



IWRM Principles Implementation in the Countries of Central Asia and Caucasus

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The Global Water Partnership (GWP), established in 1996, is an international network open to all organizations involved in water resources management and among them: developed and developing country government institutions, agencies of the United Nations, bi-and multilateral development banks, professional associations, research institutions, non-governmental organizations, and the private sector.

GWP was established to provide the favorable conditions in order to implement the **integrated water resources management (IWRM) principles**. GWP promotes IWRM by creating the conditions for freedom of discussions at global, regional, and national levels designed to support stakeholders with their practical implementation of IWRM principles.

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PREFACE

This status report “IWRM Principles Implementation in the Countries of Central Asia and Caucasus” has been prepared as the regional contribution to activity co-ordinated by the Global Water Partnership (GWP) that is preparing the global review, which is to show the process of developing the national integrated water resources management and efficient water use plans by different countries. The main goal of this report is promotion of the search for funds for supporting the above-mentioned national plans.

Two peculiar features related to water resources formation, management and use characterize the region of Central Asia and Caucasus.

The geographic location and geopolitical processes predetermine the first and basic feature: clear-cut subdivision into two sub-regions - Central Asian and Caucasus. Water has always united Central Asia nations (Kazakhs, Kirghizes, Turkmens, Tajiks, and Uzbeks) by joint use of the water resources in the Aral Sea basin. Similarly, the peoples of Caucasus were united by joint use of water resources of the Kura River, Araks River, and other rivers of South Caucasus. Close economic and political relations were formed based on joint water use. At first sight, it seems that geographical remoteness and rupture of former economic relations make the water partnership difficult. However, it is necessary to take into account that the peoples have survived over the centuries based on joint water use, the different water-user groups met a challenge of water resources management and water use, and there have been no grave incidents related to water resources in the region.

The second general feature of this region is that most of the fertile lands are located in the arid and semiarid climatic zones, where water resources are intensively used as a basis for cooperation at both the sub-regional and regional levels. The life of the peoples inhabiting the Aral-Caspian region over thousands of years was related to water resources use. Water is a key factor of social and economic welfare; and the most expedient way to maintain this welfare is integrated water resources management (IWRM). There is a precise understanding in the region of Central Asia and Caucasus that IWRM is the process focused on developing solutions and decision-making at all levels (local, sub-basin, national, and regional) to provide effective integration of key factors relating water and land resources use to the process of economic and social development ensuring the population welfare on the basis of principles of equity in allocation of scarce water resources and the least environmental damage.

Overall, practical application of the IWRM principles is a long-term process that is to include specific practical actions. Measures and a scale of works in each country will depend on current conditions, water resources use efficiency, and readiness to develop the IWRM plans.

This document is an attempt to assess briefly progress in transition to IWRM in eight countries of Central Asia and Caucasus.

Authors of this status report are the members of the Regional Technical Advisory Committee of the Global Water Partnership for Central Asia and Caucasus and a number of invited national experts.

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INTEGRATED WATER RESOURCES MANAGEMENT **(The experience of Central Asia and Caucasus)**



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Why Integrated Water Resources Management?

Water resources management is an art to supply the required water volume with acceptable quality at the proper place and proper time. A few interrelated elements are needed to implement this approach. First of all, the engineering water-delivery infrastructure (reservoirs, canals, control structures, drainage systems etc.) should be constructed. In addition, the institutional infrastructure (water governance institutions) is needed to maintain this engineering infrastructure and to provide water supply and other related services. For successful performance of the institutional infrastructure, management tools should be provided: (i) a legislative framework and regulations; a methodological framework (to evaluate water requirements and water-distribution, to analyze water use, etc.); and (ii) a monitoring system (gauging-stations and information database). In addition, a system of financing and initiatives (payment for services, payment for pollution, etc.) is to be established. Thus, it is clear that this art represents an integrated (multifactor) process, which in the current practice (and in scientific bibliography) is referred to as integrated water resources management (IWRM). The overall objective of IWRM is sustainable, fair and equitable water supply for the needs of water users and the nature.

IWRM is a process, which is based on accounting all available water sources (surface, ground and return waters) within the hydrological boundaries, integrates the interests of different sectors and hierarchical levels of water use, involves all stakeholders into decision-making, and promotes efficient water use for the sake of the sustainable public welfare and environmental safety.

IWRM Principles

The IWRM process includes a few key principles, which specify its practical context. In general, key principles of IWRM are as follows:

- Water management is implemented within the hydrological boundaries in accordance with geomorphology of the specific drainage basin (catchment);
- Water management provides for the water inventory and involvement of all available water resources (surface, ground and return waters) taking into account climatic features;
- Close co-ordination of the water use process and all involved institutions over horizontal links between sectors, and over vertical links between hierarchical water use levels;
- Public participation not only in water governance and management but also in financing, maintenance, planning and development;

- Public awareness, openness and transparency of the water management system;
- Priority for nature requirements in activity of water institutions;
- Incentives for water saving and control of unproductive water losses (at the water users' and water institutions' levels).

A backbone of each key principle is described below. It is important for understanding what measures are needed for their practical implementation.

What do the hydrological boundaries mean?

As is well known, water does not recognize any boundaries. According to the laws of physics, water goes through the complicated hydrological cycle - water falls to the Earth in the form of precipitation forming streams (rivers), from which water can be withdrawn for the needs of a human being, evaporates and enters the atmosphere, transforming into precipitation again. Partly, water from precipitation seeps into the ground forming bodies of groundwater (aquifers), which are, nevertheless, in close interrelation with surface streams. The area, where a surface stream is formed and the complete water cycle takes place, is called a hydrologic basin (a drainage basin or catchment). Water within the hydrologic basin circulates regularly, and naturally crosses administrative boundaries, which are delineated by people being on the basis of geopolitical considerations. According to the conditions of formation and transformation of water runoff, the river basin (catchment) territory can be conditionally subdivided into three main zones:

- a. Runoff formation zone (its recharge zone in upper/mountain areas);
- b. Zone of transition and dissipation (runoff use);
- c. Delta zone.

Construction of large dams and reservoirs has been implemented in the runoff formation zone, therefore, in this zone, the runoff regime is considerably transformed, but water quality is stable. In the zone of transition and dissipation, the runoff regime is completely different from the natural one and conform the needs of human beings. Here, the hydrological cycle and water quality are changed due to interaction between rivers and adjacent areas. This interaction is characterized, on the one hand, by water withdrawal from rivers to meet the needs of human life, industry development and irrigated agriculture and, on the other hand, by return water disposal into rivers, which contains salts, agricultural chemicals, and other pollutants.

A delta zone is an accumulation zone of residual water resources within the river basin. Here, the water is mainly «consumed» through evaporation.

Thus, it is clear, in order to control all possible factors affecting the hydrological cycle, the whole river basin (catchment) should be under the jurisdiction of a single water organization responsible for water resources management. The institutional framework within the administrative boundaries, not coincident with hydrological boundaries, results in loss of controllability of some components of the hydrological cycle that impacts on stability, assurance and evenness of water distribution i.e., on implementation of the main management objective. The administrative principle of water governance creates opportunities for some pressure of local administrations on the principle of equitable and uniform water distribution along catchment.

negatively affects ecosystems. Dissociation of sectoral authorities in use of allocated water (drinking water is controlled by the communal services, industrial water use is controlled by respective industrial authorities, irrigation is controlled by water managers) is the main problem.

The second constituent of renewable water resources is phreatic (ground) water, which according to its genesis can be subdivided into two groups: phreatic water, naturally formed in the mountains and over the catchment area, and phreatic water, formed due to deep percolation in the irrigated areas. Phreatic water resources within a catchment are usually estimated based on the hydrogeological survey, following which aquifer storage available for usage is approved. Assessing storage and use of aquifer is carried out by the Departments of Geology without clear-cut coordination with authorities responsible for water resources management.

Return water, i.e. water that is returned to the natural system after use of natural runoff, is a part of the available water resources within the catchment. Return water can form due to both surface water releases and underground inflows. Owing to its higher salinity, this water is the main source of pollution of water bodies and the environment as a whole. Under current conditions in basins with arid climate, drainage water of the irrigated areas forms about 90 percent of the total return water volume, and the rest is sewage water released by industrial plants and public utility companies. The water management organizations and hydrometeorological services are mainly keeping record of return water. For practical purposes, nobody controls re-use of return water. Although, many research and promotional works were carried out to assess the scope of the return water use, there are not clear-cut normative documents and regulations in any country. As a result of unsystematic application of this water for irrigation, secondary land salinization takes place and land productivity (fertility) drops considerably in some areas.

A huge amount of return water, released back into rivers without any limits and restrictions, transforms good fresh water into brackish water, which it is difficult to use for any needs. Water bodies in the desert zones and at the periphery of irrigated lands are fed by drainage water without any planning, as a result, these water bodies are losing their environmental and nature-stabilizing value. For instance, in Central Asia a few hundreds of lakes with different capacities and sizes were created in natural depressions on the basis of drainage and waste water. The largest water bodies are Lake Aydar-Arnasay with a capacity more than 25 km³, Lake Sarakamish with a capacity of about 100 km³, the Dengiskul, Solenoe, and Sudoche lakes as well as a number of small lakes with a total capacity amounting a few million cubic meters. As a rule, these water bodies have no through-flow; flora and fauna are not developing in them due to the unstable water and salt regime, which is formed without any control under influence of casual factors.

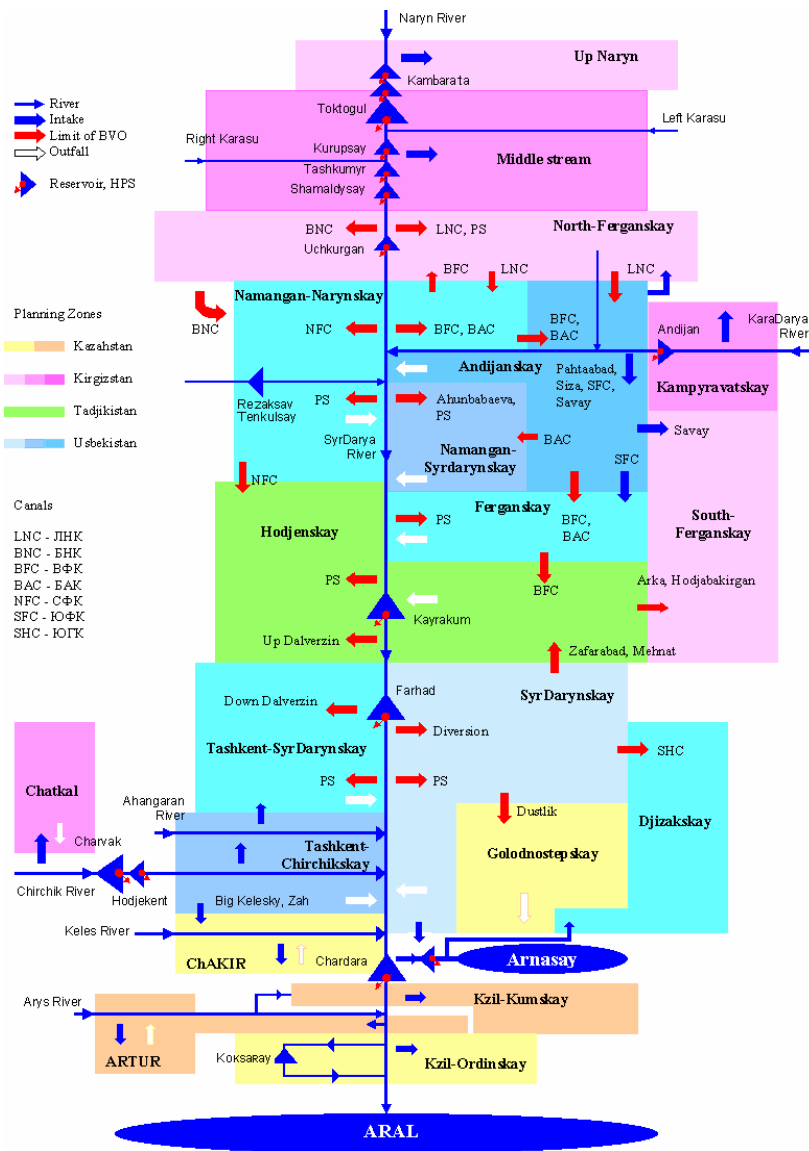


Figure 2 Hydrological Modeling Diagram for the Syr Darya River Basin (A.G. Sorokin, SIC/ICWC). As you can see multicolored arrows show interaction of different waters over the basin zones.

Thus, the above description of the problem clearly shows that clear-cut co-ordination is necessary in order to keep record of and to manage different types of water. This task is inseparably linked with the next IWRM principle.

Integrating Water Use at Cross-Sectoral and Hierarchical Management Levels

From the point of view cross-sectoral (horizontal) integration, water management bodies should equally take into consideration the water use interests of all sectors equally and provide a priority for water saving and the environment within one hydrological unit (Figure 3). The problem is that different authorities manage different waters. For example, surface water is managed by the Ministry of Water Resources covering agricultural interests and at the same time by the Ministry of Energy in the interests of power generation. Ministry of Geology co-ordinates groundwater use. Drinking water supply is the responsibility of municipal services or local governments. The

respective industrial authorities control industrial water use. At the same time, all the above-mentioned public/governmental authorities, as a rule, do not co-ordinate their activity with each other. If during the Soviet period there were statistics on water use by all sectors (2-TP vodkhoz), currently nobody has even general information over the catchment.

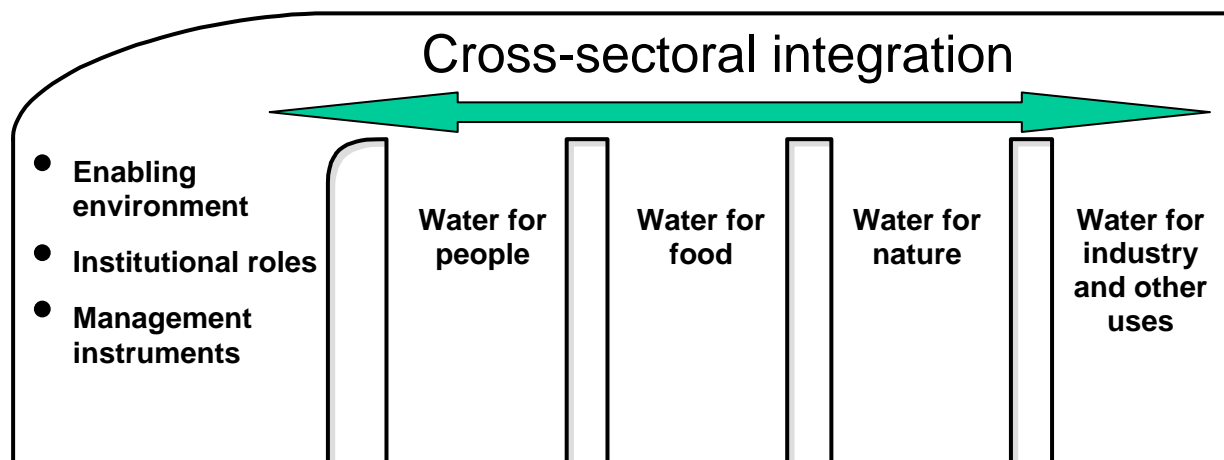


Figure 3 IWRM and its relations to sub-sectors² (horizontal integration)

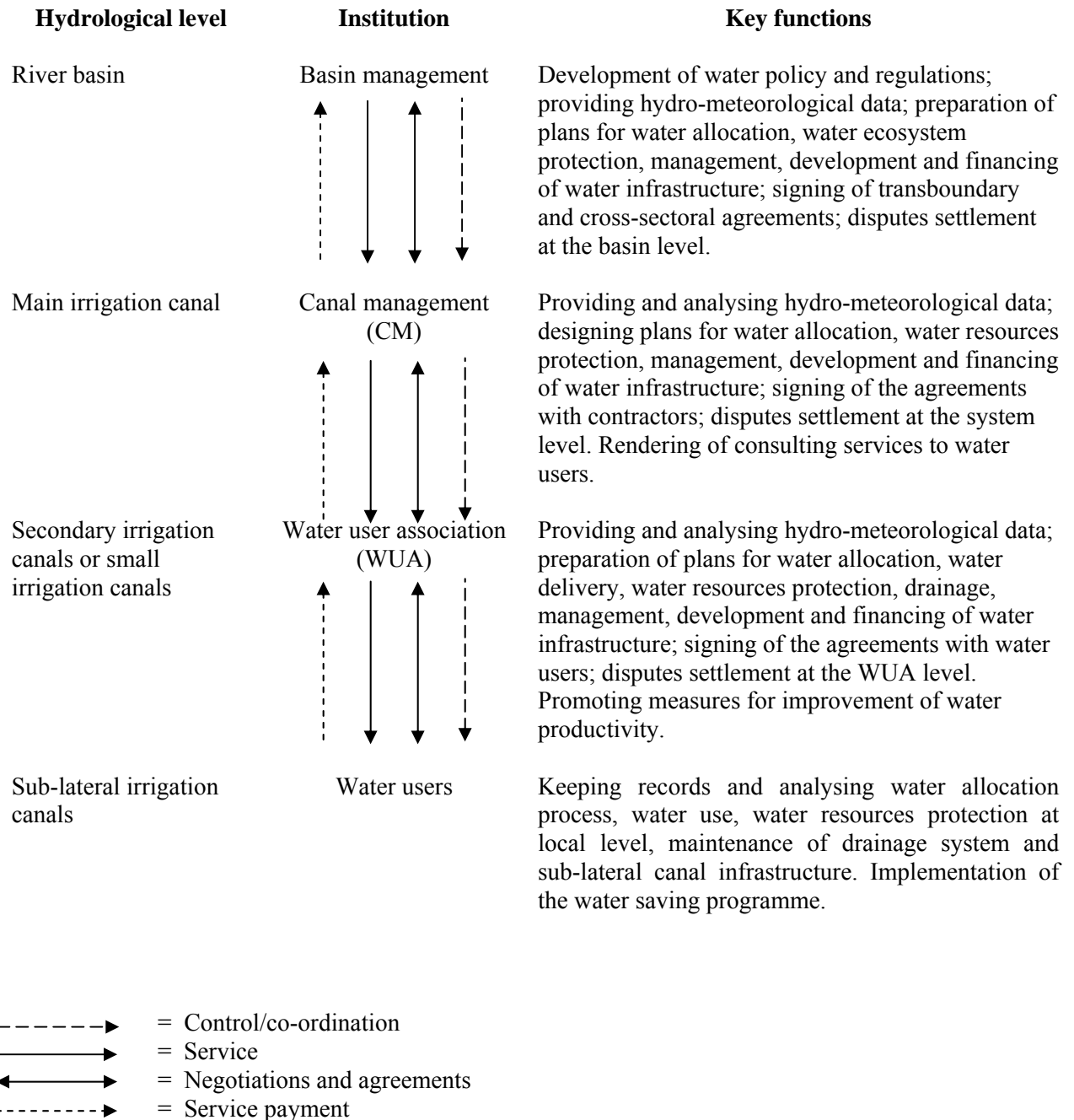
At the minimum, three components are needed in order to co-ordinate cross-sectoral interests: a unified legislative basis, the institutional framework, and water management tools. It needs to be noted that there is the positive experience of partial cross-sectoral integration in Armenia, where the single institution «Armkomvodkhoz» simultaneously maintains the irrigation and drinking water supply systems.

From the point of view of vertical integration, to implement the IWRM principles at the national level, the hierarchical institutional framework has to be built according to the following chain: the water management authority (the Ministry or the Department) - the basin water management administration - the irrigation scheme/canal administration (ISA) – WUA (water users association) - water users. The institutional framework, covering the catchment area, is shown in the diagram below. Both the irrigation canal and the inter-district canal administration (IDCA) established according to the hydrological principle could be taken as the separate management units. WUA should replace the pre-existing organization responsible for O&M of on-farm irrigation and drainage systems.

At the stage of establishing WUAs, the crucial issue is the terms of transfer of secondary canals and on-farm infrastructure, which was formerly funded by water management organizations. Here, two different approaches are possible: (i) transferring of the infrastructure to WUAs for temporary use on a contractual basis with annual financing for O&M of this infrastructure from the state budget; (ii) a public/governmental water management organization becomes one of the WUAs founders. Its assessed contribution is transferring the water infrastructure to WUAs.

² GWP TEC Paper No 4, 2000

IWRM Institutional Framework within the Catchment³



The main aspect of necessary reforms consists in minimizing hierarchical water management levels and clear-cut cross-sectoral co-ordination, which enable decrease of unproductive water losses.

³ the proposed framework for transition to integrated water resources management in the Fergana Valley under active water-users participation. SIC ICWC, IWMI, SDC, Tashkent, 2004

Public Participation in Water Management⁴

An extremely important element of the IWRM process is wide involvement into the process the public organizations and public opinion according to the multi-step water management hierarchy.

Water use management issues need to be considered in the context of interactions between a civil society and the State. The State (in narrow sense) is a superstructure over a civil society in the form of the authority structures (political and administrative institutions), which have occurred in the course of the historical development in order to rule a civil society. Subdivision into the State and a civil society is conditional. In specific cases, the same persons or organizations can be representatives of the State or a civil society. Khakim (Major) of the administrative district or a representative of the district water management organization, as landowners, are often members of water users associations. The State is represented by officials of the authority structures and departments, and a civil society by members of public associations, trade unions, parties i.e. non-governmental organizations (NGOs).

The main problem is that personal interests of decision-makers often do not coincide with the interests of a civil society. Particular examples of negative internal purposes can be aspiration to overestimate a budget, unjustified application of expensive technique, and neglect of direct duties. First, when profit is not a work indicator, instead of it a budget plays its own role. Institutions are provided with funds and staff based on their budget, and this intensifies distortion of incentives. Secondly, the institution's objective can become a striving to high-tech solutions or «technological quality». Sprinkling or drip irrigation systems could be recommended where application of less expensive and more reliable irrigation methods are justified. «Extra-modern» management systems (for example, automatic control systems) can be designed and even installed in spite of the fact that installation of less complicated systems would be more efficient from financial, social, and technological points of view. Finally, officials of water management organizations can be inclined to infringement of existing rules for a few «favorites» by means of bribes or another way.

Public participation has to create an environment of *transparency* and *openness*, under which the likelihood of decisions not corresponding with public interests is decreased. The more intensive the public participation the less favorable conditions for corruption and ignoring public interests.

In the Soviet period, public participation, which was represented by trade unions, people's delegates, etc., was officially assessed as very high, but *de facto* it was paltry. Currently, there are certain positive changes in some countries of the region (Armenia, Kazakhstan, and Kyrgyzstan), but as a whole the role of socially active members in water management is obviously insufficient for the time being. The State has to watch over the public interests, but often in pursuing of political and economic goals, it ignores social aspects, and therefore socially active members should have the opportunity to participate in the decision-making process concerning matters of principle.

The nature of water itself defines the necessity of public participation in water use management. Depending on the goal of water use, the water, as natural resource, can be⁵: a) *private* or b) *public* good.

⁴ The report of N.N. Mirzaev (SANIIRI) «The role of public organizations in improving water use efficiency and environment stability in CAR», Almaty 2003, was used under preparation of this section

⁵ See, for example: V.A. Dukhovny. Water is the public good under commodity production conditions. Nukus, 2000, Documents of the International Scientific and Production Conference «Market and Water Resources» and Robert A. Yang. Water Resources: Economy and Policy. Rome, FAO, 1993.

For example, as a private good, water is used for municipal water supply (drinking water, food preparation, sanitary needs, etc.); fishery; irrigation of crops and leaching of salt affected land; hydropower production, etc.

