenting WUA activity;	Mapping of potential WUAs; Re-arranging WUA according to the hydro-geographical principle; involving the CWC; Establishing WUGs in the problematic areas; Training in water management, drafting business plans, and documenting WUA activity;
6.	Number of initiators	6		6	10
7.	Service area, ha	9125	18000	8600	96,215
8.	Area covered by SM activity, ha	8647	5600	3245	48,107

Social mobilization and Interventions		Irrigation Canal			
		AAC	PMC	KBC	SFC
9.	Monthly meetings of WUA leaders	✓	✓	✓	✓
10	Number of trained WUA specialists	12	26	6	32
11	Number of trained WUG leaders	54	18	26	24

The principal task of WUA is uniform, equitable and sustainable distribution of irrigation water among water users. The sustainability of WUA depends on proper water governance and involving water users in the process of water allocation. To bridge some institutional gaps in WUA operation, the project has initiated establishing of water users groups (WUGs) on tertiary irrigation canals and at problematic sites. Enormous mobilization activity was undertaken for establishing WUGs. At that, WUGs have allowed properly arranging water distribution, reducing the number of conflicts, improving the contractual relations with WUAs and technical state of on-farm irrigation systems, enhancing collection of fees for water services

The manual covering all issues of establishing WUGs aimed at WUA irrigators and specialists has been prepared based on the project experience. Objectives and tasks of establishing WUGs and their advantages for improving water productivity, as well as procedures of establishing, functioning and developing were described in this manual in detail. The manual contains the recommendations on water distribution within WUGs (i.e. among water users that take water from a single off-take on tertiary irrigation canals) with detailed description of successive steps necessary for introduction of simple methods of water distribution within and between WUGs.

Apart from other SMID activities in all three countries, field teams facilitate monthly casual meetings of WUAs' managers (informal dinners in line with local traditions) on the voluntary basis for all comers. These meetings were initiated in the frame of pilot WUAs as experiment, but later WUA directors supported this idea and continued these meetings. A major purpose of such meetings is to discuss the burning issues with colleagues, to share their experience in solving these issues and to coordinate a mutual aid of neighboring WUAs etc. Such informal dinners are organized in neighboring WUAs in turn. The meeting is started by firsthand acquaintance of visitors with the WUA (a short guided tour) and by a brief presentation of its achievements and critical problems. After that, all participants jointly cook the pilau²³, and in the process of cooking and during the dinner, participants continue to discuss these problems. The decision on placing at neighbor WUA's disposal of special machinery for cleaning irrigation canals is the telling illustration of the effectiveness of such meetings. Another example is the election of one of experienced dispatchers of the Kuva District Water Administration for rational water distribution among all WUAs established based on the hydro-geographical principle during the periods of water deficit (excessive irrigation water delivered into one WUA can be re-distributed to another one, which needs more water). Initiatives of WUAs' directors related to creating the incentives for planned fee collection (for example, bonuses to WUG leaders who managed to collect 80% of planned fees) are discussed as well

Water management: a new method of water rotation between and within WUGs with the complete ten-day cycle was proposed since the ten-day planning of water distribution is employed in Central Asia countries.

Duration of irrigations can be calculated: (1) based on crop pattern and irrigation scheduling; (2) proportionally to farm size receiving irrigation water from an individual off-take. The manual was prepared by us jointly with specialists of the SIC ICWC who have proposed daily water distribution for large plots. This method, earlier tested on the tertiary irrigation canal "Sokolok" (WUA "Japalak"), was widely disseminated among WUG leaders through training seminars. A package of training aids

²³ Pilau is the national favorite dish

was developed; and the training seminars covering five topics: crop water requirement, methods of irrigation scheduling and planning of water use, irrigation water rotations, water measurement methods, monitoring and evaluation of WUA activity based on evaluation indicators were held.

Small Transboundary Rivers: Over the past period, social mobilization activity was aimed at introducing IWRM principles and preparing the basis for involving water users according to the principle “bottom-up” on small transboundary rivers Shakhimardansay and Khodjabakirgansay on both sides of the border like SMID activity on the pilot canals and covered the following levels:

1. Irrigation system – Small Transboundary River and main canal
2. WUAs
3. WUGs

For disseminating the project experience and initiating large-scale social mobilization the following arrangements were implemented:

- Cartographical data necessary for implementing the hydro-geographic analysis and planning social mobilization activity related to adoption of the hydro-geographical principle under establishing WUAs were gathered;
- At present, reconciliation of maps with WMOs and water users is in progress;
- An explanatory campaign and mobilization of key parties for establishing the single irrigation system administrations (ISA: a river and main canal) were completed;
- Identifying of all types of water users that have to be covered by large-scale mobilization with purpose of creating the Irrigation System Users Union (ISUU) was implemented;
- Workshops aimed at raising awareness of key parties regarding a role of river commissions, which in the nearest future will be composed by Irrigation System Committees (a joint representative body consisting of the members of ISUU and ISA), are being held;
- Meetings with WUA specialists and irrigators of local communities to explain to them the IWRM principles and to disseminate the project manuals and booklets were organized;
- Initiators have held a number of training seminars concerning irrigation water management within WUAs (topics: crop water requirements, drafting the water use plan; principles of irrigation water allocation, water measuring and accounting, evaluating WUA activity based on established indicators etc.);
- To provide effective mobilization the pilot WUGs were established in pilot WUAs; and
- Field seminars for farmers were held with purpose of dissemination of the project experience and thematic booklets covering the topics related to rise of water and land productivity in private farms.