Examples of water use, as a public good, are sanitary water releases, water-body-reserves for conservation of flora, fauna and natural habitats, water bodies for recreation and entertainment purposes.

Water management in countries of Central Asia and Caucasus is set in such a way that water is supplied to some consumers in the first place, i.e. they are *high-priority water-consumers* (communal, industrial, and technical needs), and others receive water according to a *residuary principle* (maintenance and rehabilitation of ecosystems, sanitary water releases), that causes damage to the nature (the Aral Sea tragedy). Public participation is a factor that could change this situation, prevent further degradation of ecosystems in the region, and facilitate rehabilitation of those ecosystems, which could be yet rehabilitated.

From the point of view of recent socio-economic approaches, there are the following water use management methods⁶:

- *Centralized (public)* method, when the management is controlled in the strictly administrative-mandative form and public participation is reduced to the minimum;
- *Decentralized (market)* method, when decision-making concerning a matter of principle in water management at different levels is possible with public participation, including water users themselves.

Both methods have both virtues and shortcomings. A market is required because without it there are no incentives to reduce water demand and to increase water productivity. However, it is also impossible to manage without the State and public participation, due to the peculiarity of a market to forget about social problems, which the State takes upon itself.

In pure form, these management methods are almost never met in current practice. As a rule, there is a combination of these methods as the shortcomings of one method are virtues of the other, and they can supplement each other. Till now, the first method was typical for countries of Central Asia and Caucasus. At present, a process of decentralization is in progress. Decentralization is implemented through application of market management methods (privatization, introducing water charge and payable water services, etc.) and transfer of the right to make decisions on issues, which can be more efficiently solved *in situ*, to the local water management bodies. The more decentralization of decision-making, the broader the scale of public participation⁷, and *vice versa*. Transition to the integrated water resources management promotes decentralization of water use management.

In respect of the aspects to be controlled, water use management includes: (i) *water resources management*, and (ii) *water demand management*. In all developed countries, priority is given to water demand management. «It is obvious that the water crisis situations are due to an increase in demand and reducing that demand would help greatly even though there would still be problems of

⁶ N.N. Mirzaev. The conceptual basis of the water policy in irrigation under transition to the market relationships in the States of CAR (the State, cooperation, private interests). Proceeding. «Water Resources in Central Asia» (Documents of the Scientific and Production Conference, devoted to 10-year anniversary of the Interstate Co-ordination Water Commission). Almaty 2002, Pages 129-147.

⁷ Afrosaid refers to not to force-majeur circumstances. It is possible, for example, that under conditions of a year with extreme water deficiency resources, water management with a high level centralization will be more effective (temporarily)

existing levels of resources conflicts and environmental degradation. Demand for water can be reduced voluntarily by using many different technical, social, and economic tools. Regulatory instruments involving permits, restrictions, and allocations to various users and uses can also reduce water demand. For example, total water demand in the USA has declined from a high in 1980, despite large increases in wealth and population»⁸.

In Central Asia and Caucasus, attention is traditionally focused on water resources management though now it became obvious that under conditions of water resources scarcity, the water use problem cannot be settled only by technical measures⁹. In our region, it is also necessary to place emphasis on water demand management. Specificity of this approach is that it is focused not on technical infrastructure (reservoirs, canals, etc.), but on the people involved in the water use process, i.e. social impacts on the water use management process by means of institutional and cognitive factors have priority.

Thus, taking into account features of water use management methods based on the principle that water is not only a private good but also a public one, one may arrive at a conclusion that public participation is the major component of water use management. The role of the public increases due to “*interpenetration*” of representatives of different organizations into other institutional frameworks. For example, representatives of water users should take part in the work of the water management organization, and representatives of the water management organization, local government, and clergy should take part in the work of water users associations. In the first case, representatives of water users play the role of the public, in the second one, representatives of water institutions. These representatives can even be deprived of the right of participating in decision-making, but their presence and participation in discussions is anyway rather useful.

Under public participation, management functions are distributed between policy-making bodies (Water Committees or Public Councils) and executive bodies (water management organizations) as follows¹⁰.

At the water system (basin) level:

Functions of the Water Committee (Public body)	Functions of the Executive Body (Governance and Management)
<ul style="list-style-type: none"> - Approval of water allocation regulations, water supply and disposal plan; - Monitoring of water supply and disposal plan implementation; - Approval of quotas for pollutants disposal; - Approval of the maintenance plan; - Approval of funding; - Necessary funds formation; - Audit of financial activity; - Determination of water service prices; - Approval of the long-term development program - Implementation of water saving and demand control policy. 	<ol style="list-style-type: none"> 1. Annual planning: <ul style="list-style-type: none"> • Identification of water demand and local water resources; • Water allocation and distribution taking into account water quotas (limits) allocated by higher organs; • Drainage and water protection. 2. Water use plans implementation and their adjustment. 3. Implementation of monitoring: <ul style="list-style-type: none"> • Water records; • Water saving assessment. 4. O&M of water infrastructure; implementation of measures improving irrigation system efficiency.

⁸ P. Rogers, A. W. Hall Effective Water Governance. GWP TEC Paper No7, 2003 (translated in Russian by GWP CACENA).

⁹ For example, the heavy water deficiency resulting in material, social, and environmental damage in Karakalpakstan in 2000 has been caused by not so much natural factors as a human factor.

¹⁰ the proposed framework for transition to integrated water resources management in the Fergana Valley under active water-users participation. SIC ICWC, IWMI, SDC, Tashkent, 2004

	5. Involvement of water users and the public in the process of water resources management and use. 6. Establishment and maintenance of the information system. 7. Support of consulting services. 8. Servicing charge collection. 9. As required, implementation of works to prevent or to repair consequences of emergency.
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At the WUA level

Functions of the WUA Committee	Function of the Executive Directorate
1. Approval of the WUA charter and regulations 2. Approval of procedures of membership and enrollment in WUAs 3. Election and appointment of executive organs including managers 4. Approval of regulations and tariffs for water services 5. Approval of the water allocation and monitoring plan 6. Approval of the cost estimate 7. WUA development measures 8. Monitoring of water allocation equity and stability 9. Approval of audit regulations	1. Preparation of water use plan and its adjustment 2. Uniform water allocation among water users 3. O&M of irrigation and drainage network 4. Improvement of land reclamation conditions within the irrigated area 5. Keeping record of water resources 6. Data collection and database formation 7. Management of side work to improve the WUA financial status 8. Auditing 9. Promotion to farmers in water productivity improvement

The Priority of Nature Requirements under Water Organizations' Activity

Only after the declaration of independence by countries of Central Asia and Caucasus, water organizations began to take into account in their practice environment degradation due to anthropogenic impacts, but, by now, the environment became a factor of social-economic destabilization in the region or in its separate parts. The main precondition providing sustainable natural and anthropogenic cycles is a minimization of negative interaction between water sources and economically-operated areas, as well as between surface and ground waters.

In respect to environment sustainability in the catchment, it is possible to propose an approach based on application of sustainability criteria considering two major interrelated components: water quality in a water source and accumulation of pollutants in economically-operated areas. In other words, criteria of welfare according to these parameters are represented as follows:

- Pollution of the economically-operated area and affected ecosystems should not exceed the permissible concentrations, and trends of accumulation of toxic pollutants are to be negative, i.e. pollution reduction is in process in the concerned area;
- Contamination of water sources over all zones of the catchment, from upperstream to delta, shall not exceed the maximum permissible concentrations for all water-users using water from water sources.

A number of statements, which should be considered under water resources management, can be formulated based on these criteria.

Firstly, it is necessary to secure commitments of the Government to take into account the environment requirements.

Secondly, the equal rights to water use (which does not mean equality in a volume of water use in each basin) can be provided in such a manner that each water-user shall have equal rights to the minimum water use determined according to «advanced water use norms» or «a long-term technological level» of water consuming sectors. At the same time, equal opportunities and rights to «normative-minimum water use», which meets the minimal needs of each person for existence, labor, and food should be established. There is a social right of each person, which should be provided to him by the State, and the Government should be responsible for observance of the water-use level that corresponds to the technological level of productive water use.

Thirdly, penalty for exceeding the level of ecologically permissible water withdrawals by each water-consumer can form a certain fund for environment protection within the catchment, which could be used for implementation of routine works improving ecological conditions in the basin.

It is clear that today the water requirements of ecosystems cannot longer be satisfied according to the residual principle (as much water as remained after satisfaction of the economic needs). It should be one of the most important activities of water management bodies within the IWRM frameworks.

Water Saving and Efficient Water Use

Despite of overall reduction of water withdrawal in all countries of Central Asia and Caucasus in recent years (mainly, due to the economic crisis), it is necessary to recognize that efficiency of water resources use is still insufficient.

Taking into account that after independence the single statistical system of water use record in all countries collapsed, outcomes of the WARMAP project implemented within the EU TACIS program in 1996-2000 may be used in order to analyze ways of water saving¹¹. This is an excellent example of water use analysis for the main water-consuming sector in countries of Central Asia that is irrigated agriculture. According to the WUFMAS database created within the project, covering 22 farms in five countries of the region, water requirement in pilot cotton farms ("gross-field") was 7,243 m³/ha, on average, including 2,039 m³/ha of leaching requirement fraction and pre-irrigation as well as 5,204 m³/ha of water applications within the growing season. The further analysis with usage of economic parameters has shown that under cotton-growing the productivity of irrigated land varies from 652 to 1314 US\$/ha, under rice - from 674 to 1004 US\$/ha, and under wheat - from 152 to 454 US\$/ha. It should be noted that price policy conducted by these States in the agricultural sector has essentially affected cost indicators of land productivity assessment.

A dramatic feature of the current situation in water use of the region is that under conditions of water supply limitation (water quotes), water deficit is aggravated by extremely irrational water use at the on-farm level. Basic water losses take place in the on-farm (former) irrigation network and in

¹¹ The analysis was carried out by the groupe of specialists from SANIIRI and SIC ICWC under the direction of M.G. Khorst

a field. At the same time, over-normative water losses at both levels, on average, amount approximately 4,436 m³/ha or 37 percent of total water supply at farm boundaries.

According to tentative calculations executed within the framework of the above WUFMAS project based on direct measurements at the field level and involving "indirect" parameters, on the average, 21 percent of irrigation water, except for losses caused by current technical conditions of on-farm irrigation systems, are lost in the field.

In the irrigation areas with a rather high water table, approximately a half of water losses comes back to the root zone in the form of capillary rise. This extra water raises, a little, overall efficiency of irrigation water use, but does not correspond to the optimum reclamation regime preventing processes of soil salinization and deterioration of surface and groundwater quality. Most of "over-normative" losses (about 20 percent of water supply to farms in the Republic of Kyrgyzstan and the Republic of Tajikistan) are caused by irrational irrigation techniques in areas with steep land surface gradients. In middle and lower reaches of river basins, most of the irrigation water losses occur in the water-conveying system from farm's offtakes to fields. Apart from water losses due to technical conditions of irrigation canals, these losses, so-called "organizational losses", are caused by the imperfect technological process of water distribution at the on-farm level and extremely irrational management of water applications at the field level. These water losses amount 15 to 35 percent of water supply to farms.

The correctness of conclusions specified in the project reports is justified with subsequent studies at the same fields when a goal of improving water use efficiency by applying elementary and low-cost technologies in order to reduce unproductive water losses, has been set. As a result of these works, only during the first year of this experiment, water productivity increased by more than 80 percent and water resources savings of 30 percent have been attained on all fields.

Based on the above practical experiments it is possible to recommend the following main elements of the water saving process in the region (that is also the pressing problem for Caucasus):

- Introducing of water charging to irrigation farming by means of incentive stepped tariffs, as well as penalty sanctions for each cubic meter of water consumed in excess of planned rate, etc.;
- Development of the single methodical approach for rigid normalization of water consumption on the basis of the corrected norms designed basically to meet the minimal biological requirements of crops;
- Creation of water saving pilot projects, as primary measure to demonstrate rational water use;
- Water rotation and other institutional measures to control water losses and unproductive water use at the field level, (short-length furrows, alternative irrigation, proper field surface levelling, etc.);
- Application of the state-of-the-art irrigation technique and technology;
- Lining of canals to prevent seepage losses;
- Complete or partial remodeling (upgrading) of the irrigation systems.

Based on these statements and taking into account that most of losses occur at the field level and under water distribution among new privatized farms, establishment of the water users associations is the major mechanism to put in order water use and saving at this level, along with water charging.

It is only necessary to note that the regional program of water saving should be differentiated for each state.

What should be done to implement IWRM principles into practice?

Taking into account all-inclusiveness of IWRM, the given process cannot be implemented at the national or basin levels at one time (during a short time period). The IWRM principles shall be put in practice stage by stage based on gradual strategic and co-ordinated planning for a few years. Terms of practical implementation of IWRM principles depend on governmental support, the financial and economic situation in the country, as well as (for developing countries and countries with transition economy) international assistance. Under ideal conditions, the implementation process of IWRM principles should pass through (at least) three phases:

- Establishing of «enabling environment» for IWRM - the general framework of national policies, legislation and regulations, information for water resources management stakeholders, public awareness, and capacity building;
- IWRM national planning - conditions analysis, priorities identification, and development of the Action Plan.
- Promotion of plan implementation – political support and strategy of financing reforms.

The main points and characteristics of each phase are described below.

The “enabling environment” for the IWRM process

Firstly, public awareness of the main IWRM principles and a political will to promote the necessary reforms are necessary for effective implementation of the IWRM principles. Information on the main IWRM principles should be, first of all, disseminated among key politicians, experts and organizations of the water sector. It can be achieved through the disclosure campaign, which should pursue an overall objective of forming a political will and interest for implementation of the IWRM principles.

Secondly, it is necessary to create conditions for extensive participation of stakeholders. It is necessary to involve existing mechanisms (public councils, committees, etc.) for widespread consultations with stakeholders (departments, professionals - water management specialists, water users, local authorities, etc.) over all IWRM issues. If there are water users associations in a country, their role in the co-ordination process can be very important. Holding national or regional conferences or meetings concerning IWRM issues is a powerful tool establishing the basis for co-ordination.

Probably, under present conditions, the most important matter for the countries of Central Asia and Caucasus is capacity building for reforms. It is necessary to create and develop the training network in the water sector, to improve communications, and to expand publications on IWRM problems. It is necessary to resolve the crisis with keeping records of water resources and their use (including rehabilitation of interrelations between water management organizations and hydro-meteorological services). Finally, it is necessary to improve the existing information systems (databases, GIS, etc).

The principal element of «IWRM enabling environment» is a legislative framework of IWRM. Practically, in all countries of the region, the current water legislation (the Water Code or other similar laws and regulations) requires significant revision. The legislation is the basis for division of powers, identification of responsibilities and rights required for establishing necessary institutes and mechanisms for implementing IWRM policy. The legal regulations stated as “the Water Law” or “the Water Code”, “the Land Law”, and other legal regulations have to promote effective state policy in the water sector by:

- Formulating the role and responsibility of Government, water management organizations and other stakeholders with respect to water resources use, allocation, management, development, preservation, and protection;
- Precise definition of socio-economic and ecological value of water;
- Forming specific attitude with respect to restructuring, division of powers, privatizations, strengthening the role of local communities and public participation;
- Precise definition of the right to water, the WUA role, rules of co-ordination between sectors, as well as mechanisms for their implementation;
- Establishing liaisons with nature protection bodies, agricultural and local authorities, economic development bodies, etc.

IWRM national planning

IWRM planning needs to start with analysis of the current situation in the country. Generalization of available information and plans concerning IWRM frameworks enables to specify precisely, where at the moment this country is on the way to IWRM as well as to answer the following questions:

- Whether there is a national water strategy (The Master Plan of Integrated Water Resources Use and Protection) or a similar document at the national, regional or basin level?
- A backbone of the national water policy.
- A package of existing programs and projects for implementation of IWRM principles (as a whole or in part).
- Other national plans (developed under assistance of the international organizations) - Sectoral Reforms, Infrastructure Rehabilitation Plan, Sustainable Development and Poverty Reduction Strategy (referring to the role of water supply and sanitation, and water resources), National Environment Action Plans, etc.
- Whether water supply and sanitation are included in the strategy as priority matters and in what part of the strategy (health, manufacture, etc.)?

The second phase of planning is establishing/reforming the institutional framework of water management with regard to forms and functions necessary for IWRM. Here, it is necessary to formulate regulations for the following key participants of the planning process:

- National agencies, river basin organizations, regulating authorities and civil society groups, transboundary water organizations, statistical departments;
- Institutes (organizations), which should participate in development of the IWRM National Plan.

To develop correct policy, in the phase of planning, it is necessary to determine precisely priorities and probable problems of water resources management for the nearest and remote prospect taking into consideration the following:

- Conflicts owing to water deficit among water users (at present and in the future);
- Resources conditions under IWRM impacts; and
- Whether the main hazards to resources are specified and taken into account?

One of the main results of planning is identification and distribution of functions of water resources management. Here, it is necessary to answer a question - whether the key water organizations are allotted by functions and powers to cover all or some IWRM aspects and problems, including:

- Resources management functions;
- Water organization and infrastructure management functions; and
- Fund management functions.

Another important result of planning is regulations for the financing and incentive framework, namely, precise identification of mechanisms of:

- Financing of water management and implementation of IWRM principles;
- Financing of water services (water supply and sanitation, irrigation, etc.),
- Investing in O&M of water infrastructure;
- Investing in water infrastructure development.

The water services financing framework with participation of all water users has to include the following components:

- Cost estimate of regulating and supervising activity of the water management organizations at all levels of the water management hierarchy;
- Cost estimate of water services;
- Identification of financial sources including a necessary fee size, local dues and fees, payments for services and/or taxes;
- Identification of regulations for fee collection, local dues and fees, etc., and also reporting forms;
- Acceptance of necessary procedures of conducting the financial account and carrying out of auditor checks.

An IWRM Principles Planning and Implementation Chart for the river basin (adopted from the report “The Hrami/Debed River Basin Integrated Planning Project”, Armenia, 2002) is given in Figure 4. The logic sequence of necessary measures and the public participation phases are shown in this chart. The main sequence of implementation of IWRM principles is also shown in the right part of the chart.

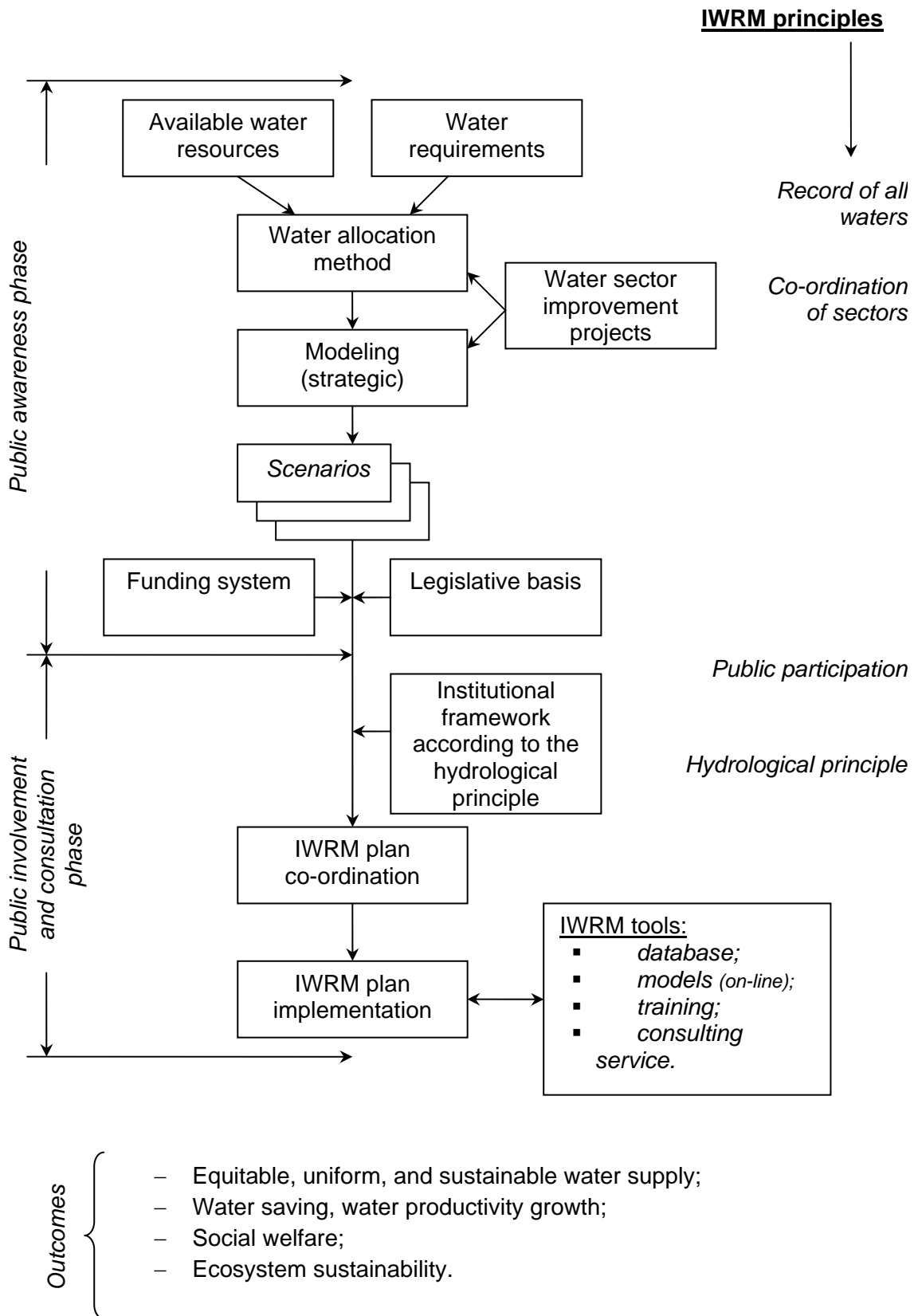


Figure 4 IWRM Principles Planning and Implementation Chart

Enabling Environment for the IWRM National Plan Implementation

When the IWRM National Plan has been prepared, it is necessary to create all conditions for its practical implementation. At this stage, each state has to make decisions in what way the political support of IWRM principles will be provided in the country, and what executive agency (ministry, government, parliament or another agency) will play a key role. Financial policy promoting implementation of IWRM principles needs to be developed in the country.

IWRM tools

It is clear that apart from the institutional framework and «enabling environment», a set of IWRM tools needs to be used for day-to-day water operation and improvement of the water management system itself. These tools shall include:

- Management tools (assessment, planning, water use efficiency indicators);
- Governance tools (water quotas under water shortage, water allocation methods, water metering);
- Economic tools (water/water services charging, subsidies and incentives, market, payment for pollution);
- Data exchange (database and a set of mathematical models);
- Social tools (education, training system);
- Conflicts resolution (public participation, consensus-seeking, arbitration).

Under transition to IWRM, water agencies, observing necessary conditions, have to provide equitable and adequate water allocation over all the irrigation system and set water supply to water users. Conditions for improving water and land productivity can be provided by supplying water to the direct water users (WUAs and others) in accordance with well-founded volumes, quality and time. This plan should provide for technical measures improving O&M including: (i) revision of the irrigation area and its water requirement; (ii) record of available local water sources (ground water, return water); (iii) water use adjustment depending on climatic and economic conditions; (iv) water rotation, water supply and water allocation procedures; and (v) water record-keeping at all levels of the irrigation system.

Private sector development (including the agricultural sector as main water consumer) should be supported by state assistance, promoting each economic entity in both technical and technological issues. To solve such issues it is necessary to establish extension centers, which will assist the water users to put in practice new technologies and state-of-the-art methods. An extension center is an organization, which works for the sake of producers realistically evaluating their needs and the capabilities of water management bodies in the water sector. Extension centers render professional consultations to:

- Farmers on improving irrigation water productivity;
- Water management agencies on matters of water planning and allocation;
- Water users on issues of interrelations with water authorities.

Water management and land reclamation are two interrelated activities within a single system. However, in recent years owing to overall economic instability water management agencies in countries of Central Asia and Caucasus have not placed high emphasis on land reclamation issues. Basic shortcomings related to these issues, which should be eliminated, are the following:

- Lack of drainage management or, in other words, control of water and salt balance of irrigation areas. To solve this problem it is necessary to revive such agencies as former hydrological-reclamation units i.e. to implement institutional measures, providing land reclamation functions. The legislative basis for land reclamation services also has to be developed.
- Lack of co-ordination between new or revived land reclamation agencies and water management bodies. However, the problem is that in most cases the boundaries of drainage systems do not coincide with hydrological boundaries of water resources management. The task consists in co-ordination of water supply and wastewater disposal.
- Lack of proper support of the state. It is important to extend land reclamation agencies' activity to the WUAs' level, because they are not able (without assistance of the State) to solve land reclamation issues.
- The return water record-keeping (by volume and quality) is absent. It is necessary to establish the monitoring system not only to control return water formation but also its re-use and disposal.
- Lack of tools that land reclamation organizations could employ in order to perform their duties. One of the main tools is water requirements management. In this connection, practical measures are needed to co-ordinate water supply regulating with optimization of the water and salt regime of the irrigation area.
- Inconsistent regulations and norms. The problem related to water requirement control is the necessity of revising regulations in force, which specify irrigation practice. This is a required measure due to soil and climatic changes as well as the considerable modification in crop pattern.
- Lack of extension centers. The important tool of land reclamation organizations is extension centers. Irrigation efficiency depends on soil and water infrastructure conditions as well as applied irrigation technique. Non-uniform soil moistening in different sections of a field and alongside furrows, unstable operation of irrigation canal, poor land surface leveling, and irrational irrigation patterns result in high consumption of irrigation water. Extension centers are intended for advising how to eliminate these shortcomings.

Water and Education¹²

There is one important circumstance that unifies the current or recommended measures on implementation of the IWRM principles. This is all possible water saving, and a solicitous attitude to water. Here, we closely came to one very important factor, i.e. the human factor. Water may be and should be saved not only by provision of economic incentives for water users, but also by intensification of the human factor, i.e. by reorganization of the public consciousness in relation to water, by liquidation of the gap between "my" and "our" or "state". It can be achieved through introduction in consciousness of people, especially the young generation, such concepts as "water is the greatest good and simultaneously the greatest value granted to us", "a human being, like water, is a part of the nature, therefore he cannot be the master neither of the nature nor of water". Revival of the solicitous attitude of our ancestors to water is expressed by such statements as: "Water contamination is a great sin" and "Water is life". However, a few things can be achieved by slogans and appeals. The public consciousness can be transformed in the necessary direction only on the basis of purposeful, integrated and persevering training of people employing stored knowledge, experience of water use by our ancestors and contemporaries, not forgetting omissions and mistakes of the last generations with respect to water and to nature as a whole. On a question "who is to be a student?" there is a natural answer - no doubt, schoolboys and schoolgirls as tomorrow, or in a few years, they become the adult and an actively employed part of the population. Generations competent in water issues should come to take our place.

¹² This chapter was written in collaboration with c A.A. Kadirov

At the moment, strong dependence on the educational programs developed and applied still in the Soviet period is being traced in educational systems of most countries of Central Asia and Caucasus. However, specific improvements of general educational programs in some states are, by this time, in progress. For example, the School Textbooks Publication System Improvement Plan was prepared in Uzbekistan. In accordance with this plan, textbooks and manuals with the general name “People and Environment” have been prepared. Four textbooks “A Human Being and Water”, “A Human Being and Air”, “A Human Being and Land”, and “A Human Being and Biodiversity” will be published as well as the manual for teachers generalizing all four above-named themes. At present, the Environment Education Training and Research Laboratory of the Training and Methodical Center "Bioecosan" under the Ministry of Education of the Republic of Uzbekistan has prepared 19 scientific and methodical recommendations for secondary schools to promote the ecological education.

In support of the mentioned efforts in reforming general educational programs, the Global Water Partnership for Countries of Central Asia and Caucasus together with the SIC/ICWC and the Regional Ecological Center (CAREC) offer to introduce water and ecological problems into educational programs. The goal of this initiative is scientific and methodical assistance to experts of the national education, the training and methodical institutions to improve the general educational programs for a number of school subjects (history, geography, chemistry, economic and legal knowledge) with a objective of developing in pupils, by the moment of graduation, good knowledge of the complex of water problems in order to inculcate conscious and solicitous attitude to water.

Speaking about realization of this initiative, for instance, in the Republic of Uzbekistan, it is necessary to keep in mind that the proposed measures and recommendations should not contradict the laws adopted by the republic (the Law on Education and the Law on the National Professional Training Program) and the governmental decrees in the field of school education. It means that all amendments and modifications to general educational programs should be in the context of the state education standard, and meet the principles incorporated in it.

One of the principles of the state education standard says that education should meet requirements of the state and society, needs of personality. Today, the range of water problems is a subject of special attention of the State and affects the interests of the society and personality more and more. Though curriculums of the above-listed school subjects contain elements covering those or other issues related to water, its properties, data on its formation sources, etc., but all this in present conditions is absolutely not enough and does not meet requirements of the State, civil society and ordinary people.

Creation of a separate topic “Water Resources” or “Water Problems” now seems to be impossible, though it would enable unifying of knowledge on water and its resources, and focusing attention of the pupil on concrete practical questions. It is necessary to find ways of integration of the topic “Water resources” in curriculums of school subjects. Fulfillment of this task by means of including this topic into different subjects seems to be the most acceptable, but it is actually related to difficulties and uncertainties. The following sequence seems to be logical: to identify what knowledge pupils have to learn in the complete set (as though there is a separate topic “Water Resources”), then to formulate what pupils have to know in final, and further, to define what they should be able to do. Such an order should be uniform under formation of topics of curriculums for all school subjects. It makes it possible to find out what questions of the proposed list already are available in existing curriculums, what questions can be easily entered in them, what questions can be included by replacement of those or other questions in curriculums, and what questions remain

not included, and their inclusion or non-inclusion is to be decided by the relevant approving departments.

Pupils should learn the following questions of the topic “Water Resources”:

- What is water? Physical states of water and its chemical composition. Water in living matter;
- Natural water and its origin. Water in the atmosphere, on the Earth surface, and in the interior of the Earth. The natural water cycle;
- Total waters reserves (oceans, seas, rivers, lakes, glaciers, icebergs, ground water, soil water);
- Water resources of Central Asia and Caucasus, some rivers of the region;
- Fresh water deficiency; the causes of fresh water deficiency;
- Ecosystems in river basins and the reasons their destroying;
- Hydrology of the rivers of Central Asia and Caucasus. Hydrological regimes of rivers and their transformation under anthropogenic impacts;
- River water quality. Transformation of river water quality on the way from river head to its mouth and in time; the causes of river pollution;
- Drinking water, drinking water requirements, information on the drinking water standard;
- Water reservoirs in river basins, their influence on hydrology and other characteristics of rivers;
- Internal and interstate (transboundary) rivers. Examples of difference in runoff management of such rivers;
- Canals, waterworks (intakes, control structures, and off-takes); water record-keeping at canals; canal efficiency;
- Water infrastructure and dam safety. Examples of dam failures and their consequences;
- Development of river basins with a view of irrigated agriculture;
- Some information on the irrigation development history in the region stage by stage: before colonization of Turkestan and Caucasus by Russia, during the colonial period, and under the Soviet Power;
- Irrigation and water allocation; development of institutional and physical water infrastructure in the country.
- The careful and solicitous attitude of our ancestors to water and its use; conceptions reflected in proverbs and sayings;
- Features of irrigation development during the Soviet period. Achievements, shortcomings, and mistakes that resulted in drying of the Aral Sea;
- Information on water resources management methods; the concept of integrated water resources management (IWRM);
- Water User Associations (WUAs) as a link between the state water suppliers and water users (dekhkan and private farms);
- Water not only the most valuable and necessary natural resource, but also in the certain conditions an economic goods having a price;
- Economic mechanisms in the water sector;
- Interrelation between the national economy and its water safety, as well as water resources conservation;
- The legal issues related to water resources, their use and protection;
- Islamic statutes concerning water relations and water use;
- The law of the country on water and water use; the governmental resolutions in the field of water resources and their use.

By the moment of graduation of school, pupils should know that:

- natural waters of all kinds and physical states are, somehow or other, interrelated and are in permanent cycles - big and small cycles;
- mankind, for its purposes, uses waters, first of all, the rivers (big and small rivers), freshwater lakes, dynamic ground water reserves;
- the fresh water to be used by people in the various purposes (drinking and domestic water supply, irrigation, many other needs for which fresh water is necessary) is quantitatively limited, is deteriorated owing to anthropogenic activity, disposal of waste water without treatment to water sources;
- sustainable economic development of any country, hence well-being of each its citizen, directly depends on adequate provision of the country by fresh water resources. Therefore, water saving and its rational use attract the state attention more and more and gain in the practical importance for the society and people;
- water is a valuable natural gift, an irreplaceable resource, and under specific conditions a goods having a price. For this reason, use of economic mechanisms (purchase and sale) in water relations is quite natural and promotes search for solutions on water saving and protection;
- water saving is a duty of each person here, there and everywhere, where qualitative fresh water is used. Water saving consists of personal savings and state savings;
- deficiency of fresh water (under its quantitative constancy) is an irreversible process due to the population growth and development of water-demanding branches of economy in the country.
- the duty of every citizen is an understanding of decisions and measures of the state and the government directed to mitigation of stresses related to water, and strict fulfillment of their own duties regarding their implementation in practice.

What should a graduate of the secondary school be able to do?

- To eliminate or promote elimination of fresh water losses (leakage from taps and other plumbing fixture in apartments, basements of apartment houses, and other places), or its use not for direct purpose;
- To explain to relatives and close people the necessity of solicitous attitude to water and its economical use; to be able to measure volume of leaks in apartments with the help of improvised means (a bottle or a glass, and watch) and to express this loss in money;
- To explain to those around him the main regulations and meaning of laws of the country concerning water and water use, latest resolutions of the government on water resources and their use.

As the Conclusion

Due to transition to IWRM, based on the above-described principles, in view of implementation of institutional, technical and other measures, as well as under condition of sufficient financing, important results can be achieved. The main results should be: (i) sustainable water supply; (ii) uniform and fair distribution of water resources over sub-basins under significant reduction of unproductive water losses; (iii) introduction of democratic water resources governance principles owing to involvement of all stakeholders and economic sectors, interested in water resources use, into water management; (iv) the solution of a part of social problems related to fair water supply of the population and, first of all, by drinking water, and poverty reduction; (v) the solution of the environmental problems occurring due to

economic activity; and (vi) as an ultimate goal, improvement of general water and land productivity.

The recommended literature and websites

GWP CACENA Website: www.gwpcacena.org

Reference sources and current documents of GWP Central Asia and Caucasus are placed in this website.

Rees J., *Regulation and Private Participation in the Water and Sanitation Sector*. Published by the Global Water Partnership, TEC Background Paper No. 1, Stockholm, Sweden, 1998.

Peter R., Bhatia R., and Huber A., *Water as Social and Economic Good: How to Put the Principle into Practice*. Published by the Global Water Partnership, TEC Background Paper No. 2., Stockholm, Sweden, 1998.

The Dublin principle: water as economic good is considered in this paper. This principle differentiates water cost, water value, and actual water prices. It is shown that water cost and value are based on technical-economic conceptions, and water prices are socio-political choice. A few case studies demonstrating the differences between cost, value and prices are reviewed (India and Thailand).

Solanes M. and Gonzales-Villareal F., *The Dublin Principles for Water as Reflected in a Comparative Assessment of Institutional and Legal Arrangements for Integrated Water Resources Management*. Published by the Global Water Partnership, TEC Background Paper No. 3, Stockholm, Sweden, 1999.

Water legislation issues and institutional measures are reviewed in this paper, including water property issues, water rights, water markets, water charging, current procedures granting of authority and putting restrictions on monopolies.

Integrated Water Resources Management. TEC Background Paper No. 4, Global Water Partnership, Stockholm, Sweden, 2000.

The fundamental publication of the Global Water Partnership represents the IWRM conception.

Rogers P. and Hall A., *Effective Water Governance*. Published by the Global Water Partnership, TEC Background Paper No. 7, Stockholm, Sweden, 2003 (translated in Russian in 2003).

GWP, *Towards Water Security: Framework for Action*, Published by the Global Water Partnership, Stockholm, Sweden, 2000.

This paper reviews the basis to achieve indicators formulated in World Water Vision 21. Five priority subjects are developed in detail: (i) political willingness mobilization; (ii) achieving effective water governance; (iii) forming water common sense; (iv) how to proceed to carry out urgent priority tasks; and (v) investments to water safety future. The Basis for Actions and the

World Water Vision are two main documents, which were presented at the Second World Water Forum in Hague.

International Network for Capacity Building in IWRM (CAPNET). «CAPNET» is International Network for Capacity Building in IWRM, which promotes human potential development in IWRM. It focuses on education, training, and applied research. The programme «CAPNET» is implemented together with the GWP. Contacts: CAPNET International Network for Capacity Building in IWRM (CAPNET), P.O. Box 3015, 2601 D, Delft, Netherlands Telephone: +31 15 215 1715; Fax: +31 15 212 2921; capner@ihe.nl. www.cap-net.org

Non-Governmental Organization Participation in Danube River Basin Management Plans: Information, Analysis, and Outcomes. This website informs on NGOs participation in the Danube River Basin Management Plan Project. The European Union (EU) Water Framework Directive has opened an opportunity for active cooperation between EU member states and accession states, specifically in regard to the protection and usage of the vast water resources within the Danube river basin. Public and NGO participation in the creation of the River Basin Management Plans will impose a greater measure of responsibility on the drafters and decision makers involved in this process. Contact Name: Richard Muller, Regional Environmental Centre for Central and Eastern Europe (REC), REC Country Office Slovakia. Web site: www.danuberiver.sk

Report of the World Panel on Financing Water Infrastructure (Chaired by Michel Camdessus) at the Kyoto Forum, March 2003, website: www.gwpforum.org (the report in Russian is in GWP CACENA website, see above).

BRIEF ASSESSMENT OF THE IWRM PROCESS IN COUNTRIES OF THE REGION

Reassessing priorities and goals for a depressed economy and the lack of formerly existing state support for the water sector, and the difficulties related to transition to a market economy (different speed of re-structuring in different countries; the need for democratization of the management processes and involving stakeholders in water management) characterize the new conditions since the independence of the states of Central Asia and Caucasus. In practice, a legal framework for IWRM does not exist in all the countries concerned. The mentioned factors are critical and require comprehensive understanding of the new situation and require developing new principles for water resources management and operation and maintenance of infrastructure. The review with respect to the willingness to implement IWRM principles in countries of the region, which was prepared by the national experts, who are members of the GWP RTAC for Central Asia and Caucasus, is presented in this assessment.



ARMENIA



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1. National Water Resources Status and Main Issues with Current Management

The Republic of Armenia is located in the South Caucasus region. The total area amounts to 29,800 sq km with a population of about 3.8 million people. It consists of highlands, has continental climate, and about 75 percent of the territory is located at a height of 1500 m above sea level. Annual precipitation amounts to 600 mm for over 60 percent of the territory, and to less than 400 mm for over 20 percent of the territory. These basic conditions determine the boundaries for water resources use. The surface water reserves are about 7.7 km³, including 940 million m³ of transboundary water.

Almost 31 percent of the population of Armenia resides in the rural areas, where crop farming is the main economic activity. Town-dwellers also possess small plots that provide them with an extra income. The main water user in Armenia is the agricultural sector contributing a 33 percent share to overall GNP (Gross National Product); and 80 percent of the total agricultural output of the Republic of Armenia is grown in irrigated areas.

About 9,480 large and small rivers, with a total length of 23,000 km, flow over the territory of Armenia. Ground water resources are estimated at about 4,017 million m³/year including spring water – at 1,595 million m³/year, drainage water – at 1,434 million m³/year, and deep groundwater – at 988 million m³/year. The volume of transit water is 1,193 million m³/year (upstream section of the Araks River basin), and 695 million m³/year flows out of the country's boundaries (into Georgia, Azerbaijan, and Iran).

Main Water Users

Main water users in Armenia are the agricultural and industrial sectors, municipal water supply, hydropower plants, fisheries, recreation, etc. Indicators for three main sectoral water users for the last fifteen years are shown in the diagram (of Figure 1).

Agriculture in Armenia is considered as the main water user. According to data of the Ministry of Agriculture of the Republic of Armenia, the irrigated lands area amounts to 940,000 ha or 67 percent of the total area of farmlands. Since 1987 till 1998, the total farmland area has decreased from 340,000 to 274,000 ha. The irrigated area has decreased from 314,000 ha to 188,000 ha correspondingly.

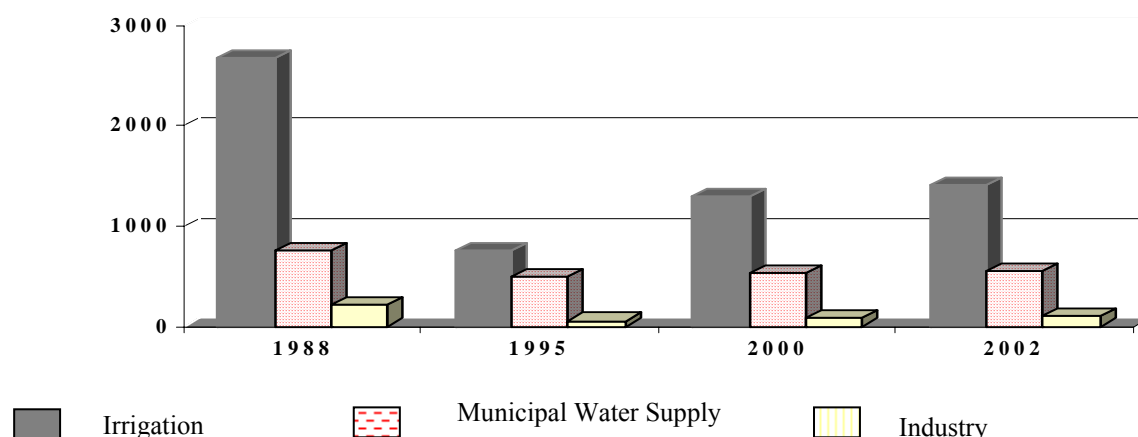


Figure 1. Indicators for Main Sectoral Water Users

The water volume to be used in agriculture has decreased from 2.7 km³ (1988) to 1.37 km³ (2000). This drop is mainly related to the decreasing use of the highly uneconomic operation of power-consuming pumping stations. Since recently, works are in progress to transfer to gravity flow based irrigation systems, through rehabilitation and improvement of the engineering infrastructure, as well as increase the efficiency of the irrigation systems, which is resulting in extension of the irrigated area. The planned irrigation water demand for the river basins is given in Table 1 (data of the institute “Armvodproekt” Integrated Water Resources Management Plan).

Table 1 Irrigation Water Demand for the River Basins (million m³)

No	River Basin	2005	2020
1	Debed	175.0	178.0
2	Agstev & Jokhaz	106.0	100.0
3	Kura River tributaries	45.0	59.0
5	Akhuryan	469.0	694.0
6	Kasakh	133.0	124.0
7	Araks	377.0	385.0
8	Mezamor (Sev Jur)	475.0	480.0
9	Razdan	956.0	924.0
10	Lake Sevan	111.0	107.0
11	Azat	66.0	60.0
12	Vedy	14.0	45.0
13	Arpa	110.0	156.0
14	Vorotan	121.0	130.0
15	Vokhchy	19.0	31.0
16	Megry	17.0	18.0
17	Razdan-Araks	128.0	171.0
Total		3322.0	3662.0

Municipal Water Use. This sector is considered as the second main water user. Ground water resources of high quality are mainly used for drinking water needs of the population in Armenia. Properly treated surface water makes up only 5 percent of the total water consumption. Municipal water supply systems in particular, due to poor technical conditions, are in a difficult financial

situation. Operation during many years without proper maintenance and investments results in depletion of the water mains and of the engineering structures. As a result, the number of breakdowns and leakages has increased. The planned municipal water demand is given in Table 2.

Table2 Planned Drinking Water Demand
(data of JSC “Dgindge” - the Integrated Water Resources Management Plan)

No	River Basin	Drinking Water Demand, mln. m ³ /year	
		2010	2020
1	2	3	4
1	Debed	53.7	56.2
2	Agstev	17.2	18.0
3	Akhum – Tavush - Akhindja	4.4	4.6
4	Akhuryan	50.8	53.2
5	Kasakh	17.1	17.9
6	Mezamor	40.5	42.4
7	Razdan	294.2	308.1
8	Lake Sevan basin	30.3	31.8
9	Azat	5.5	5.8
10	Vedy	21.9	23.0
11	Arpa	8.4	8.8
12	Vorotan	11.6	12.2
13	Vokhchy	9.7	10.2
14	Megry	2.0	2.1
	Total	567.3	594.3

JSC “Ervodocanal”, which is serving more than one million habitants of the capital and adjacent villages, and JSC “Armvodokanal”, which is serving approximately 1.4 million inhabitants of 43 towns and 290 villages, maintain the municipal water supply systems. Water supply to the 600-thousand population of more than 600 population centers in the republic (including towns) is provided through the local governments. The organization “Nor Akunk” is serving the 100-thousands population of 12 towns and villages of the Armavir District.

At present, reforms are conducted in the field of irrigation, drinking water supply and sewage disposal. Policies are starting to be implemented in order to transfer water supply to the commercial sector on a financially-sustainable basis.

Almost all cities of Armenia, where about 67 percent of the population live, have sewage networks. Because rehabilitation, maintenance and repair have not been carried out in Armenia over a long time period, sewage systems are deteriorating. Nineteen wastewater treatment plants that operated in the past do currently not operate anymore. As a result, untreated sewage of settlements is directly released to the surface water system and causing heavy pollution.

Industry. Industrial water demand is partly covered through municipal water supply systems. The industrial plants of Armenia have their own water supply systems normally. They withdraw

water both from surface water bodies and from underground springs. For last ten years, water consumption of industrial plants has considerably dropped (from 220 to 50 million m³) due to industrial production reduction and shutdowns. Most of these plants are located near Yerevan, amounting to about 40 percent of all industrial water consumers of Armenia. The main industrial water consumer is the nuclear plant. In spite of the fact that industrial water consumption makes up a small percentage in comparison with the total water consumption, the main problem of this sector is industrial sewage disposal, which is frequently containing many pollutants. Most of the industrial plants release sewage water without preliminary treatment into the municipal sewage systems or directly into the rivers and other water bodies.

Hydropower. The total potential capacity of the hydropower sector in Armenia comes to 1,020 MW, but only approximately 800 MW is generated. Out of the existing 35 hydropower plants, nine hydropower plants are considered as components of two major hydropower cascades - Voratan and Razdan, which, in turn, have 92 percent of the total potential hydropower capacity of the country, but generate only about 23 percent of total electric power. One of the current reforms ongoing in the hydropower sector is private operator involvement for management, operation and maintenance of hydropower plants.

Water Resources Pollution. Surface water quality monitoring is responsibility of the Nature Protection Monitoring Center. In recent years, only 10 percent of their planned activities were implemented. Water sampling was conducted in 51 points out of the 131 planned points of their monitoring network in 2000, and in only 29 points in 2001. Because of insufficient data, it is difficult to assess the actual surface water pollution levels.

Protection of Lake Sevan is important for preservation of biodiversity and ecosystems as a whole, and for sustainable and economic use of water resources, fisheries, and tourism development. Water level raise of Lake Sevan will enable to prevent an ecological imbalance, which has taken place due to large-scale water releases from the lake.

Springs are connected to deep aquifers without protection against pollution, in particular, relating to bacteriological and chemical (manure, garbage dumps, domestic toilets, and agricultural chemicals warehouses) substances. All water intake facilities (tapping of groundwater) should be protected by sanitary zones. Because these are lacking, potential sources of pollution are frequently found near springs, which represent a real threat to the groundwater quality.

Groundwater in general is subject to more pollution sources. The main source of pollution is sewage from agriculture chemical's dumps, industrial and household dumps, and presence of solid and liquid waste products in topsoil layers (1.5 to 5.0 m). Water-bearing layers of artesian water are better protected. The above-lying layers and impervious layers prevent water pollution. However, ill-equipped wells can also become a cause of pollution. All springs have high quality water, but water supply quality does often not meet sanitation standards. For the last years, this situation has worsened. Analyses of water samples taken at 1,133 water supply systems show that water for 52 percent of the systems does not meet microbiological standards. A main cause is faulty sealing and the deplorable condition of the water supply systems and

sewage disposal systems; sewage from damaged pipes penetrates into water supply systems occasionally for that reason.

River floods in spring damage infrastructure, private buildings and personal property of people living near the rivers, and sometimes become a cause of accidents. Rainfall is a main cause of floods in the Kura River basin, and in the Araks River basin – due to snowmelt. This, in combination with the many streams as a result of extremely high temperatures and rather warm rains, causes floods that can heavily damage and destroy bridges, coastal protection structures and can inundate cultivated areas. In areas with steep slopes with weathered and loose soil layers, heavy precipitation causes increased run-off through erosion gullies and causes mudflows, which are more dangerous than surface streams.

The irrigation reservoirs built in Armenia were not designed for flood control. Nevertheless, most of them have the potential to partly mitigate destructive impacts as a result of flooding.

Droughts occur often in Armenia. A drought period may have more harmful consequences due to the very bad condition of the water infrastructure and heavy leakages that do not allow to store floodwater for later use during dry seasons.

In summary the problems in the field of water resource management in Armenia include: (i) non-uniform territorial and seasonal distribution of water resources; (ii) dry territories; (iii) heavy water losses in water supply and irrigation systems; (iv) unproductive use of water resources; (v) environment degradation of Lake Sevan, (vi) pollution of surface and ground water resources, (vii) conflict of interests between irrigation, hydropower, environment protection; etc.

Planning and allocation of water resources is at present mainly carried out according to existing standards. These standards are actually obsolete, and frequently do not meet current requirements. In order to make correct and competent decisions concerning water allocation the current water resource management system needs to be improved and adjusted.

2. Enabling Environment for the IWRM Process: Evaluation of the Current Situation in the Country

In 2001, Armenia has signed and ratified the Aarhus Convention. The specific measures to implement the convention are undertaken, and in particular, the data exchange system has been improved, and public hearings related to the implementation of certain laws and standard setting documents are held.

The legislation of the Republic of Armenia foresees in the right of the public to participate in the decision-making process concerning environment problems. Implementation of this right envisages:

- access to relevant information;
- direct participation in the decision-making process; and
- access to legal and administrative procedures in the course of the decision-making process, which is not popular with the population.

These rights of the public are stated in various articles in the Constitution of the Republic of Armenia and, are in more detail described in relevant laws. The right of access of the public to environmental information (in accordance with established procedures) including information on sanitary and epidemiological conditions and on emergency situations, as well as the duty of state agencies to inform the public (in particular, those parts of the population, which are subjected to primary impacts, are stated in the following laws:

- The Legal Foundation of the Republic of Armenia for Nature Protection (Article 11),
- On Environment Impact Assessment (Articles 2 and 8),
- The Water Law of the Republic of Armenia (Article 20),
- Sanitary-and-Epidemiological Safety of the Population the Republic of Armenia (Article 10)
- Protection of the Population of the Republic of Armenia under Emergency (Article 5), etc.

There are only a few NGOs that are directly engaged in issues concerning water resources use, management, and protection in Armenia. There are a dozen of organizations, which in the course of their activity are facing water problems to a greater or lesser extent.

The idea of Integrated Water Resources Management (IWRM) is new for Armenia; but some steps to put IWRM principles into practice are already undertaken.

Under the financial support of the World Bank, the Integrated Water Resources Management (IWRM) Program (Executors: IWACO (Netherlands), Norconsult (Norway), and JINJ (Armenia)) has been implemented in 1992-2000. Based on the outcomes and conclusions of this program, Government of the Republic of Armenia has developed and approved the Concept of Water Resources Management improvement and water sector development in the Republic of Armenia, which in turn became the main document for legislative improvements and institutional changes in the water sector.

On June 4, 2002, the new Water Code (WC) of the Republic of Armenia was adopted, in which the IWRM principles have been stated considering a river basin as the basic water management unit. The WC provides guidelines by means the following documents:

- The National Water Policy;
- The National Water Program;
- River Basin Management Plans;
- Licensing water use.
- Licensing use of water infrastructure (water systems).
- Management by third parties.

The WC recommends that decision-making on water allocation should be based on supply rather than demand. The WC obliges to inform all stakeholders in the course of granting water use licenses that enables to use economic incentives in the process of water resource management, which can cover expenses, and creates opportunities to private operators to manage state water infrastructure. The law also requires awareness and public participation activities in the decision-making process related to implementation of the WC guidelines.

By now, more than thirty by-laws and standards setting documents promoting the WC were developed. Development of projects based on the National Water Management Policy and the National Water Program is being carried out.

Other laws concerning water resources are the Law of the Republic of Armenia “On Lake Sevan”, which has a rather declarative character and the Law of the Republic of Armenia “On Sanitary-and-Epidemiological Safety of the Population”.

After the independence, Armenia has signed and ratified a number of International Conventions regulating the water resource management process:

- The Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar, 1971).
- The Convention on Environment Impact Assessment in a Transboundary Context (Espoo, 1991).

The IWRM principles that are stated in the Water Code of the Republic of Armenia, exactly formulate that water resources and infrastructure (water supply, wastewater disposal, and irrigation) are the property of the State, and only operation and protection management may be transferred into the hands of private operators. The Water Code provides for regulating water tariffs, which are to be specified by real costs of water supply and accessibility of water in the required quantity and quality. The question on public participation in the decision-making process is precisely stated in the Water Code and according to the requirements of the Aarhus Convention. In addition, a document regulating "public awareness regulations and methods" is developed and adopted. A national policy for water resources and water infrastructure management is also adapted into the Water Code of the Republic of Armenia and statutory acts following from it.

3. Willingness to Adopt the IWRM National Planning Process

National water policies designate the strategy for water resource management, operation and maintenance (O&M) of water supply and sanitation systems. According to the law of the Republic of Armenia, the national water policy:

- specifies the long-term goals and tasks of water resources development, its protection and use as well as the priorities for water use;
- provides implementation of long-term goals and tasks for the water sector, including the development of the strategy and plans for river basins management for the next 10-15 years,
- assesses quantity and quality of water resources, which have to be distributed, and the present and future water demand to meet the needs of the population and the economy.

The projects related to improvement of the legislative basis and a monitoring system, as well as promotion of integrated river basin management principles have been implemented or are in progress of implementation in Armenia under the financial and technical assistance of the international organizations promoting implementation of IWRM principles in the region.

USAID/DAI. Since 2001, the South Caucasus Water Resource Management Program is being implemented in the Hrami-Debed and Alazany river basins. The goal of this program is to apply in practice the model of integrated water management planning in the mentioned river basins and to create the relevant

enabling environment at a local level. The program co-operates with the hydrometeorological office “Armgidromet” (a few gauging-stations at the Debed River were repaired and equipped with necessary gauging devices within the framework of this program). The Northern River Basin Management Organization (their office was repaired and equipped) was established, and works promoting public awareness and participation in the decision-making process were carried out within the framework of this program (as pilot projects).

USAID/ARD implements the “Promoting Sustainable Water Resources Management Program” at the national level. Within the framework of this program the new Water Code of the Republic of Armenia has been developed. The monitoring laboratory belonging to the Hydrometeorological Office “Armgidromet” was repaired and equipped with state-of-the-art equipment, as well as the Water Resources Management Agency’s office.

The regional project, the Joint Rivers Management in the South Caucasian Region - the Kura River, was implemented under the TACIS financial assistance. Within the framework of this project, the monitoring centers of three countries of South Caucasus have been equipped with laboratory equipment, and training of the centers’ personal was conducted.

Also now in the region and within the framework of the NATO program «Science for Peace», a scientific program designed to establish a water resources quality database is being carried out.

Armenia is actively involved in the implementation process of sustainable development principles, which are included in the development programs of the country. Public institutes are being created in the country that in turn have to promote public participation in the sustainable development process. Under this initiative, large-scale programs financed by international donors were implemented in Armenia:

1. The Lake Sevan Ecological Balance Restoration Project, 1995-1998, financed by the World Bank;
2. The National Environment Action Plan, 1997-1998, financed by the World Bank;
3. The Integrated Water Resources Management Plan, 1999-2001, financed by the World Bank;
4. The National Action Plan of the Republic of Armenia on Desertification Control. 1999-2002, UNEP.
5. The Natural Resources Management and Poverty Reduction Project, 2002-2008, financed by the World Bank;

The institutional framework of water resource management in Armenia is the following:

Government of the Republic of Armenia develops the water management policies and makes decisions on water releases from the Sevan Lake.

The Regulating Commission is responsible for the tariff policy in the water sector and grants licenses to use water management structures.

The Ministry of Nature Protection develops the water resources protection policy.

The Water Resources Management Agency develops water resource management policies, grants water use permissions (licenses).

The State Committee for Water Infrastructure under the Government of the Republic of Armenia carries out management and regulation of water infrastructure use.

The Ministry of Agriculture develops policies for O&M of irrigation and drainage systems.

The Ministry of Health monitors water quality in view of public health.

The Ministry of Municipal Engineering develops policies for drinking water supply of the population and for waste water treatment and sewage water disposal services.

The Ministry of Energy develops policies and programs for the development of hydropower engineering.

The Ministry of the Finance and Economy is responsible for developing water tariffs and other financial issues.

Local Governments resolve local issues, and are responsible for operation and protection of water supply systems in villages.

The institutional framework of *the State Committee for Water Infrastructure under Government of the Republic of Armenia* consists of the following organizations:

JSC “Ervodokanal” is responsible for water supply of Yerevan and some adjacent villages, as well as for sewage treatment and disposal.

JSC Company “Armvodokanal” carries out water supply for all cities of Armenia (except for Yerevan), most of the villages, as well as sewage treatment and disposal.

JSC “Vogorum-Jarar” (irrigation - water withdrawal) operates that part of the water infrastructure, which provides for water withdrawal from natural sources.

JSC “Vorogum” (irrigation) carries out water distribution among “water users associations”.

“Water User Association” allocates water among farmers - water users.

Different specialized organizations such as research institutes, private consulting companies, universities, and NGOs, which carry out projects and programs in the water sector, are also interested to participate in water resources protection, management and use in Armenia. Close co-operation of all stakeholders needs to improve water resource management and promote the IWRM principles in Armenia. It is important also to involve the public to the IWRM process as Armenia has ratified the Aarhus Convention and the Transboundary water EIA Convention in which issues of public participation in the decision-making process are precisely stated. Global practice shows that for involving all stakeholders and the general public in an IWRM process it is necessary to establish public management units - the Public River Basin Councils. These councils support state water management organizations and are a link between the general public and the authorities. As a result of the activities of the Public Councils, it is possible to co-ordinate upstream and downstream water use protecting the interests of all water users.

First steps for establishing the Public Councils of river basins are undertaken in the Debed River basin in Armenia. In the future, they will participate in water resource management at national and transboundary levels. As a result an atmosphere of mutual trust will be built up and concessions made, which will control social, economic and political stress that in turn will create the enabling environment for negotiations between the states of South Caucasus.

The main problems in the water sector of Armenia can be divided into two basic groups:

1. *Water resource management problems:*

- poor water quality related to pollution by industrial sources and agriculture waste water disposal;
- floods, mudflows, and soil erosion;
- conflicts among water users related to water allocation including transboundary water allocation;
- lack of incentives for water saving;

- water ecosystems degradation due to pollution of surface water and adjacent lands by industrial waste water, refuse, etc.;
- considerable reduction of available water resources due to ruthless use and environment degradation;
- ignoring ecosystem protection in the course of construction of recreational zones (Lake Sevan).

2. *Problems of municipal water supply and waste water disposal infrastructure management:*

- poor water quality that threatens the health of the population;
- insufficient sewage treatment resulting in ecosystem degradation;
- irrational water resources use due to inefficient regulation of water demand, poor water delivery infrastructures conditions, and heavy water losses.

As was mentioned earlier, the Water Code of the Republic of Armenia allocates different functions of water resources protection, use and management among three separate departments: the Water Resource Management Agency (water resource management), the Ministry of Nature Protection of the Republic of Armenia, and the River Basin Management Organizations, which are within the framework of the Ministry of Nature Protection.

The River Basin Management Organizations also implement the river basin management plans in their management regions. Water infrastructure management functions are implemented by the State Committee of Water Resources (Goskomvodkhoz) that is responsible for management, protection and safety of water infrastructure, which is a state property.

Water resource management in Armenia is supposed to be carried out by means of the integrated planning. The plan is a package of co-ordinated measures tackling matters of water resource management, protection and use. The plan has to take into account different types and location of water users over the river basin and has to base itself on available water resources in the specific basin.

The integrated plan adjusts inter-sector relations and presumes co-operation both within the country (at the sub-basin level) and between the countries at state level (transboundary water resources).

A weak point of water resource management is that management and protection functions are the responsibility of one department (the Ministries of Nature Protection) only. This contradicts principles of the "Concept" adopted in 2001 and can impede effective and purposeful management and protection of water resources.

The main principle of economic regulation of protection, management and use of water resources and water infrastructure is water charges. As a result of application of economic principles (payment is collected for water use and licensing is introduced for water use) and introduction of a water record-keeping system, the revenue in the state budget of the Republic of Armenia has considerably increased. The law «On payments for protection and use of natural resources» adopted in Armenia provides conditions for effective utilization of natural resources, and also increases financial flows as a result of payments in support of nature protection measures. In the nearest years, financial resources earned should be invested in solving problems related to water resources (harmonization of laws and standards, establishment and operation of river basin management organizations, drawing up the integrated management plans, improvement of the monitoring system, development of a water cadastre, training of staff, etc.).

4. Enabling Environment for IWRM National Plan Implementation

Resolute steps to put the IWRM principles in practice have been made in Armenia. These steps are stated in the Water Code and in the related by-laws over the last years. The IWRM principles are adopted in a number of projects and the programs, which are implemented in Armenia under financial support of the international donors. The Ministry of Nature Protection and the Water Resources Management Agency play a key role in practical application of the IWRM principles. The IWRM promotes public awareness and participation processes. Public participation in water resource management is stated in the Water Code of the Republic of Armenia, in other laws of Armenia and in different international conventions ratified by Armenia.

The local and regional programs, which are promoting both the IWRM principles and public awareness and participation were being implemented and are implemented in Armenia. To put the IWRM principles in practice and to settle problems in the water sector, some organizations were established in Armenia:

- The Global Water Partnership;
- The EU Water Initiative;
- The Regional Ecological Center “Caucasus”;
- The Kura – Araks Association, etc.

From our point of view, for more effective introduction of the IWRM principles, training of specialists in application of these principles is required. The GWP can help to organize training both for experts and for stakeholders. In Armenia, the Debed river basin could be considered as the pilot basin for successful introduction and implementation of the IWRM principles as it is the pilot basin for the programs “South Caucasus Water Resources Management”, “Joint Rivers Management”, and others.

All foundations for this process were established, but without international support application of the IWRM principles in Armenia will be slow and non-successive, as this requires time and substantial finance.

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AZERBAIJAN



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1. National Water Resources Status and Main Issues with Current Management.

Azerbaijan is located along the western coast of the Caspian Sea at the Greater and Lesser Caucasus Mountains foot, in the Kura and Araks rivers downstream stretches. The country is bordered on the north by Russia, on the northwest by Georgia, on the west by Armenia, and on the south by Turkey and Iran. The river network of Azerbaijan consists of 8,539 rivers (7,860 of them are classified as small rivers with length less than 10 km). The main rivers of Azerbaijan Kura, Araks, Samur, Ganykh (Alazan), and others are transboundary rivers (they totals twenty-one). Water resources of Azerbaijan are limited. In an average year, the total runoff over the Azerbaijan territory amounts to 28.5-30.5 km³, in dry years it decreases to 22.6 km³. About 70 percent of water resources are formed by transboundary rivers.

Available Water Resources of Main Transboundary Rivers in Azerbaijan (km³)

River	Total water resources	Transit runoff	Local runoff
Kura (as far as confluence with Araks)	17.765	11.744	6.021
Ganykh (Alazan)	3.942	1.826	2.116
Gabyrry (Iory)	0.501	0.487	0.014
Khram	1.851	1.851	-
Aksfatachay	0.416	0.356	0.060
Akhyndjachay	0.176	0.150	0.027
Araks	9.157	7.836	1.321
Arpachay	0.747	0.684	0.063
Okhunchay	0.315	0.310	0.005
Bazarchay	1.211	0.694	0.063
Samur	2.36	0.889*	0.065

*-used according to the protocol at 75 percent water probability.

Due to uncontrolled runoff of most of the inland rivers in the republic, it is impossible to use this runoff efficiently during a flood period. In summer time, most of the rivers dry up. As a whole, the local water resources are formed by surface runoff (58 percent) and ground water (42 percent or 4.3 km³).

Since antiquity, in Azerbaijan agriculture is based on irrigation. At present, 1.45 million ha are irrigated out of 4.5 million ha of land resources suitable for agriculture. These irrigated areas are mainly located in the arid and plain zone, which is characterized by hot dry climate, scanty atmospheric precipitation (200 to 300 mm per year), and complicated soil conditions. Therefore, amelioration measures need to be implemented and permanently to be improved providing crop

yields. Complex ameliorative measures were implemented, and the drainage network was built over 610 thousand ha of the irrigated lands area. Due to arid climate, 90 percent of gross revenue in the agricultural sector is produced in the irrigated lands area.

The total annual water withdrawal rates from natural sources in the republic equal 10 to 14 cubic km and 2.9 to 3.7 cubic km³ out of this volume are water losses in the conveying network. The agricultural sector uses 60 to 70 percent of available water resources, the industrial sector – 20 to 25 percent, and the rest is used for municipal needs and drinking water supply. The volume of wastewater including drainage water is 4.0 to 4.6 km³.

In recent years, global climatic changes and long-drawn drought result in discharge reduction of the Kura and Araks rivers. Since 1989 until 2002, the Mingechevsk Reservoir with the total capacity of 15.7 cubic km could not be filled. A tendency of diminution of the irrigated lands area due to water deficiency and impacts of the agricultural sector reforms (approximately by 300,000 ha) takes place.

At present, eight reservoirs with the total capacity of 640 million m³ are in the territory invaded by the Republic of Armenia, and their use became impossible. This has also aggravated conditions in agriculture of this region.

Available land resources in Azerbaijan, which would be used for the long-term development of agriculture, are not completely developed. Climatic, topographic and soil conditions in Azerbaijan enable to increase the irrigated lands area up to 3.0 to 3.2 million ha. However, water resource scarcity hampers implementation of these plans.

Out of all states of the South Caucasus, only Azerbaijan has joined and ratified the Helsinki Convention on protection and usage of transboundary watercourses and international lakes adopted in 1992. To obtain specific results in the field of sustainable water use, Azerbaijan builds up its relations with other countries located within transboundary river basins based on this Convention.

Relationships between Azerbaijan and Georgia regarding water resources use of the transboundary rivers, in particular, Kura, Temple and others, are regulated on the basis of bilateral sectoral agreements.

Azerbaijan and the Islamic Republic of Iran have established the Iran-Azerbaijan Commission, acting on the permanent basis, for joint use of water and energy resources of the Araks River.

Since long-standing time, peoples of Azerbaijan and the Republic of Dagestan (Russia) jointly use water resources of the Samur River (at present, based on the Protocol of the Ministry of Water Resources of the USSR dated October 7, 1967). Currently, the agreement on joint water resource use of the Samur River according to the International Conventions is under preparation.

Fence-mending with Armenia in the sphere of transboundary water resource use and protection currently is impossible owing to aggression of this republic against Azerbaijan. Because of this aggression, water infrastructure located in the invaded zone is destroyed.

Along with water shortage, a basic indicator of stress growth in the social-ecological sphere is severe contamination of river water. During many years, high-polluted water flows through transboundary rivers (Kura, Araks, Okhchuchay, and others) from Armenia and Georgia to Azerbaijan. As the pollution level of the Okhchuchay River that flows from the territory of Armenia has exceeded critical concentrations, this river is called "dead". Mean annual

concentrations of pollutants in these rivers (nitrogen, phenol, copper, and oil products) exceeds the maximum permissible concentration levels stated in sanitary standards ten times, and in summer even more.

Untreated waste disposal, more than 470 million m³ per year in the territory of Armenia and Georgia, is one of principal causes of pollution of transboundary rivers. Available treatment plants in our country do not also meet modern requirements. Treatment plants were built only in thirty-five cities and district administrative centers out of seventy-five built-up areas. In many administrative districts, there are no sources with sufficient quality and quantity of drinking water, which would meet the sanitary and hygienic requirements. This situation has resulted in epidemiological outbreaks. Therefore, for last 10 years, eight epidemics of water-related infectious diseases have been recorded in the republic. Main percentage of sickness rate falls on the population of Baku and areas located along the rivers Kura and Araks, where this water is used as drinking one.

Azerbaijan is one of regions of the world, where the population and the national economy often bear losses due to mudflows and floods caused by uncontrolled rivers. There are 154 mudflow-forming rivers in the republic, sixty-one out of which flow down from the southern slopes of the Greater Caucasus, and are the most hazardous rivers.

Approximately 200 settlements in 30 districts of the country with the population more than 1.5 million people and numerous infrastructure facilities are in the zone of mudflow and flood risks.

The Caspian Sea level fluctuations, having a cyclic pattern, are a serious problem for coastal zones of the republic. Because of Caspian Sea level rise by 2.5 m since 1977, more than 800 sq km of this territory have been flooded, and now flooded zones refer to regions of ecological disaster. As a result, damage has made up more than US\$ 4 billion. Due to Caspian Sea level rise and droughts in recent years (until 2002), the Kura River channel and its delta were silted up. Therefore in wet years the river channel does not provide water realize into the sea. In 2002-2003, floods within the Kura and Araks river basins has resulted in inundating more than six thousand households and other infrastructure units.

Insufficient application of the state-of-the-art farming techniques, unsatisfactory technical conditions of irrigation systems, lack of water saving technologies have resulted in salinization more than 40 percent of the irrigated lands area, and scarcity of water resources does not enable to ameliorate these irrigated areas, which gradually fall out of agricultural practice. Continuous operation of physically out-of-date irrigation systems, most of the irrigation canals (more than 90 percent) without lining, as well as the lack of gauging posts and other control structures create extra problems for sustainable water resource use. In many cases, pumping irrigation (about 500, 000 ha) results in economically inefficient farming.

In Azerbaijan, water resources are state ownership. At the national level, different institutions are involved in water resource management, monitoring, O&M and scientific researches. The State Committee of Land Reclamation and Water Resources (SCLRWR) is the main agency responsible for water resource management, use and protection, operation of irrigation and drainage systems, as well as implementation of measures for mudflow and flood control. The Ministry of Environment and Natural Resources implements quantitative and qualitative monitoring of water resources, surface water protection, and is responsible for ground water use and protection. The Ministry of Health is responsible for drinking water quality monitoring. Drinking water supply of the population is provided by: (i) the Apsheron Water Company in Baku, Symgayit, and Apsheron; (ii) the State Committee on Construction and Architecture and different organizations and local

governments in administrative districts of the republic. The Ministry of Fuel and Energy is responsible for developing policies and programs in the hydropower sector. The integrated water resource use of reservoirs built at the rivers Kura (Mingechaur, Shamkyr, and Enikend) and Araks (the Araks Reservoir) for the needs of irrigation, hydropower and fishery is annually managed by the State Committee of Land Reclamation and Water Resources and JSC “Azerenergo”.

The Cabinet of Ministers co-ordinates activities of all stakeholders and develops water policies. However, close co-ordination of all these organizations at the national and local levels is necessary. Since a due basis for broad activity of stakeholders is absent. To improve the current situation in the country, priorities for establishing the overall basis for mutual understanding of key stakeholders were specified. Incomplete co-ordination of the main ministries, directly or indirectly, affects development of uniform state policy in the field of water resource protection, management and use. At present, it is planned to establish the State Water Council in order to implement and co-ordinate uniform water policy. O&M of irrigation and drainage systems and water infrastructure annually requires significant funds, which the state cannot provide *in corpore*.

Administrative management methods in the water sector, the lack of institutional support, administrative and financial dependence of water organizations, the lack of state support to water users are constrains for transition to the IWRM principles. At present, the Soviet norms and standards on water resources protection and use, which need to be revised and improved, taking into account market economy requirements, are in force in Azerbaijan.

2. Enabling Environment for the IWRM Process: Evaluation of a Current Situation in the Country

The integrated water resource management principles are a rather new approaches or tools for Azerbaijan, likewise as for many countries of the world including countries of the South Caucasus. IWRM represents the continuous and multilateral process, which requires participation of policy-makers, experts and organizations that represent different interests. At present, awareness and knowledge of IWRM main principles among key experts and managers of institutions related to water issues are insignificant. However, changes occurring in recent years since the independence, as well as surface water pollution and exhaustion, irrational water resources use, water ecosystems degradation, and significant damage caused by droughts, mudflows and floods, require integrated water resource management approaches.

However, at the transition stage of reforms in all fields of the social and economic life in the republic, including the water sector, certain positive results were already achieved. Major objectives of reforms in the water sector are determined including establishing the right of property with respect to water infrastructure, irrigation efficiency improvement, and gradual transition to financial self-sufficiency.

Since 1996, as a result of agrarian reforms in Azerbaijan, numerous small landed proprietors have arisen instead of state farms, collective farms and other state agricultural enterprises. At the same time, the on-farm irrigation and drainage infrastructure, O&M of which was responsibility of state farms and collective farms, became ownerless and gradually began to be out of commission. Taking into account these circumstances, Government of the Republic of Azerbaijan has decided to transfer all these systems to the State Committee of Land Reclamation and Water Resources.

At the same time, since 1997 the paid water service was put in force based on “The Paid Water Use Regulations in the Republic of Azerbaijan” adopted in 1996. Institutional mechanisms and

conditions for public participation in the water allocation processes have been developed to put rational and economical use of water resources in practice.

The Farms Privatization Project, financed by the World Bank in 1996, has supported establishing water users associations (WUAs), and the first six WUAs were established in different zones of the republic within the framework of this project. At present, 550 water users associations (WUAs) covering 60 percent of the irrigated lands area were established in the republic through the water users' initiative and on the basis of a voluntary principle.

The Paid Water Use Monitoring Department was established within the institutional framework of the State Committee of Land Reclamation and Water Resources to render methodical-consulting assistance to WUAs.

Experts of the research and design institutes subordinated to the State Committee of Land Reclamation and Water Resources were involved to the public awareness campaign related to paid water use. However, more organized and regular public participation is required covering this activity.

The State Committee of Land Reclamation and Water Resources, at the expense of the credit granted by the World Bank for implementation of the Irrigation Project Phase II, provides for to rehabilitate, in part, inter-farm and on-farm irrigation and drainage networks in eleven administrative districts of the republic in the area of 56,000 ha and to improve their management. The project provides for to transfer on-farm irrigation and drainage systems to WUAs for long-term use, transforming associations to non-profit organizations established by agricultural producers, as well as to provide specific training. For strengthening the legislative basis of the WUAs, amendments to the Law on Land Reclamation and Irrigation of the Republic of Azerbaijan, which are now in the closing stages of approval by the Parliament, have been developed.

The National Department of Hydrometeorology of the Ministry of Environment and Natural Resources monitors surface water quality and quantity. On the contract basis, SKMWR and Department exchange available data on rivers and water infrastructure, as well as water availability forecasts of river systems in the republic. According to these data, SKMWR develops and implements the mudflow and flood control plan. At the same time, it is necessary to establish more enabling environment for use of available monitoring data.

The Water Code of the Republic of Azerbaijan had been adopted in 1997. The Water Code, supplemented with by-laws, has been adopted in the republic, which states main principles and rules of water resource management. The Water Code specifies the inventory of water resources that consists of inland waters and the Azerbaijan sector of the Caspian Sea, as well as the right of property with respect to water infrastructure, which is the state and municipal property.

The Water Code does not directly address the IWRM principles. However, one of fundamental principles adopted in the Water Code is that water resource management should be performed based on combination of hydrological and administrative-territorial principles as well as on the Water and Economic Balances, the Integrated Water Resource Use and Protection Plan, the Water Cadastre, and water use records. At the same time, the main organization responsible for this is the State Committee of Land Reclamation and Water Resources.

On the basis of the Water Code, normative-legal regulations, which regulate maintenance of the water cadastre, the state control over use and protection of water infrastructure, development of the integrated water resource use and protection plan, public examination and other issues were developed and adopted. Subsequently, some amendments and new legislative acts had been adopted. In spite of the fact that the Water Code contains comprehensive classifications and

technical details, it does not completely cover all aspects of water management and does not provide exact definition of functions and powers of stakeholders, and the rights and duties of water consumers. Some parts of the extensive additional legislation are often contradictory and do not fall into overall policies of water resource management.

It is necessary to note that the Law on Irrigation and Land Reclamation of the Republic of Azerbaijan adopted in 1996 specifies legal bases for activities in the field of land reclamation and irrigation, the rights of property related to water infrastructure.

In Azerbaijan, other laws with respect to the water sector were adopted including: “On Water Supply and Waste Disposal” (1999), “On Hydrometeorological Service” (1998), “On Environment Protection” (1999), “On Ecological Safety” (1999), “On Public Participation in the Decision-Making Process on Environment Protection and Open Legal Procedures” (1999), “On Municipal Water Supply” (2001), “On Waterworks Safety” (2002) and others.

Taking into account changes in economy and the IWRM principles, the legal basis of the water sector of Azerbaijan should be reformed and improved.

3. Willingness to Adopt the IWRM National Planning Process

In Azerbaijan, all "development schemes" including the Integrated Water Resource Use and Protection General Plan, the Integrated Nature Protection Plan, the Municipal Facilities Development and Placing Plan, and the Azerbaijan SSR Water Infrastructure Placing and Ameliorative Construction Arrangements Plan were drawn up in the Soviet times in various years (the last one in 1990). These development plans were mainly drawn up by 2010 as a component of the general development scheme of the former USSR using uniform methods. However, they contain the integrated approach to water resource use and protection. Basic weakness of these development plans is that they do not take into account completely sustainable, equitable and reasonable water supply for the needs of water-users and the nature, as well as water and economic balances for specific natural and economic zones.

To provide further development of land reclamation measures in the republic, the State Committee of Land Reclamation and Water Resources has prepared “The 1996-2010 Land Reclamation and Water Sectors Development Concept”, and investment programs, which were revised in 2003 in view of results of recent years. These documents specify guidelines for land reclamation and water sector development for near-term outlook, investments to the water infrastructure, policy of sectoral reforms, maintenance of existing water infrastructure, and other issues.

In Azerbaijan, programs and projects providing IWRM principles implementation are not yet adopted *in corpore*. However, different national programs were adopted recent years, in which the environment context and the main IWRM principles are indirectly reflected.

In 1998, under support of the World Bank, Government of Azerbaijan has prepared the National Environment Action Plan (NEAP). This plan contains the following aspects: environment protection problems assessment, ecological priorities and policies for their phased planning and implementation in view of changing economic and social conditions in the country.

The NEAP specifies drinking water quality deterioration, surface water pollution, damage caused by Caspian Sea level rise to cities and rural settlements within the Caspian coastal zone, and illnesses due to water-borne infections as main environment problems.

The projects related to these issues are the following:

- The DAI Project: Alazani River Basin Integrated Planning within the South Caucasus Water Resource Management Framework, financed by USAID;
- TACIS projects: Joint Rivers Management Programme; the Kura River Basin: Transboundary Rivers Water Quality Monitoring and Assessment, and the Environment Policy Implementation and NEAP Promotion in Commonwealth of Independent States
- The Caspian Sea Environment Plan (CSEP).

To provide secure, reliable and accessible services to the population of Azerbaijan in the water supply and sanitation sector, the World Bank has financed the project: the Azerbaijan National Water and Sanitation Sector Policy Study (1997), as well as the Feasibility Study for Irrigation and Drainage Systems Rehabilitation and Improvement in Azerbaijan (1998). In order to ensure foreign investments efficiency, eleven out of outstanding 150 water objects of great importance for our economy have been selected, including three top priority projects: the Milsk-Mugan Main Collector-Drain Construction, the Samur-Absheron Irrigation System Rehabilitation, and the Vaykhir Reservoir Construction, which shall be financed in the first place.

Under support of credits (US\$ 96 million in total) granted by the World Bank and the European Reconstruction and Development Bank, the Big Baku Water Supply Rehabilitation Phase I Program has been implemented. A few important water facilities, including Djeyranbatansk and Kurinsk treatment plants, and, in part, the city pump station have been rehabilitated.

Nowadays, the World Bank finances the Irrigation and Drainage Infrastructure Construction and Rehabilitation Project, which provides for rehabilitation works at the Samur-Absheron Canal's head section of 50 km long including the water intake at the Samur River; construction of the Milsk-Mugan Main Collector-Drain Phase III, as well as strengthening the institutional framework of the State Committee of Land Reclamation and Water Resources and its local divisions for O&M of irrigation systems.

The Islamic Development Bank finances construction of the Hanarh Canal being a component of the Samur-Absheron Irrigation System.

Measures for environment conditions improvement around the Djeyranbatansk Reservoir, which is the main water supply source for Baku, Sumgait, and Apsheron with the total population about 4 million people were implemented at the expense of the European Bank's grant.

In 2004-2007, the bank-protection measures at twenty-eight mudflow-forming rivers are planned to be implemented at the expense of funds of the Asian Development Bank.

Primary tasks need to be implemented by the country to diminish environment risks:

- Qualitative drinking water supply to the population;
- Operational irrigation and drainage networks and regular water supply to maintain irrigation of all crops, as well as drainage water disposal into the Caspian Sea;
- Decreasing water shortage due to irrigation canals lining and pipelines construction (at present, more than 90 percent of canals have not lining), introduction of state-of-the-art

- irrigation methods, revising water requirements of crops, and return water reuse including drainage water;
- Soil salinization control within the lowland zone by means of drainage systems construction, land reclamation measures, sedimentation and weed control at the irrigation canals and collector-drains, and O&M improvement;
 - Mudflows and floods control by means of construction of protective dams and cleaning of river channels;
 - River water pollution control, especially along transboundary rivers;
 - Elimination of the Caspian Sea level rise consequences by means of construction of coast-protecting structures;

Most of the water infrastructure of national importance - reservoirs, inter-district and inter-farm irrigation canals and collector-drains, large pump stations, control structures, irrigation systems, protective dams along the rivers Kura and Araks, observation wells and others are the objects which are not subject to privatization.

On-farm canals and collector-drains, small pump stations, sub-artesian wells, groundwater tapping structures, outstanding objects, haulage contractors are attributed to a category of privatized objects. The new institutional framework of the State Committee of Land Reclamation and Water Resources and its regulations were adopted. In accordance with market economy principles, multistage and irrational structural units have been liquidated, and new, more mobile structures were established instead of a number of former organizations.

The government has made decision on gratuitous transfer on-farm sub-artesian wells and small pump stations to water users for the period of 10 years.

All water infrastructure, including 135 reservoirs with the total capacity of 21.5 km³, 49,100 km of irrigation canals, 30,400 km of drainage network, 110,000 various hydraulic structures, 881 pump stations, more than 7,000 sub-artesian wells, 1,700 km of protective dams, large control structures and other objects are managed by the State Committee of Land Reclamation and Water Resources.

There are two research institutes, one design institute, the State Monitoring Directorate for Water Resources Use and Protection, the Water Infrastructure Cadastre Directorate, Hydrogeological and Land Reclamation Service, and two repair and engineering workshops within the institutional framework of the State Committee of Land Reclamation and Water Resources.

In Azerbaijan, water resource management is implemented at large-scale water infrastructure including O&M of hydroschemes and reservoirs (7), main irrigation canals (6), and main collector-drains (5), as well as irrigation systems in accordance with an administrative-territorial principle (42).

The State Committee of Land Reclamation and Water Resources has the state budget for O&M of above-mentioned water infrastructure, as well as for maintenance of organizations performing scientific-research and other functions. However, owing to economic restrictions only 40 to 50 percent of required funds are allocated from the state budget. The Design Association "Azgiprovodkhoz" functions as a self-supporting institution.

Additional financial sources of SCLRWR are the following:

- Water supply for irrigation is paid by water users at the rate 8-10 percent of normative production cost of water supply per one hectare under crop (Phase I of transition to water charging);
- Water supply to Baku, Sumgait, and Apsheron at the rate 69 Manats (14 cents) per 1 m³;
- Water delivery for industrial needs is paid by enterprises at a rate of the cost price of water supply.

4. Enabling Environment for IWRM National Plan Implementation

There are specific conditions in order to apply IWRM at the national level in the republic. First of all, phased transition to IWRM is required due to water resources depletion and pollution. At the same time, support of Government is necessary. The first step has been already made, as in the near future the State Water Council under presided by the First Deputy Prime-Minister of the republic with powers to implement uniform water policy and co-ordination of all stakeholders was planned to be established. There are highly skilled experts and scientists in the republic, who are able to promote transition to IWRM.

The foreign assistance to Azerbaijan needs to apply new approaches to water resource management, including assistance of international financial institutions and the GWP. At the same time, at the initial stage the GWP would promote to implement pilot projects in different river basins and at large-scale water infrastructure, and to improve the legislative framework. The Water Code of the Republic of Azerbaijan Improvement Based on International Regulations and IWRM Principles Project is proposed as the primary measure.

Development and introduction of IWRM principles at the national level, taking into account transition to market economy and new management methods, should be carried out under supervision of the Cabinet of Ministers and the Parliament of the Republic of Azerbaijan. At the same time, a key role should be played by the State Committee of Land Reclamation and Water Resources and the Ministry of Environment and Natural Resources, and their research and design institutes. The National Academy of Sciences, other organizations of the water sector, and the public should be also involved in the process of development and implementation of the IWRM National Plan.

At present, there are not conflicts among water users, except for frontier areas with the Republic of Armenia and invaded zones. In these areas, water shortage is sharply felt. It is necessary to note that due to occupation of the Sarsangsk Reservoir with the capacity of 560 million m³ by the Republic of Armenia, irrigation of the farming area of 100,000 hectares became impossible, that has put an irreparable loss to economy of this region. Along with this, the highest dam (135 m) in the republic due to insufficient maintenance service creates real threat to 400,000 people, living in downstream areas of the Terter River.

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GEORGIA



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1. National Water Resources Status and Main Issues with Current Management

Georgia is a country rich in water resources. Surface and ground water resources include numerous thermal and mineral water sources. Many rivers fed by thawed snow and glaciers run down from mountains complemented by thick water-bearing horizons (limestone) in vicinities of the Greater Caucasus. The total annual river runoff of 65.8 km³ out of which 56.5 km³ are formed in Georgia, and 9.3 km³ are transit water resources flowing across its territory. On average, a runoff rate comprises 810,000 m³ per 1 sq km a year. However, water resources are non-uniformly distributed over the Georgian territory. In the western part of the country, the annual runoff rate is 1,340,000 m³ per 1 sq km, whereas in the eastern part the runoff rate is only 370,000 m³ per 1 sq km. A natural division of these two regions coincides with a border between drainage basins of the Black Sea (the rivers Rioni, Ingury, and Churokhi) and the Caspian Sea (the rivers Kura/Mtkvary and Alazany). There are more than 26,000 rivers in Georgia, and most of them are classified as small rivers (length is less than 25 km). The total length of the river network is 59,000 km.

Table 1. The Number and Length of Rivers in Georgia

Length of River	Number	Total Length	% of number/total length
< 25 km	25,905	50,480	99.4/85.6
26 - 100 km	141	5,743	0.54/9.72
101 - 500 km	13	2,344	0.05/3.99
> 500 km	1	390*	0.0001/0.69
Total	26,060	58,957	100/100

Note* - Kura/ Mtkvary in the territory of Georgia

There are more than 860 lakes and reservoirs with a total water surface area of sq km in Georgia.

Most of the 43 reservoirs (35 in the eastern part and 8 in the western part of Georgia) are used for hydropower production. The annual regulated runoff is 2,184.85 Mm³.

Georgian ground water resources are abundant, especially in the lower part of the Greater Caucasian Ridge slopes (karst limestone) on the Akhalkalaky and Marneuly Plateaus. Estimated fresh ground water resources equal 337.5 m³/sec or 10.6 km³ per year (Eastern Georgia – 4.2 km³ or 39.5 percent and Western Georgia – 6.4 km³ or 60.5 percent, respectively).

Due to a prolonged economic crisis, water withdrawal rates and usage for industrial, agricultural and domestic needs are diminishing. At the same time, water losses have increased due to poor operating conditions of water intakes and pipelines.

Table 2 Water Withdrawal Rates (WWR) and Usage (WU) (Mm³/year)

Georgia, in total	1990		1995		2000		2002*	
	WWR	WU	WWR	WU	WWR	WU	WWR	WU
	3,853	3,623	2,000	1,628	2,010	778	1,953	764

Note: * - hydropower is not included

As users divert water from the same sources, competition is inevitable. Conflicts between hydropower engineering and water supply, on the one hand, and agriculture and fishery, on the other hand, are typical. The latter requires a natural hydrological regime whereas agriculture and hydropower are more concerned with overall river flow regulation. The users "taking" water in the upper reaches of the rivers (hydropower and water supply) reduce the accessible volume of water resources for downstream users.

Such water users as industry, municipal water supply, and irrigation utilize considerable volumes of water and return it with worse quality. Hydropower, water transport, flood control, timber floating, fishery, and recreation "do not consume" water, but can degrade its quality.

The main problem of water governance is to take into account interests and needs of all stakeholders. At present, management is based on a sectoral approach that frustrates coordination. Efficient water resources control is complicated, since conflicts of interest between water users are severe. Effective and sustainable water management could be achieved only by coordinating interests of upstream and downstream users.

A major principle is that upstream water users must recognize basic needs of downstream consumers and to share available water resources with them.

Over-consumption or pollution of water resources by upstream users can deprive downstream users of the right to their share of water resources. Therefore dialogue and resolution of conflicts, involvement of stakeholders in the decision-making processes and management are critical.

During past decades, economic activity of the population has strongly affected annual water resources distribution, greatly upsetting the natural hydrological cycle. Particularly, anthropogenic impacts during warm seasons are obvious in semi-arid regions.

Intensive water withdrawal from the Kura River and its main tributaries for irrigation in Georgia and Azerbaijan and the absence of the agreements on surface water resource use and protection can result in conflicts.

Along with anthropogenic impacts on surface water resource distribution, the most important factor is water pollution. Industrial, mining, household and agricultural wastewater disposal threatens water quality.

Household wastes are a basic pollutant of surface water containing organic compounds and nitrogen and phosphorus compounds. Heavy industrial enterprises are sources of specific compounds contamination (oil products, phenols, trace elements).

A serious problem for Georgia is the absence of even the most primitive wastewater treatment facilities at resorts, infectious and tubercular hospitals. There is a serious risk of surface water pollution from medical contaminants in the Kura River basin. National water resources are also polluted with agricultural chemicals.

Municipal filtration fields, scattered trash dumps, and industrial waste disposal sites contaminate surface water resources as the majority of them are illegally placed, and water resource protection does not meet sanitary requirements. Most of them are located along riverbanks. Dangerous industrial wastes are often not separated from household wastes.

Scarcity and poor quality of drinking water are causes of infectious disease outbreaks in cities. According to data from the State Sanitary-and-Epidemiological Inspection of Georgia, about 17.3 percent and 16.0 percent of water samples collected at water supply systems (in 1999 and 2000 respectively) did not meet drinking water quality standards with respect to toxicity and bacteriological pollution.

The territory of Georgia, and the Caucasus as a whole, is characterized by very complex geological and geomorphologic structures, variability of climatic and meteorological conditions, as well as a high seismic activity. The territory is subject to the risk of various dangerous natural phenomena - landslides, rockfalls, mudflows, snow avalanches, and occasional strong earthquakes. As a rule, all these phenomena are closely interconnected. Floods are seasonal (basically, in spring from thawing snow). All of these factors result in high sediment load and flow regime disturbance.

Good management, political and sectoral reforms are necessary. Measures establishing better management, directed against corruption and financial disorder, are important. A partnership between private and public sectors should ensure equitable and transparent water allocation for all stakeholders and provide environment protection. Strengthening institutional potential and establishing an information database to promote planning and decision-making processes should be one of overall goals. This process should also ensure participation of water users in developing water policy and strategy.

Unbalances in water policy, laws and management should be eliminated. It is very important to reanimate the monitoring systems and information databases to evaluate the real water resource status. An integrated record-keeping system of water use and wastewater removal should be established. Transparency and the involvement of all water users in the water resource management process should be provided.

In addition, sectoral needs and ecological aspects should also be considered. Political dialogue between water professionals and policy-makers (local administrations, officials at the national level) concerning the legal and financial aspects of water resource management and use should be strengthened. Co-operation at the national and regional levels should be encouraged. For this purpose, it is necessary to harmonize the legislative framework and existing standards. Effective regulation or incentives for planning watershed management must be developed, and administrative bodies providing information interchange for water resource management within watersheds should be established.

2 Enabling Environment for the IWRM Process: Evaluation of a Current Situation in the Country

A common goal of the GWP is global water security as contribution to poverty reduction, living standard increase and natural resources protection. Georgia is the member of the GWP (GWP-CACENA) since February 2002. Nevertheless, the IWRM principles are not yet incorporated into state water policy.

It is necessary to take decisive steps in order to improve public awareness concerned with the IWRM process and to create an enabling environment. Currently some activity, which could be the basis for IWRM, is in progress. Certain measures on institutional capacity building have been already undertaken by the REC "Caucasus".

Readiness and political will exist for achieving effective translation of theory into practice. Politicians and those responsible for water resource management such as representatives of sectoral administration perceive a need for applying a new approach to water resource management.

Georgia is increasingly involved in international water initiatives. Representatives of Georgia have taken part in the Third World Water Forum held in Kyoto (March 16-22, 2003) and the Fifth Pan-European Ministerial Conference on the Environment held in Kiev (May 21-23, 2003).

In July 1999 Georgia joined the European Partners for the Environment (local, regional and transboundary air and water pollution control, water quality management, agricultural impacts on the environment, effective environment monitoring (Article 57)).

Main participants in these organizations are politicians and water professionals. Water policies have been developed, and economic tools are now available. Legislation and standards are harmonized with European analogues.

First steps towards new water management principles have been already made. Some projects, which could form a basis for the IWRM process, have been implemented.

Georgia has ratified different international conventions and is the participant in bilateral and multilateral agreements on co-operation in the water sector. Bridging with international organizations promoting new initiatives has been established.

There are mechanisms for wide consultation of water users on IWRM problems, such as the National Water Partnership, recent national and sub-national conferences and meetings on the IWRM issues, etc.

Establishing a National Water Partnership was discussed at the GWP meeting held in Almaty (Kazakhstan) in May 2003. It was decided to set up Initiative Groups in each country in the region under the guidance of a member of the Regional Technical Advisory Committee. It was also decided to implement consultations in each country, to specify goals, tasks, actions, and relevant budget. In addition, the representatives of Initiative Groups will attend the GWP Conference (in Tbilisi).

As previously noted in the GWP CACENA progress report (January - June 2003), the website of RGWP has been created. It is a powerful tool used for communication and information dissemination, and strengthening co-operation between countries.

GWP CACENA has established collaboration with the International Network of Basin Organizations (INBO). This collaboration could be enhanced within the framework of the

INBO/GWP Associated Program under support of the EU Water Initiative. The INBO Central Office intends to establish two affiliates in Central Asia and the Caucasus. NGOs, the governmental and regional organizations will be involved in this initiative, promoting the IWRM process in transboundary basins. There was also suggestion to create an INBO for the CIS region (12 countries of the former Soviet Union) if the INBO Central Office will support this idea.

An open dialogue on vital issues of the IWRM process has commenced.

At the meeting held in Almaty, the joint session of the RTAC GWP CACENA, the ICWC and the Swiss Development and Cooperation Agency (SDC) "Ways towards the IWRM process in the Aral Sea Basin" was convened. Institutional reform trends in the water sector, practical issues of establishment and development of water users associations (WUAs) in Central Asia, ways towards irrigation efficiency increases, tools required for applying the IWRM principles, and also involvement of water users in water resource management processes were discussed.

Transformation of the RTAC in the Regional Water Partnership Council was discussed, and it was decided to commence preparation procedures related to this issue.

In addition, the following themes were discussed: (i) joint efforts of countries in water management at the basin level; (ii) water saving through a partnership at the interstate (regional) level; (iii) accounting of economic and ecological interests through an inter-sectoral partnership in each country; integration over vertical hierarchy "country - basin/irrigation system - water users"; (iv) joining of water users and water organizations at all levels of water management; and (v) a partnership between governmental and nongovernmental organizations.

Integration of knowledge and practice through a partnership of science, water users and water organizations; integration of international donors and regional/national organizations through co-ordination and partnership between the international financial agencies and the countries were also reviewed.

Conferences.

Between 2001 till 2003, three conferences of the REC "Caucasus" were held:

- Water Resources Management in Countries of South Caucasus, 2001
- Droughts and Desertification Problems in Countries of South Caucasus, 2002
- Mountainous Regions Sustainable Development in the Caucasus, 2003

At present, there is not a single political document in which policies of Georgia in the field of water resource management and protection is directly stated. There are more than 30 laws related to these issues. Laws on the environment and water resources as well as a number of other laws specify key principles and create the political framework.

The Environment Law, approved by the parliament of Georgia in 1996, specifies the general legal framework for comprehensive protection of the environment and water resources; the Water Law, adopted in 1997, states main goals of water resource management and provides guidelines and tools for achieving long-term objectives. Under their activities, the governmental and private organizations are obliged to follow these guidelines.

The Water Law approves state ownership of water resources and creates the legal basis for licensing water withdrawal from surface water sources and sewage disposal to these sources. The law states the top priority of drinking water supply. The law specifies principles of water protective zones, surface water quality standards, and quotas for sewage disposal as well as tools for implementation of these principles.

Important laws have been adopted in 1996: the Law on Environment Requirements and the Law on the State Ecological Examination. These laws specify the legal basis for implementation of key principles under ecological licensing:

- Economic activity categories requiring ecological licensing;
- Procedures of granting ecological licenses;
- Procedures of the state ecological examination;
- Procedures of environment impact assessment;
- Public awareness and participation in the decision-making processes related to ecological licensing.

In accordance with potential environment impacts, economic activities are divided into four categories. An ecological license for projects is ranked into the first category and is issued only following a complete environment impact assessment (EIA) and examination by the Ministry of Nature Protection.

The Law on Public Health Protection was approved by the parliament in 1997. The law states measures, which should be undertaken to ensure health protection of the population, and specifies risk factors affecting health of people and preventive measures.

The Sanitation Code approved by the parliament in 2003 states sanitary-and-hygienic standards and specifies responsibilities at all levels of authority and the measures necessary to solve problems.

3. Willingness to Adopt the IWRM National Planning Process

The IWRM Action Plan has not been yet prepared. Developing a strategy and plans for sustainable integrated water use is in progress. Currently certain steps for improving public awareness regarding the IWRM principles and preparing the basis for promoting IWRM processes have been made. Appropriate action to develop the IWRM framework and to strengthen the institutional potential is being implemented.

At present, Georgia as member of the GWP CACENA, is involved in projects and programs within the GWP framework. In the near future, the plan is to establish collaboration with the INBO.

The GWP-CACENA Program for 2004-2008 provide for the following activities:

- Establishing regional water partnership between all stakeholders and analysis of the possibilities/ways for IWRM implementation through dialogues and participation (2004-2005).
- Strengthening regional and country partnerships and implementation of the IWRM principles using participatory tools and fund raising (2006-2007).

- Agreement on a strategy of further steps for water partnership development in the region to provide sustainable outputs (2008).

The following actions are planned: (i) the public awareness campaign; (ii) ToolBox development to use it for preparation of IWRM plans and programs; (iii) design of the reform via identification of country's and regional needs; (iv) development of tools for day-to-day practice of water management; (v) cooperation with regional organizations addressed to development of Water Information System (databases, modeling, and a network of libraries); (vi) training.

The main governmental agency responsible for the environment, including water resources, is the Ministry of Nature Protection and Natural Resources. The ministry develops ecological policies and strategies, monitors and co-ordinates actions on nature protection.

The ministry is responsible for the following:

- Routine design of sustainable development policies and action plans;
- Licensing for natural resources use, including water resources;
- Licensing sewage discharges (all municipal, industrial and other discharges into water bodies). Licensing is based on an estimate of maximum permissible sewage discharges and is implemented by the ministry or its regional subdivisions on the basis of the decision of the Inter-Sectoral Commission or the Regional Advisory Panel;
- Ecological licensing issues (any enterprise acting in the field of development and construction should receive the ecological license). The ministry (or its local subdivisions) issue licenses on the basis of ecological examination;
- Annual reporting on environment status.

The Ministry of Labor, Public Health and Social Protection designs and approves sanitary-and-hygienic rules and standards (hygienic "specifications") to ensure human environment security, in particular, the Ministry designs and approves such standards regarding surface water resources that are used for drinking, household and recreational needs.

The Ministry of Economy specifies, through consultation with stakeholders, investment projects, and prepares project implementation plans and coordinates tariffs.

The Ministry of Infrastructure and Development is responsible for coordination and control of municipal infrastructure/engineering structures.

The Ministry of Finance allocates funds for investment projects. The Tax Inspection subordinated to the Ministry is responsible for tax collection for water withdrawal and sewage discharges.

Local authorities are responsible for operation, maintenance and financing of water supply and sewerage systems.

The National Environment Action Plan (NEAP) has been approved by the Decree of the President (No 191) in 2000. The NEAP addresses high-priority environmental problems including such priorities as drinking water quality and sanitation.

However, none of the plan items have not been implemented due to lack of financing. The second phase of this plan is now developed, in which emphasis is placed on legal and institutional issues.

The National Environment and Health Action Plan (NEHAP) has been approved in 2003. This plan adresses all problems related to public health including drinking water reserves and water resources quality and makes recommendations on improving situations. However, not all of these recommendations can be implemented due to a lack of funds.

Water users, taxpayers and donors repay O&M of water infrastructure. Financial resources are obtained from foreign private investors and international organizations. At the local level, funds from development banks and micro-credits are used.

Financing of the water sector is provided from:

- *Water users* such as households, farmers and enterprises. Households, in particular, in rural areas and poor cities invest their money, labor and materials for construction of wells, pipelines, and sanitary facilities. Farmers invest money to drill wells, procure pumps and construct irrigation systems, both individually and within the framework of groups and associations. Industrial plants and business corporations often construct their own water intakes and water-treatment facilities. Some large firms even supply water to populations of cities or settlements. Users cross-subsidize each other to repay various tariffs;
- *Informal suppliers*. In districts without centralized water supplies, local private entrepreneurs frequently circumvent the law by selling water from tanks or in bottles.
- *Public water management organizations implement* their activities at the expense of paid water services, loans, and governmental subsidies;
- *Private companies*, local or foreign, provide funds from different sources;
- *Non-governmental organizations and local communities*, basically, receive funds from international agencies.
- *Local banks and other financial institutions* offer short-term and medium-term loans at market interest rates;
- *International banks and export credit agencies* can grant more funds than local agencies, under corporate guarantees or available receipts;
- *International multilateral and bilateral institutions* grant credits on the basis of concessions or grants;
- *Multinational financial institutions*: provide loans with interest rates similar to market rates;
- *National central and local governments* provide subsidize, guarantees for loans, and debt instruments.

4. Enabling Environment for IWRM National Plan Implementation

Initial steps have been undertaken to provide political support to the implementation of IWRM principles. The Ministry of Nature Protection has been appointed as the key executive agency. In 2003, the ministry prepared the legislative act “On Amendments in the Water Law”. Application of basin water resource management principles is proposed to be implemented in 2006 (currently territorial principles are employed, and implementation of IWRM principles is not ensured).

At present, a financial strategy for IWRM implementation is absent. A project financed by the World Bank and the GEF (started in 1998) is considered as the first experience of this kind.

In our opinion, measures for IWRM implementation should be the following:

1. Matching a legislative framework for Georgia, Armenia and Azerbaijan in conformity with that for Europe, based on the European Water Directive (dated October 23, 2000).
2. Improving the institutional framework for water resource management and its reorganization based on the basin water resource management approach.
3. Signing and ratification of the Helsinki Convention on the use and protection of transboundary watercourses and lakes (1992).

Financial assistance from international donors is necessary for the development of new water legislation - a Water Code of Georgia based on IWRM principles. In this respect, development and implementation of an IWRM plan for the country can be initiated in 2007-2008.

KAZAKHSTAN



Leonid Dmitriev

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1. National Water Resources Status and Main Issues with Current Management

Total water resources of the Republic of Kazakhstan amount to about 539 km³ including water resources of lakes - 190 km³, rivers and reservoirs - accordingly 100.5 and 95.5 km³, glaciers - 95 km³, and ground water resources - 58 km³.

According to data on water resource use and protection being recorded by the governmental agencies, mean annual renewable surface water resources equal 100.5 km³; useful ground water resources are 12.8 km³/year, and return water being formed in the process of natural water resource utilization is 4.0 km³.

1.1 Available Water Resources.

Available surface water resources in Kazakhstan, in an average year, amount to around 42.4 km³ (2.8 thousand m³/year per capita), and in dry years (95 percent probability) they decrease to 25.4 km³ (1.7 thousand m³/year per capita).

The estimated ground water resources with salinity less than 10 g/l are 40.4 km³/year, including 12.8 km³/year of useful ground water resources.

The analysis of water resources distribution shows that only due to extreme non-uniform distribution of both surface water resources and ground water resources over the territory of Kazakhstan there are a number of regions subjected to water deficit, at times, having a negative water balance.

It is necessary to note that the current water situation in certain regions of the republic can be aggravated even more due to intensive economic activity in neighboring countries, where the rivers Irtysh, Ural, Ili, Syr Darya and others, supplying a significant amount of transboundary surface water, have headwaters.

Out of available 4 km³ of return water only about 1.9 km³ come back to water sources, the rest of runoff is dissipated over the territory. Return water discharges mainly into the Syr Darya River (47 percent), Irtysh (34 percent), Ili (8 percent), Nura (5 percent) and others (6 percent).

Thus, the total volumes of available water resources, which may be used in economic sectors at the current level of development, in an average water year amounts to 46.0 km³, including surface water resources – 42.4 km³, ground water resources – 1.7 km³, and return water – 1.9 km³. Distribution of surface water resources of the republic for the river basins is shown in Table 1.

1.2 Actual Water Demand.

Annual water withdrawal rates by all sectors of the national economy in 1995-2002 were 28.8 to 21.0 km³ depending on climatic conditions, economic activity, and due to institutional reforms taking place. Water supply is mainly provided by surface water resources (89 to 94 percent), and in part by ground water, seawater and wastewater.

Most of the water resources are used by the agricultural sector (74 percent). In 1990, the volume of irrigation water use was 16.7 km³, in 2002 – 7.0 km³, i.e. has decreased more than two times owing to decline in the irrigated lands area.

Table 1 Surface Water Resources (SWR) in the Republic of Kazakhstan (km³)

River Basin	Annual runoff		Mandatory water releases (sanitary, ecological, and transport) and losses	Available SWR	Runoff		Available SWR in a dry year	
	Total	Including inflow from riparian states			75% probability	95% probability	75% probability	95% probability
1. Aral-Syr Darya	17.9	13.7	6.9	11.0	14.7	14.2	9.8	9.3
2. Balkhash-Alakol	27.8	11.9	17.5	10.3	22.8	17.8	7.0	5.4
3. Irtysh	33.8	8.0	22.5	11.3	26.6	19.7	10.8	8.0
4. Ishim	2.2	-	0.6	1.6	1.1	0.3	0.4	0.1
5. Nura-Sarysuy	1.3	-	0.6	0.7	0.4	0.1	0.3	-
6. Tobol-Torgay	2.0	0.3	0.6	1.4	0.8	0.3	0.3	-
7. Shu-Talass	4.2	3.0	0.6	3.6	3.5	2.8	3.0	2.3
8. Ural-Caspian	11.3	7.1	8.8	2.5	6.2	3.0	1.0	0.3
Total	100.5	44.0	58.1	42.4	76.1	58.2	32.6	25.4

Source: The Water Resources Committee of MoA, RK, Institute “Kazgiprovodkhoz”

Decline in water consumption is typical for all sectors of the national economy in all regions of Kazakhstan, particularly in the southern and southwest provinces. Water resources use by sectors of the national economy is given in Table 2.

Table 2 Water Usage in Different Sectors of the National Economy in Kazakhstan

Water Use	1990		1995		2000		2002	
	km3	%	km3	%	km3	%	km3	%
1. Municipal sector	1.4	4.9	1.2	5.4	0.6	4.3	0.6	4.2
2. Industrial sector	5.0	17.5	4.1	18.5	2.8	20.1	2.9	20.4
3. Agriculture	21.8	76.2	16.5	74.7	10.41	74.7	10.6	74.7
including:								
Regular irrigation	16.7	58.4	12.1	54.8	7.6	54.6	7.0	49.3
Liman irrigation	4.0	14.0	3.7	16.7	2.5	17.9	3.3	23.2
Water supply	0.6	2.1	0.4	1.8	0.18	1.3	0.18	1.3
Pasture water supply	0.5	1.7	0.3	1.4	0.13	0.9	0.12	0.9
4. Fishery	0.4	1.4	0.3	1.4	0.12	0.9	0.10	0.7
Total	28.6	100.0	22.1	100.0	13.93	100.0	14.2	100.0

Source: The Water Resources Committee of MoA, RK,

1.3 Main Water Conflicts and Competition among Water Users

The main cause of conflicts and competition for water among water users is water resource shortage and deterioration of river water quality. Water supply to sectors of the national economy in different river basins and administrative provinces of the republic is given in Table 3.

Table 3 Water Supply in River Basins and Administrative Regions

River Basin	Administrative Oblast	Percentage of water demand (%)		
		An average year	75% probability	95% probability
1. Aral-Syr Darya	Kyzylorda, South-Kazakhstan	90	82	77
2. Balkhash-Alakol	Almaty, Eastern-Kazakhstan	98	80	61
3. Irtysh	Eastern-Kazakhstan, Pavlodar	100	100	100
4. Ishim	Akmolinsk, North-Kazakhstan	90	40	10
5. Nura-Sarysusk	Karaganda, Akmolinsk	53	20	5
6. Tobol-Torgay	Kustanaysk, Aktubinsk	89	33	6
7. Shu-Talass	Jambulsk	90	73	56

8. Ural-Caspian	Western-Kazakhstan, Atyrausk, Aktubinsk	100	35	10
Total		97	76	60

As shown, especially low water supply to sectors of the national economy is observed in dry years (95 percent probability) in the river basins Ishim, Nura-Sarysusk, Tobol-Torgay, and Ural-Caspian due to water-environmental problems, natural factors, water allocation problems of Torgaj river runoff between Kystanaysk and Aktyubinsk provinces.

Since 1993 until 2002 there was decline in water consumption in sectors of the national economy from 37.6 to 22.9 km³, including in agriculture from 26.9 to 14.3 km³.

Conflicts, having an inter-sector nature, occur, first of all, between hydropower, environment, and agriculture at the national level in the river basins: Ili (the Kapshgaysk hydropower plant) and Irtysh (the cascade of reservoirs with hydropower plants), as well as at the interstate level in the Syr Darya River basin owing to water releases from the Togtogul Reservoir in Kyrgyzstan subjected to an operational regime of the hydropower plant. Water users, located in upstream and downstream reaches of rivers, are in unequal conditions (especially along transboundary rivers).

In Kazakhstan, during dry years, drinking water supply and ecological water releases have priority with respect to agricultural and industrial sectors.

The IWRM (basin) principles enable to provide rational regulation and to eliminate disputable situations between sectors.

The most severe problems for Kazakhstan are the following:

- winter water releases from the Togtogul Reservoir resulted in significant water shortage during the growing season and winter floods of settlements located on the Syr Darya's riverbanks in Kazakhstan;
- lack of agreements on water resource use: with countries of Central Asia with respect to the Syr Darya River and with the People's Republic of China with respect to the rivers Ili and Irtysh.

Interstate conflicts in the Central Asian region are possible due to different approaches of the countries with respect to water resource allocation and lack of effective mechanisms for dispute settlements, as well as because of aspiration of some riparian states to use their geographical location for receiving of the maximal economic and political benefits.

1.4 Main Threats to Water Resources

Water resources are being depleted; for recent 25 years, natural surface water resources have decreased by 14.1 km³ (in a mean water year), due to decline in water resources formed in the territory of Kazakhstan (4.1 km³) and decreasing transboundary inflow (10 km³). As a result, water supply to natural complexes practically in all river basins is decreased, but especially in downstream reaches of the rivers Syr Darya, Ili, Shu, and Talas.

Carrying capacity of riverbeds and water infrastructure has decreased, in particular, the Syr-Darya's riverbed.

Because of self-discharging of artesian wells, depletion of groundwater resources takes place in mountain districts of the republic.

Pollution of surface water is practically observed in all river basins. Their hydrochemical, hydro-biological and sanitary regimes have essentially changed due to anthropogenic impacts.

Dangerous contamination of groundwater takes place owing to seeps from numerous ponds of industrial and municipal sewage. Practically, water of all rivers became unsuitable for drinking water supply.

The greatest water erosion in Kazakhstan is observed within riverbeds in mountain areas and downstream of reservoirs. Critical water erosion is also observed in irrigated fields with steep surface slopes (more than 0.01) due to imperfect water application technique. An area of such lands amounts to more than 500,000 ha.

1.5 Risks related to water.

Engineering conditions of dams in the republic is extremely unsatisfactory. The greatest risk is related to probable failures of dams. As a result of their destruction, an inrush wave could result in numerous human victims and incredible social and economic damage.

Dangerous hydrological events are observed including mudflows in mountain areas (Almaty, Jambul, South-Kazakhstan, and Eastern-Kazakhstan provinces) and floods of rural settlements and cities practically in all river basins. In the current year heavy losses from flooding took place in the Syr Darya River basin due to winter water releases of the Togtogul hydropower plant in Kyrgyzstan.

Infectious diseases outbreaks related to poor-quality drinking water are frequent. A sickness rate by intestinal infection diseases and virus hepatitis has increased; plague and cholera outbreaks are registered in the Pre-Aral area. Children (10 to 14 years old) and teenagers (15 to 17 years old) are most subjected to diseases. A life expectancy in Kazakhstan is rather low and equals 63.5 years (in 1995).

1.6 Main Issues of Water Resource Management at the National Level.

Current water policy of the state may be considered as “transitional policy” which needs to be improved.

The following problems are inherent to water resource management at the national level:

- Governance of professional capacity and resources in the water sector at national and local levels is inefficient;
- The role of long-term planning, monitoring and evaluation of program implementation is depreciated;
- The current legislative framework does not enable to build up, in full, market relations and to regulate private sector development;
- Lack of sufficient financing for water sector development.
- Basin and national water management organizations are insufficiently equipped with office equipment, vehicles and modern communication facilities;
- Lack of the National Integrated Water Use and Protection Action Plan of the Republic of Kazakhstan;
- Inability of water users currently to pay for, in full, water resource use and services to water suppliers; and

- Inefficient water use by consumers.

2. Enabling Environment for the IWRM Process: Evaluation of a Current Situation in the Country

2.1. Public Awareness Concerned with Main IWRM Principles and Political Will to Support Reforms

Awareness concerned with the main IWRM principles among politicians, water professionals and organizations, and public organizations dealt with water issues is still obviously insufficient, as these principles are not completely implemented in none of eight river basins. Primary expectations regarding IWRM principles implementation are related to a Water Code adopted by the Decree No 481-II dated July 09, 2003, in which the basic requirements to IWRM are clearly enough stated. Practically, only in the beginning of 2004, the reform of the water sector based on the Water Code of the Republic of Kazakhstan has been started.

Government of the Republic Kazakhstan, state agencies, the parliament, and NGOs support reforms in the water sector of economy based on the IWRM principles.

In March of this year, the Head of State has signed the decree on preventing emergencies caused by man-made and natural factors in Kazakhstan and ensuring the population security. This decree commits to the Ministry of Emergencies, MAWR, governors of provinces, Astana, and Almaty to develop required measures, done in good time, on water sources control, strengthening hydraulic infrastructure safety, flood control and riverbanks protection, and monitoring of mudflow-forming conditions, etc.

The public awareness campaign is organized well enough in Kazakhstan including information dissemination through mass media, Internet, broadcast and TV, publication of legal documents and scientific and technical information. Since 2004, the magazine “Water Management in Kazakhstan” is being published.

2.2. Enabling Environment for Wide Public Participation

A key water resources management agency in the river basin is the Basin Water Organization (BWO), which according to the Water Code provides co-ordination of all state bodies that are carrying out state control over water resource use and protection including environment protection, use and protection of mineral deposits (ground water resources), sanitary-and-epidemiological well-being of the population, veterinary service, and phyto-sanitary monitoring.

In practice, authorized supervision bodies, in this or that form, co-ordinate the annual working plans with the BWO.

However, within a year, there is not regular exchange of on-line information and data on water resources quantity and quality analysis.

The new Water Code designates the BWO as the chief organization responsible for water management. Establishing the Public Councils with participation of all stakeholders is also

provided for. It is possible to conclude that after putting in force of the Water Code and a number of by-laws, favorable conditions for wide participation of stakeholders in water resource management were created in Kazakhstan.

The process of establishing water user associations (WUAs) in the irrigation farming sector of the republic has only started; search of optimum frameworks to promote self-management and water use efficiency is conducted. However, the role of WUAs is not yet essential.

2.3. *Capacity Building for Reform Implementation.*

After disintegration of the Soviet Union, the education and training system that earlier existed in the water sector has collapsed, and during long time, water professionals could not be acquainted with the best practices of developed countries in the field of water management and irrigated agriculture, with new ideas and trends.

Recent years, significant activity in order to organize training for water professionals in the republic is conducted. The certain number of specialists has participated in training in the Training Center at the SIC/ICWC.

In 2002-2003, workshops related to water management issues, in which more than 300 national experts representing local authorities and more than 200 organizations of different sectors of economy were held in each of eight basin water management organizations within the framework of the special project. Computer-aided teaching was provided for all water professionals, especially for young specialists. Activity related to development of GIS systems and water resource management models for BWOs was started. The first GIS system and the Nura-Ishimsk River Basin Model have been designed.

Similar activity with participation of British Company Jacobs GIBB has been started for the Ili-Balkhash Rivers Basin. Preparation of these water management tools has shown that it is necessary to involve increasingly young experts experienced in computer technologies within the framework of BWOs.

In the republic, there is a widespread network of the hydrometeorological stations providing record-keeping and monitoring of water resources. However, their equipment and the number of gauging stations are obviously insufficient for maintaining high-grade water cadastres.

2.4. *The Legislative Framework for IWRM*

The current water legislation in the Republic of Kazakhstan and other by-laws related to the IWRM principles are summarized below:

No	Name of Documents	Date of Constitute	Note
Major lows, codes, and conceptions:			
1	The Constitution of the Republic of Kazakhstan	August 30, 1995	
2	The Water Code of the Republic of Kazakhstan	July 09, 2003 No481-113RK	
3	The Decree of the President of the Republic of Kazakhstan, operative as the Law on Land Resources	January 24, 2001 No152-113RK	
4	The Land Code of the Republic of Kazakhstan	June 20, 2003 No422-113RK	
5	The Law of the Republic of Kazakhstan «On Nature	July 15, 1997	

No	Name of Documents	Date of Constitute	Note
	Protection»		
6	The Decree of the Republic of Kazakhstan, operative as the Law “On Subterranean Resources Use and Protection”	January 26, 1996	
7	The Conception of Ecological Security of the Republic of Kazakhstan by 2004-2015	Approved December 03, 2003 No241	
8	The Forest Code of the Republic of Kazakhstan	July 08, 2003 No77-II	
9	The Law of the Republic of Kazakhstan “On Emergencies Due to Natural and Man-Caused Events”	July 05, 1996 No 19-1	
10	The Law of the Republic of Kazakhstan “On Civil Defense”	May 7, 1997 No 100-1	
11	The Law of the Republic of Kazakhstan “On Rural Water-User Consumers' Co-operative”	-	
12	The Law of the Republic of Kazakhstan “On Sanitary-and-Epidemiological Security of the Population”	December 04, 2002 No361-II3RK	
13	The Conception of Water Sector Development and Water Policy of the Republic of Kazakhstan by 2010	January 21, 2002 No 71	
Programmes:			
14	The National Program “Drinking Water”	January 22, 2002 No 93	
15	The National Program “Rural Development in the Republic of Kazakhstan by 2004-2010”.	July 10, 2003 No 1149	
16	The National Food Program of the Republic of Kazakhstan by 2003-2005	March 31, 2003 No1051	

3. Willingness to Adopt the IWRM National Planning Process

3.1. Availability of Policies and Plans for the IWRM Framework

The Conception of Water Sector Development and Water Policy of the Republic of Kazakhstan by 2010 was developed and was effective since 2002 in Kazakhstan. At the same time, the National Environment Action Plan was developed and is being implemented.

These documents, taking into consideration environment protection requirements, determine main lines and priorities of water sector development. This year, the integrated basin water resources use and protection plans (IBWRUPP) are started to be developed, in particular, for the Irtys River Basin. In 2005, it is envisaged to continue development of IBWRUPPs for other river basins. Developing such basin plans will take not less than 5 to 8 years for the republic depending on terms of financing.

The Message of the President of Republic Kazakhstan (dated October 10, 1997) "Kazakhstan - 2030: Prosperity, Security and Well-Being Improvement of All People in the Country" has defined the long-term development strategy for Kazakhstan till 2030.

Water policy, which now is in progress, should provide achieving the long-term objectives declared by the state in the Strategy-2030 including water resources preservation and rational use promoting health and well-being of citizens of the republic with priorities for drinking water supply, ecological water releases, and water infrastructure rehabilitation.

An all-in-one program for implementing the IWRM principles in the Republic of Kazakhstan is absent. The IBWRUPPs were not also updated. At the same time, since 2003, computer models of water resources management in river basins are started to be developed taking into account interests of all sectors of economy.

To promote sustainable water policy, taking into account current processes and requirements of sustainable economic development, apart from above-mentioned national strategy and programs, "The Concept of Regional Economic Development of the Republic of Kazakhstan" (the Institute of Economic Researches) is at a developmental stage. Within the framework of international cooperation, a number of programs and projects are implemented with assistance of the International Bank for Reconstruction and Development, the Islamic Development Bank and countries-donors, in particular, the Great Britain, Germany, and others. Large-scale water infrastructure rehabilitation is planned to implement in the Syr Darya River Basin within the framework of the Water Action Program, Phase II under the aegis of the World Bank.

A number of the action plans are developed and implemented by regional administrative organs (Province Government) regarding sectoral reforms, infrastructure rehabilitation plans, and reduction of poverty, drinking water supply and sanitation.

The five-year water supply development program, called "Drinking Water", was developed and operates in the republic. This program covers over 3,640 rural settlements with the population of 4.0 million people and 63 cities with the population of 6.0 million people. Significant budgetary funds that have enabled to begin large-scale reconstruction of water supply systems are annually allocated for its implementation.

3.2. Water Management Institutional Framework

The State Committee of Water Resources under the Ministry of Agriculture, local representative organs (Maslikhats), local executive organs (Akimats of provinces, districts, cities, and villages) as well as other specially authorized state organs, within their competence implement water management in the Republic of Kazakhstan.

Other specially authorized state bodies in the field of water resources use and protection are the State Hydrometeorological Agency "Kazgidromet" under the Ministry of Nature Protection, the Ministry of Nature Protection, the Ministry of Energy and Mineral Resources, the Sanitary-and-Epidemiological Institution under the Ministry of Public Health, the Ministry of Emergencies and Civil Defense, which implement, in the limits of their competence, nature protection, water record-keeping and maintaining the water resources cadastre. In addition, the state water resources management bodies implementing their functions interact with other state agencies such as the Ministry of Transport and Communications, the Ministry of Foreign Affairs, the Ministry of Finance, the Ministry of Justice, and land resources management agencies.

The State Committee of Water Resources under the Ministry of Agriculture, in the limits of its competence and in accordance with the established procedure, issues regulations in the form of orders, which are valid in the territory of the Republic of Kazakhstan. The State Committee of Water Resources consists of the central office, basin water management organizations (BWOs) and their subdivisions in the provinces, and specialized RSEs. The governing role of the State Committee of Water Resources includes water allocation, meeting the needs of the population and

all sectors of economy. Functions of control and monitoring are entrusted to executive and inter-regional bodies of the State Committee of Water Resources (BWOs).

Out of eight BWOs, only The Nura-Sarisuysk Basin Water Organization operates the internal closed river basin. There are transboundary watercourses in zones of responsibility of other BWOs; and they co-operate with similar agencies or water management organizations of the riparian states.

Excepting two provinces, there are specialized RSEs related to water management in all other provinces. They have the rights to operate and maintain inter-regional and republican water infrastructure and group water mains as well as technically complicated objects, which are designed for water supply to specific sectors of economy and (or) regions. Among them, it could be especially mentioned such objects as the Big Almaty Main Canal named after D. Kunaev, the Main Canal named after K. Satpaev, a number of large main canals in the Syr Darya River Basin and group water mains in the Northern Kazakhstan.

The IWRM key principles, which should put into practice stage by stage, are one of mechanisms improving of the framework of water sector governance. Kazakhstan has sufficient potential of research institutes under the Ministry of Education and Sciences, the National Academy of Sciences, the design institutions under Ministry of Agriculture and Ministry of Nature Protection, including the design institute “Kazgiprovodhoz”.

3.3 Water Resource Management Priorities and Problems.

The conflicts, occurring between water users and state water resources use and protection bodies, related to water allocation and pollution are settled in the form of administrative agency rules, penalizing infringer, as well as by negotiations of the parties or their consideration in the authorized body in the field of water infrastructure use and in courts.

In the future, BWOs and their Basin Council would play a role of the arbitrator in settling disputable situations, or a court, if the problem is not settled within the BWO framework.

One of primary factors, which negatively impact on water quality, is disposal of not enough treated municipal and industrial sewage into rivers and, in part, drainage water from irrigated areas.

The problem of complete treatment of waste and drainage water to the level of the standard maximum permissible concentration (MPC) cannot be solved in short term, therefore, as agreed by the parties, levels of maximum permissible discharges (MPD) are temporarily established.

3.3. Current Functions for Water Resources Governance

The water legislation of the Republic of Kazakhstan regulates relations in the field of water resources use and protection, management of water infrastructure and other water relations.

The Water Code, the legislation of the Republic of Kazakhstan, and international agreements ratified by the Republic of Kazakhstan regulates relations concerning transboundary water use and protection.

The State Committee of Water Resources under the Ministry of Agriculture is the state authorized body in the field of water resources use and protection, primary objectives, functions and rights of which are specified by “Charter” approved by the Resolution No 1267 of Government of the Republic of Kazakhstan dated November 28, 2002.

The water sector of the Republic of Kazakhstan includes: (i) the state water management organizations established by Government having functions of state governance; (ii) municipal organization established by local governments, with functions of water infrastructure management; (iii) private organizations established by physical and legal persons including foreign citizens and

companies for rendering services on water delivery, maintenance service of water infrastructure, and business activity in the field of water resources use and protection.

The financing mechanism of rational water use is provided by collection of dues and fees, provided for by the tax legislation of the Republic of Kazakhstan, as well as at the expense of public funds, own financial sources of organizations-consumers, loan funds, centralized investments (on the repayable basis), the republican and local budgets under the state support of the water sector and granting credit and other privileges to physical and legal persons.

3.4. Frameworks for Financing and Incentives

Annually, the State Committee of Water Resources under the Ministry of Agriculture develops, coordinates and approves the financial plan for water infrastructure construction, rehabilitation and operation (at interstate and republican levels) based on the following financial sources: the republican budget, local budgets, investments (grants) of the international financial agencies and countries-donors, as well as private financial sources.

Last years, financing of water sector by the republican budget has considerably increased. The assistance of the international financial institutions is actively involved: the World Bank, the Asian Development Bank, the Islamic Development Bank, UNDP and others. A total amount of investments to implementation of the National Program “Drinking Water” for 2002-2010 has been determined at a rate of 115 billion Tenge.

Significant capital investments are stipulated for solving environmental problems of the Aral Sea. At the same time, negligible funds are provided for land reclamation, repair and rehabilitation of irrigation infrastructure.

The budget of the State Committee of Water Resources under the Ministry of Agriculture for O&M and construction of water infrastructure for the period since 2000 till 2004 has increased almost 25 times, from about 705 million Tenge to 17,564 million Tenge, and since 2002 till 2004 financing implementation of the sector program “Drinking Water” has increased at the expense of the republican budget from 2,320 to 8,468.12 million Tenge and at the expense of the local budget from 3,356 to 4,360 million Tenge.

Under increasing the budgetary financing of the water sector, subsidizing water services related to irrigation water supply directly to farmers is provided for. Such a measure of the state support is also applied in drinking water supply.

4. Enabling Environment for IWRM National Plan Implementation

The State Committee of Water Resources under the Ministry of Agriculture together with Basin Water Management Organizations will play the key role in development and implementation of the IWRM principles. Their responsibility includes participation in development and implementation of state policies in the field of water resource use and protection, development of the water resource database and providing participation of all stakeholders in the decision-making process. They should inform the government, the parliament, local governments (Akimaties of provinces and cities), all stakeholders and decision-makers about all major water problems taking place.

The effective form of informing the top management of the country is representation by the international organizations together with national experts of various overviews and reports with analysis and recommendations on settling water and environmental problems.

Settling water and environment problems in the republic is related to a number of complex internal and external factors of governance and managing, a high capital intensity of water infrastructure that, to a certain extent, limits opportunities of creation in short terms of optimal functioning governance system in the water sector of economy, and also put in practice the IWRM principles. It is necessary to note that currently there is not the scientifically-founded strategy (plan) of long-term forecasting regarding to the water sector financing.

In Kazakhstan, some IWRM principles have been implemented, in particular, the basin principles of water resources management; the legislative framework was prepared (the new Water Code with by-laws) for IWRM introduction; GIS and water database are developed. At present, activity related to development of IBWRUPPs being a basis of IWRM is already started.

According to expert assessment, possible terms for implementation of the IWRM principles are 10 to 12 years, under an assumption of development of IWRM Plans for all river basins.

Undoubtedly, the GWP could promote putting in practice the IWRM principles, as well as involving public organizations and water professionals to the wide public awareness campaign regarding the IWRM principles.

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THE KYRGYZ REPUBLIC



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1. National Water Resources Status and Main Issues with Current Management.

Surface water, groundwater, return water and water storage of large lakes and high-mountainous glaciers are forming water resources in the Kyrgyz Republic. The Kyrgyz Republic has significant water resources: about 45 billion m³/year of river runoff, 13 billion m³ of ground water resources, 1,745 billion m³ of lake water, and 650 billion m³ of glaciers. The republic utilizes only 12-17 percent of available water resources, 90 percent of them are used for irrigation. Owing to topography, geographical and climatic conditions, runoff of small mountain rivers is mainly used for irrigation in the republic (806,000 ha or 76 percent of the total irrigated lands area). Runoff of small mountain rivers is low controlled; only 86,000 ha (11 percent) are irrigated using regulated runoff, and 720,000 ha (89 percent) is irrigated by natural runoff. Mean annual runoff forming within the Kyrgyz Republic is given in Table 1.

Table 1 **Distribution of Mean Annual Runoff Forming within the Kyrgyz Republic for River Basins**

River Basin	Mean annual surface runoff (km ³)	
	Total	including runoff forming within the Kyrgyz Republic
1. Syr Darya River	46.04	27.40
2. Amu Darya River	93.42	1.93
3. Chu River	6.64	5.00
4. Rivers Talas and Assa	1.84	1.74
5. Rivers Ili and Kar-Kyra	0.36	0.36
6. Issyk-Kul Lake	4.65	4.65
7. Tarim River	6.15	6.15
TOTAL:	159.10	47.23

Basic useful groundwater resources (UGWR) are located in intermountain basins, the territories of which are economically most advanced. The total UGWR is 6,085,000 m³/day (2.22 km³/year). Out of 44 explored and approved groundwater fields, 20 fields are used for household and drinking needs, and 24 fields for the needs of irrigated agriculture.

Previous statistics regarding water resources use in the Kyrgyz Republic shows that the maximum water withdrawals (13.93 km³/year) and consumptive water use (10.05 km³/year) have been achieved in 1988. After that period, a stable trend of water consumption decline is traced due to the following causes:

- Abrupt decline in GNP under transition to market economy, including economic slump in agrarian and industrial sectors of economy;
- Retirement of a part of the irrigated area;
- Shift of cropping pattern with replacement of hygrophilous crops (perennial grasses) by less hygrophilous crops (cereals);
- Deterioration of technical conditions of water infrastructure in all sectors of economy, without exception;
- Degradation of centralized water supply systems;
- Reduction of water consumption related to introduction of payment for water services and low business solvency of water users, first of all, farmers, as well as the population.

It is also necessary to note low reliability of official statistical data on water use, in particular during the period after 1995. According to different expert judgments, actual water consumption exceeds statistical data, at least, on 10 to 15 percent for the following causes:

- Due to the lack of due record-keeping of water use by numerous water users, which have arisen after disintegration of collective farms and state farms in the agricultural sector;
- Because of conscious underestimation in reporting of actual water consumption volumes by the majority of water users' categories after introduction of paid water services;
- In connection with technical and organizational difficulties of the state control over water resources use under conditions of abrupt increase in the number of water users.

Water and hydropower resources of rivers in Kyrgyzstan should be used harmoniously combining water needs of different sectors of economy - households and industrial water supply, agriculture, hydropower, fishery, recreation, sports, etc. Only at such an integrated approach to water resources use the highest economic effect can be achieved. The integrated approach enables to receive double-threelfold effect from use of the same water resources and water infrastructure.

It is complicated to forecast the long-term water use development in Kyrgyzstan including dynamics of internal water consumption due to unstable economic conditions under transition to market relations. When indications of stabilization in manufacture are visible only two recent years, opportunity to extrapolate data of previous statistics for long-term outlook is not enough objective. This conclusion was proved true by low reliability of forecasts of development of industrial and agricultural sectors for the period of 1995-2000, which were overoptimistic. Therefore, estimates of long-term water consumption reported by experts of different ministries and departments within the framework of the national water strategy development contain assessments that are more pragmatic. As a rule, they cover the period no more than 15 to 20 years.

In the total water demand balance of the Kyrgyz Republic, water consumption of the agricultural sector of economy, both currently and in the long-term outlook, remains rather low. As a reference point for drawing up the long-term water demand forecast, parameters of water use at the level of 1999-2000 could be taken. At the same time, it needs to be taken into account that actual water consumption in those years has exceeded data of the official statistical reporting, at least, by 10 to 20 percent. Most of the independent experts have confirmed such a conclusion. Summary of long-

term water demand in different sectors of economy and in the Republic as a whole are given in Table 3.

Table 3 Forecasting Internal Water Demand in the Kyrgyz Republic by 2005-2020

Sector of economy	Forecasting water demand, million m ³				% of total water demand in 2020
	2005	2010	2015	2020	
1. Municipal water supply					
1.1. Water supply of the population	95-100	105-111	121-126	138-146	1.2
1.2. Water supply to organizations, institutions, and infrastructure	17-18	19-20	21-22	24-26	0,2
1.3. Water supply to industrial enterprises	(20-40 % of water demand of the population).				
2. Rural water supply					
2.1. Water supply of the population	97-100	115-120	152-157	175-193	1.5-1.6
2.2. Water supply to organizations, institutions, and infrastructure of settlements	19-20	23-24	30-31	35-39	0.3
2.3. Water supply to industrial enterprises	(up to 5% of water demand of the population).				
3. Irrigated farming	7500-8500	8500-9500	9500-10000	10,000-10,600	89-90
4. Industry, in total	350-400	500-550	600-650	630-700	5.9-6.0
5. Energy sector	10.5	11	11.5	13	0.1
6. Forestry	20.5	21	21.5	22	0.2
7. Fishery	65	70	75	80	0.6-0.7
8. Other sectors of economy in total	30	40	50	60	0.5-0.6
TOTAL	8,204-9,264	9,104-10,467	10,582-11,144	11,167-11,879	100.0

Designed parameters indicate that the total water withdrawals for the internal needs in the Kyrgyz Republic will exceed the water limits (quotes) provided for by the interstate water allocation agreements in effect by 2010.

Capability for long-term increase in water withdrawal volumes is limited not only by quotas of interstate water allocation. In the territory of Kyrgyzstan, over 75 percent of the farming areas are irrigated using natural runoff of small rivers (uncontrolled river runoff). Currently, all reserves to increase water withdrawal volumes from these rivers during the growing season are already exhausted. Further extension of irrigated areas at the expense of gravity water intakes at large rivers has the extremely limited prospects. As a result of this, (excluding increase of internal water consumption due to reduction of runoff to downstream states) options providing necessary water supply are as follows:

- Redistribution of annual runoff of small rivers by means of construction of reservoirs;
- Inter-basin redistribution of water resources (rivers Tarim and Naryn);
- Intensive development of groundwater fields;
- Development of pumping irrigation along large rivers; and

- Effective utilization of return water.

At present, the sectoral principle of water management under which functions and the responsibilities in the field of water relations are distributed between different ministries and departments is used in the Kirghiz Republic. The regulation of water relations is implemented by the following bodies: the National Parliament - Jogorku Kenesh, the Government of the Kyrgyz Republic, the Ministry of Agriculture, Water Resources and Processing Industry, including the Department of Water Resources, the Department of Rural Water Supply and Department of Fishery; the Ministry of Ecology and Emergencies including the Hydrometeorological Service and the Emergencies Department; the State Agency of Geology and Mineral Resources including the Hydro-Geological Survey Unit; the Ministry of Public Health including Sanitary-and-Epidemiologic Services. In addition, there are other organizations involved in water resources management, in particular JSC "Power Plants", municipal services of cities and district administrative centers, etc. The following republican bodies are involved in regulation of water relations:

- The National Statistical Committee implementing the state supervision over statistical reporting on water resources use and protection, and developing and approving the normative basis and format of statistical reporting;
- The State Inspection on Standardization and Metrology implementing the state supervision over the system of standardization and accuracy of measurements including quantitative and quality indicators of water resources status and use;
- The Ministry of Foreign Affairs implementing the state supervision on international water law compliance as well as regulations of interstate water treaties and agreements signed by the Kyrgyz Republic;
- The Ministry of Justice implementing state registration of all statutory acts including water laws and the state control over conformity of any statutory act to the constitutional norms and the current legislation of the Kyrgyz Republic.

Local state administration bodies participate in water management in the territories under their jurisdiction providing:

- Protecting the rights of water users;
- Allotment of land with water resources; and
- Restricting the right of water use in the proved cases.

The water resources management hierarchy includes national, provincial and district levels. The framework of the Department of Water Resources consists of seven basin water management organizations (instead of provincial water management organizations), the territories of which mainly coincides with borders of administrative provinces, and forty-district water management departments.

It is necessary to note that functions of these numerous bodies were not stated in the law currently in force, and determined by regulation for their activity. In addition, these functions are distributed between them not in effective way and frequently duplicated; they can easily be changed, amended or transferred from one department to another one. Thus, numerous state organizations with their own regulation, specifications and guidelines are engaged in water resources management. At the same time, from the point of view of laws of physics, water (surface water and groundwater) is a single resource and should accordingly be managed according to uniform regulations and preferably by one organization.

At present, the Department of Water Resources (DWR) plays the leading role in water resource management. It implements operation and maintenance of irrigation systems, provides water delivery to water users and simultaneously is the leading state water resources management organization, which allocates limits of water withdrawals from surface and underground water sources for all sectors of economy including irrigated farming, industry, drinking water supply, hydropower, fishery and others. Under such a situation, other sectors of economy (excepting agriculture) are not sure in correctness of DWR decisions and therefore potential conflicts of interest related to water supply are probable.

There is a similar situation around the State Agency on Geology and Mineral Resources, which drills water wells (Hydro-Geological Survey Units implement this activity) and simultaneously grants licenses for water wells drilling to independent drill-operators. Nobody doubts professionalism of this organization, but in this case, there is again conflicts of interest.

2. Enabling Environment for the IWRM Process: Evaluation of a Current Situation in the Country

Most of the managers and leading water professionals in the water sector of the country have sufficient information regarding the integrated water resources management principles. Since 1997, in accordance with the Order issued by the Department of Water Resources, former provincial water management organizations have been reorganized into basin water management organizations. In addition, within the framework of the Department of Water Resources, inter-district canals' administrations (in Chuysk and Talass provinces) are operating; in the Osh Province the administration of the Aravan-Akburinsk Main Canal within the framework of the IWRM-Fergana project and the Water Committee of this canal with participation of water users' representatives were established.

Taking into account that the Draft Water Code contains main integrated management principles and the Government approved this document, it is possible to speak about understanding the role and necessity of integrated management principles implementation by the leaders of the republic. Certainly, it is early to assert firmly that there are full adherence to the integrated water resources management principles and political will of leaders prior to adopting and the beginning of implementation of the Water Code.

The basic legislative act regulating relations in the field of water management is the Law of the Kyrgyz Republic "On Water", approved by the Jokorgu Kenesh on January 14, 1994. This law is the framework regulating all aspects of water resources use. Minor amendments were incorporated into this law in 1995 in order to eliminate the previous exemption from water services payment adapted for agricultural and forestry sectors of economy. The major feature of this law is introduction of economic incentives in the water sector by establishing water charges.

The water charging system is still far from being worked out, and consequently water saving is not properly stimulated in the country. Currently, the Jokorgu Kenesh of the Kyrgyz Republic approves tariffs for irrigation water supply. Tariffs do not depend on economic factors and do not reimburse real expenses for water services, and their amounts are fixed taking into consideration political conditions.

At present, two sources are used for financing the water sector: the state budget and payment for irrigation water supply services, which is taken into account by the budget. Till now, the

Department of Water Resources under the Ministry of Agriculture is guided by the Law of the Kyrgyz Republic “On Tariffs for Irrigation Water Supply Services in 1999” dated December 29, 1998. The similar laws drawn up for 2000 and follow-up years are not adopted till now. Today, operative tariffs (1 to 3 Tiyin per one m³) are very low and reimburse only third part of O&M expenses and as a result, water infrastructure fail and cannot completely perform its functions. The water cost share within the framework of gross agricultural output cost is 0.5 to 2.5 percent.

In 2002, the Law “On Water Users Associations” that regulates activities of WUAs and replaces the Resolution of the Government was adopted in the republic.

At present, activity related to establishing the training centers network within the framework of the water sector of the republic, including the Training Center of the Department of Water Management in Bishkek and training centers in all basin and district water management organizations, is being completed. The workshops on the IWRM principles are held in these training centers with participation of representatives of local administrations, regional departments, WUAs, NGOs, and other stakeholders. The main objective is practical assistance to WUAs (342 WUAs over the republic) in the field of institutional reforms, planning irrigation systems rehabilitation, and joint water resources management and financing O&M water infrastructure. To support WUAs, the On-farm Irrigation Project providing the credit for rehabilitation of irrigation systems with subsequent repayment only 25 percent of the credit, another part will be reimbursed by the Government, is now implemented.

In addition, water professionals of the republic take part in workshops at the ICWC Training Center held in Tashkent.

This year, in February, within the framework of the NATO Program “Science for Peace” the workshop “The Integrated Transboundary Water Resources Management – the Interstate and Inter-Sectoral Approach” was held in the Training Center of the Department of Water Management with participation of representatives of all states of the region and international experts. This year in March the conference “Agrarian Reforms in Kyrgyzstan” was held; one of sessions was devoted to water sector development, and a wide discussion on issues of public participation in the water resources management process was organized with participation of representatives of water users from all regions of the republic, WUAs, NGOs, scientists and water professionals.

To promote public awareness, a newspaper “Water, Land and People” and Website of the Department of Water Resources were established, as well as the information is disseminated by the training centers but in limited quantity.

Records of surface water resources are performed by the Hydrometeorological Service of the Ministry of Ecology and Emergencies, and ground water by the State Agency of Geology. Water quality monitoring over the whole country is conducted by the Ministry of Ecology and Emergencies, but in sources of drinking and municipal water supply by the Sanitary-and-Epidemiological Services of the Ministry of Public Health. Records of water use are performed by water-consumers, the statistical reporting on surface waters use according to the Form 2-TP (Vodkhoz) for all sectors of economy is conducted by organization subordinated to the Department of Water Resources, and regarding underground water by organization subordinated to the State Agency of Geology.

Relations between the Department of Water Resources and the Hydrometeorological Service are based on annual contracts including payment for rendered services.

Databases (land reclamation conditions of irrigated areas, water resources use record, crop irrigation schedule, etc) scattered among different organizations. There is not a single database. Currently, SIC ICWC upgrades databases within the framework of the project "CAREWIB".

3. Willingness to Adopt the IWRM National Planning Process

At present, there is not the National Water Strategy of the Kyrgyz Republic, though the International Institute of Strategic Researches has prepared its draft. At the same time, since the end of the 1990s, elaboration of “the Concept of National Water Strategy of the Kyrgyz Republic” (the Ministry of Agriculture, Water Resources and Processing Industry), “The Concept of Integrated Water Resources Use and Protection of the Kyrgyz Republic” (The Institute of Water Problems and Hydro-Power Engineering of the National Academy of Sciences), and the international projects related to domestic and international water relations (with participation of the Kyrgyz Republic) is implemented.

In 1997, the Kirghiz Republic has adopted the Concept of Sustainable Human Development, with a priority of human potential development as a key resource of sustainability and the Concept of Ecological Security. Since 2002, the Republic has started institutional reforms for transition to sustainable development. Strategic priorities of Kyrgyzstan on the way to sustainable development are as follows:

- Reduction of poverty twice till 2010;
- Ensuring the food security (ecologically pure food stuffs) and increase in export of agricultural outputs after profound processing till 2005;
- Preservation of fresh water resources and biodiversity of natural eco-systems by increase in the area of especially protected territories up to 30 percent of the country’s territory;
- Increasing in volume of services at the domestic and international markets - the international trading-intermediary terminal by 2007.

New approaches to resources consumption for transition of the Kirghiz Republic to sustainable development:

- Maintaining high quality of resources;
- Combining consumption with simultaneous restoration of resources;
- Conformity to the international principles of nature management: contaminator and user should pay;
- Decreasing raw material intensive and power-consuming industries, applying wasteless technologies and interchangeability of resources;
- Equity in access to resources, in distribution of revenue collecting due to natural resources use.

In 1996, Kyrgyzstan has officially acknowledged poverty in the country. The state programs were adopted and are implemented: the National Poverty Reducing Strategy (NPRS) for the Year 2003 and the Integrated Development Plan of the Kyrgyz Republic for the Year 2010. In 2001, under support UNFPA, the population census of 1999 was summed up, and the Demographic Policy Concept of the Kyrgyz Republic was approved.

The following concepts were developed: the Bishkek City Sustainable Development Concept by 2010; the Bishkek City: the Agenda for the 21st Century, and the Kirghiz Republic: the Agenda for the 21st Century

The National Sustainable Development Council was established.

Within the framework of the international co-operation, and also performance of obligations related to the international conventions in Kyrgyzstan the following ecological projects are implemented:

- The Regional Environment Action Plan Development Project (RNEAPDP);
- The Environment Monitoring and Capacity Building Phase II Project (ADB and the Government of Finland, 2001);
- The Western Tien Shan Biodiversity Preservation Project (EU TACIS);
- The Lake Issyk Kul Biosphere Project (GTZ, 1998);
- The Regional Mining Development Cooperation in Central Asia (the project financed by ADB and the Government of Switzerland, 1995);
- The Increasing Environmental Knowledge of the Population in the Kyrgyz Republic (the project financed by EU TACIS, 1997);
- The Assistance to Kyrgyzstan in the First National Report Preparation regarding the United Nations Framework Convention on Climate Change;
- The Snow Leopard Preservation Project.

A number of projects related to integrated water resources management are implemented in the Kyrgyz Republic including the Integrated Water Resources Management in the Fergana Valley financed by the Swiss Development Agency and of the Effective Integrated Water Resources Management Development in the River Basins Chu and Talas financed the European Economic Commission. In addition, within the framework of the UN SPECA project, the Chu and Talas Rivers Bilateral Commission Establishing Project results of which can be used for others transboundary rivers of Kyrgyzstan in succeeding years.

The Integrated Development Plan of the Kyrgyz Republic for the Year 2010, adopted at the National Assembly on May 29, 2001, provides for the following measures increasing efficiency of water and land resources use and protection:

- To adopt amendments to the water legislation in view of political, economic and social situation changes;
- To complete preparation of the Water Cadastre of the Kyrgyz Republic;
- To assess return water impacts on river basin water balances;
- To adapt and introduce UN SDC indicators for assessing sustainable water use;
- To introduce state-of-the-art water resources control systems;
- To establish a uniform national database on water resources use in the Kyrgyz Republic;
- To establish water users associations (WUAs);
- Stage-by-stage, to introduce state-of-the-art irrigation methods in the agricultural sector of economy;
- To introduce economic tools for transition to effective water use, water-saving and water-protective technologies.

As mentioned above, the sectoral principle of water resources management, when functions and responsibilities in sphere of water relations are distributed among different ministries and

departments is applied in the Kyrgyz Republic. The Ministry Agriculture, Water Resources and Processing Industry and the Ministry of Ecology and Emergencies are leading agencies, which are responsible for surface water resources use and protection. The current water resources management system in the Kyrgyz Republic is characterized by the following negative factors:

- Control functions overlapping and unjustified costs of the state budget;
- Lack of effective coordination of activity of different departments;
- Insufficient efficiency of state control measures related to observance of the water and water-protection legislation;
- Lack of proper human and technical potential for implementing assigned functions in certain agencies;
- Legislative contradictions related to departmental subordination of bodies within institutional framework of the Department of Water Resources that are serving most of sectors of economy but belong to the Ministry Agriculture, Water Resources and Processing Industry and mainly representing interests of the only agricultural sector;
- Legal contradictions due to combining functions of the state control and economic activities related to operation and maintenance of the water infrastructure by the same water resources management bodies;
- Low efficiency of water resources governance due to drastic increase in the number of water users, as a result of disintegration large-scale water users, in particular, collective farms and state farms;
- Unsatisfactory rates of water infrastructure privatization, first of all, in the agrarian sector, and introducing water charging, as well as a low level of public participation (water users associations) in the water resources management process;
- Scattering functions of collection and generalization of data on water resources use among water resources management, nature protection and geological bodies without sufficient coordination of their interaction. This circumstance essentially complicates establishing and operative use of the uniform national database for efficient water resources monitoring.

Specified shortcomings predetermine necessity of reforming the existing water resources management system of the Kyrgyz Republic in the nearest years.

Water resources management in the country at national, regional and district levels is a prerogative of the Department of Water Resources under the Ministry of Agriculture, Water Resources and Processing Industry of the Kyrgyz Republic. At present, DWR, the separate ministry in the past, (in 1996 the Ministry of Agriculture and the Ministry of Water Resources were merged to consolidate budgets of these two departments and to provide more rational coordination of their activity both in the general governance and in their practical work) regulates water resources use in the country and supervises over designing, construction and operation of the irrigation infrastructure as a whole. In addition, within the DWR framework, the production unit "Selvodzachita" is responsible for protection of rural settlements and agricultural area against mudflows and floods. Funds from the republican budget are allocated to the DWR for O&M of the water infrastructure and performance its functions. A part of funds is provided at the expense of payment for services on irrigation water delivery. Taking into account the limited financing from the state budget for O&M of irrigation systems and safe operation of the water infrastructure, the Government was compelled to use credits and grants of international organizations to implement the following projects:

- a) The Irrigation Systems Rehabilitation Project (ISRP) financed by the World Bank and the Government of the Kyrgyz Republic. The project provides for rehabilitation of 13 large-scale reservoirs, as well as inter-farm canals of 48 irrigational systems serving more

420,000 ha. Completion of works within the framework of the ISRP is planned in 2007-2015;

- b) The On-farm Irrigation Project (OFIP) financed by the World Bank provides for to use the credit for crop productivity increase in the irrigated area of 160 thousand ha by 2006. The overall goal of this project is rehabilitation of the on-farm irrigation infrastructure, improvement of operation and maintenance, as well as promoting WUAs;
- c) The Chu Valley Agrarian Sector Development Project financed by the Asian Development Bank provides for to use the credit for rehabilitation of drainage systems over the area of 160,000 ha, rehabilitation of the on-farm irrigation network over the area of 320,000 ha, as well as development of institutional frameworks for water resources management at various levels, and promoting water users. The project is planned to be implemented in 2001-2006, with completion of rehabilitation works by 2015.

The “Kyrgyzjilkommunsouz” of the Department of Rural Water Supply and State Enterprise “Bishkekgorvodokanal” are responsible for drinking water supply to the population, and sewage disposal. As additional sources of financing are provided for:

- Increasing tariffs for irrigation water delivery services which were not revised since 1999;
- Introducing a payment for the right to use water resources and the water infrastructure.

The draft of such a law is submitted for approval of the Parliament. However, taking into account, that the term of validity of delegates expires at the end of this year, it is possible to predict that owing to political reasons these laws will not be approved.

The civil sector of the Kyrgyz Republic is represented by the following voluntary public organizations:

NGOs – 3019,

including:

- female organizations – 94
- ecological organizations – 200
- national-cultural centers – 26
- religious organizations – 195
- political parties – 25
- trade unions – 289
- associations for social protection – 1608
- business associations – 71
- mass media – 500

including

- print – 388;
- electronic – 51
- scientific-engineering and social-educational – 335.

The civil sector plays a key role in democratization, achievement of human rights and social partnership. Besides the independent status, the civil society possesses various and lasting knowledge in the fields, which provide social security and ecological safety in sustainable development processes. Ecological NGOs and their associations have participated in elaboration of projects the Healthy Nation (1994), the National Environment Action Plan (1997), the Biodiversity Preservation Strategy and Action Plan (1998), as well as in discussion of ecological laws. As an example of NGOs and Public Funds engaged in ecological issues could be mentioned: the Fund “Meerim”, the Fund “Soros-Kyrgyzstan”, the Ecological Movement of Kyrgyzstan (EMK)

“Aleyne”, the EMK "Tabiyat", the Environment Protection Fund of Kyrgyzstan, the Youth Ecological Movement "BIOM", and others. Communication with NGOs is supported by personal meetings, joint participation in meetings, seminars and by information interchange through communication lines.

The National IWRM Plan could be elaborated under the direction of the Government of the Kyrgyz Republic with assignment of the basic duties on the Ministry of Agriculture, Water Resources and Processing Industry (the Department of Water Resources) with obligatory participation of the Department of Rural Water Supply and the Department of Fishery, the Ministry of Ecology and Emergencies including the Hydrometeorological Service and the Emergencies Department, the State Agency of Geology and Mineral Resources including the Hydro-Geological Survey Units, the Ministry of Public Health including the Sanitary-and-Epidemiological Service, the Joint-Stock Company “Hydropower Plants”, the “Kyrgyzjilkommunsouz”, and local governments. Taking into account that the Parliament disposes the rights of property, participation of corresponding representatives from Committees of the Jogorku Kenesh is necessary.

In the field of water resources management even during the Soviet time under rigid state regulation there were problems, which currently have become aggravated even more due to occurrence of numerous water users and consumers with various forms of ownership. Under these conditions it will be the only correct decision to reform water resources management according to the river basin principle.

Conflicts between water consumers are not expected in the Kyrgyz Republic at present and in long-term outlook. Though in dry years it seems that stress related to water supply to the irrigated lands in Djalalobod, Osh, and Batkensk provinces is possible.

4. Enabling Environment for IWRM National Plan Implementation

Most of the integrated water resources management principles were included into the Draft Water Code. Adoption of the Water Code, after approving by the Parliament (the Jogorku Kenesh) and signing by the President of the Kyrgyz Republic, will enable to launch application of the IWRM principles in the country. The abovementioned projects implementing currently in the Fergana Valley and in the river basins Chu and Talas (their lessons can be used for public awareness and forming the favorable public opinion) may essentially assist in the IWRM process.

Essential constraints for introducing the IWRM principles will be the lack of financing and the financial strategy. In addition, the absence of the National IWRM Plan will impede the IWRM process.

In the case of settling financial problems, the feasible terms of the IWRM principles implementation are 3 to 5 years.

The international co-operation, in particular, with the Global Water Partnership in developing the IWRM principles and information interchange is a crucial factor for sustainable implementing the IWRM principles.

In this context, the Kyrgyz Republic has initiated the National Action Plan for 2004 to 2008 promoting “The GWP Policy in Central Asia and Caucasus” under the direction of the Department of Water Resources, which includes the following actions:

- Establishing communication systems and grounds for information interchange between the regional centers and the national center in the Kyrgyz Republic;
- Public participation and capacity building in the water sector by means of the national information network: the National IWRM Center of the Kirghiz Republic in Bishkek (simultaneously being the national office for northern provinces of the country) and the national office in Osh for southern provinces;
- Developing a training network by means of establishing a branch of the ICWC Training Center in Osh for seven provinces in the Fergana Valley participating in implementation of the Fergana Valley Integrated Water Resources Management Project. Along with already available and planned curriculums, it is assumed to employ additional curriculums: “Economic Tools for Efficient Water Use”, “Water Resources Formation and Reperian Countries’ Interaction”, “Water Tariffs”. IWRM principles’ training for water professionals, representatives of WUAs and other sectors of economy related to water issues is planned in training centers in all river basin water management organizations and the training center of the Department of Water Resources which were established within the framework of the On-farm Irrigation Project;
- Formation of Public Water Councils for interaction and information interchange regarding water resources management at first at the river basin level and then at the national level, but a reverse order is also possible. The Kirghiz legislation concerning WUAs provides for formation the Basin Water Councils with involvement of the public, water users and local authorities. In addition, the Draft Water Code provides for establishing the National Water Councils with participation of all stakeholders related to water resources management and use;
- Participation in legislative framework development for transboundary water use and protection, interstate water agreements, etc.

The GWP would render assistance in search of donors, information dissemination and implementation of above-mentioned actions. Based on all above statements, it is possible to draw conclusion that the governance system of the water sector in the Kyrgyz Republic is at a stage of prompt development; most elements necessary for the IWRM process exist.

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TAJIKISTAN



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1. National Water Resources Status and Main Issues with Current Management

The Aral Sea basin occupies the territory about 1,760,000 sq km. 80 percent of the catchment area, where water resources of the Aral Sea basin are formed, belongs to Tajikistan and Kyrgyzstan. Here, there are headwaters of the largest rivers of the Amu Darya and Syr Darya basins.

Quantitative indicators of surface water resources are estimated on the basis of historical data provided by the advanced hydrometric network of the Hydrometeorological Services in the Central Asian countries, which are stably operating since the 1920s. At present, the number of gauging stations (and quality of their measurements) has drastically decreased and does not enable to estimate exactly actual runoff. Out of 332 gauging stations and posts within the Amu Darya basin currently only 147 gauging stations and posts are operable, and accordingly within the Syr Darya basin 139 out of 545 gauging stations and posts. The existing hydrometric network is insufficient for estimating runoff losses at transit reaches of rivers; the monitoring network at collector-drains that are discharging into rivers and their tributaries is not developed; the monitoring system of water pollution due to drainage water disposal, etc does not exist.

According to standard methods, water resources of the basin are subdivided into natural and anthropogenic water, surface and ground water. Natural water resources include the precipitation, water of natural water bodies (lakes), glaciers, river runoff, and seasonal snow in mountains, groundwater formed in natural conditions due to natural processes without interventions of human activities. Return water forming in process of utilizing natural water (for example, river runoff controlled by reservoirs) and under influence of human activity is an anthropogenic component of water resources.

Available water resources are the total volume of natural and anthropogenic water within the certain territory (downstream of a certain section line) over the certain time interval, which may be used for the needs of the human society or the nature.

Mean annual runoff (according to historical data) of these rivers (Amu Darya and Syr Darya) amounts to: 78.46 km³/year and 37.14 km³/year accordingly. In wet years (5-percent probability), Amu Darya River runoff reaches 108.4 km³/year, and Syr Darya River runoff – 54.5 km³/year, in extremely dry years (95-percent probability) Amu Darya River runoff is 46.9 km³/year and Syr Darya River runoff is 21.4 km³/year, respectively. Tajikistan occupies an area of 143,100 sq km, 90 percent of this area belong to the runoff formation zone [15,20].

Major part of the Amu Darya runoff (about 83 percent) is formed within the territory of Tajikistan, further the river flows through Uzbekistan, along the border with Afghanistan then through the territory of Turkmenistan and again through the territory of Uzbekistan and empties into the Aral Sea. About 8 percent of river runoff is formed within the territory of Afghanistan and about 3.5 percent within the territory of Iran and Turkmenistan. About 6 percent of the Amu Darya river runoff is formed within Uzbekistan.

Basic part of the Syr Darya runoff is formed within Kyrgyzstan (about 70 percent), further the Syr Darya river flows through territories of Uzbekistan, Tajikistan and Kazakhstan, where empties into the Northern Aral Sea. About 15 percent of Syr Darya runoff is formed within Uzbekistan, about 6 percent within Kazakhstan, and about one percent within Tajikistan.

Great inconsistency is observed regarding quantitative estimation of surface water resources formed in Central Asian countries. Many authors consider that mean annual runoff of the Aral Sea basin formed within Tajikistan amounts to 51.2 to 52.7 km³ including 50.5 km³ of Amu Darya runoff. According to historical data, mean annual runoff formed within Tajikistan is 64 km³ including Amu Darya runoff – 62.9 km³ and Syr Darya runoff – 1.1 km³. It is necessary to use these figures for subsequent calculations and substantiations, [1, 5, 6, 15, and 16].

An amount of dynamic water resources can be estimated based on the following elementary considerations regarding the water balance of the runoff formation zone. As mentioned, 90 percent of the territory of Tajikistan can be referred to the runoff formation zone (12.8 million ha); the annual precipitation in the foothill area can be taken as, on average, 750 to 800 mm out of which one third at once evaporates and two third of rainwater may flow downwards into the plain.

Tajikistan is a country rich in glaciers; their total area amounts to about 5,000 km², and 90 percent of them are located in the Amu Darya basin. Water reserves in glaciers are estimated as 500 km³ and under thawing they form about 5 percent of the total water resources and a considerable part of summer runoff.

Great water resources of Tajikistan are concentrated within mountain lakes; most of them are located in remote areas (mainly within intermountain troughs of Pamirs and Alay Mountains). Mountain lakes contain about 44 km³ of water including 20 km³ of fresh water having drinking quality [14].

The reservoirs with the total capacity of 15.1 km³ and the active volume of 7.4 km³ were built to provide more rational water resource use and more suitable base flow hydrograph, and simultaneously for flood control within Amu Darya and Syr-Darya river basins.

Ground water resources of the Republic of Tajikistan are formed due to the water from precipitation seep into ground in highlands, and in other parts of a catchment area owing to seepage from reservoirs, lakes, canals, river channels, etc. Irrigation impacts substantively on groundwater regime and resources. According to available data (data of national groups for the period of 1987 to 1994)? the total ground water resources of Tajikistan are estimated as 18.2 km³ including useful reserves - 6.02 km³. According to data from another source, the total groundwater resources of the republic are 6.65 km³ including approved useful ground water resources - 2.2 km³. Above data regarding ground water resources needs to be specified [14, 19]. As a whole, the republic possesses enormous ground water resources, but their use within the irrigated area is not efficient from economic point of view. Irrational groundwater use is a result of their level drop, depletion of groundwater resources up to 30 to 40 percent and more of the total water extraction that will essentially increase water cost.

Return water is a high share of the total water resources (about 7 percent of surface runoff) in the river basins of Amu Darya - 3.4 km³/year and Syr Darya - 1.2 km³/year. Return water formed by drainage runoff from the irrigated area and industrial municipal wastewater is the main source of pollution of the water environment.

The runoff formation zone and the population living here are often exposed to various natural processes, which can result in disasters. Out of 70 kinds of dangerous natural phenomena observed in the world, more than 20 take place in the runoff formation zone. Mudflows, floods, and landslips are most dangerous. Floods and mudflows owing to frequent occurrence and repeatability and causing damage are most dangerous among other dangerous natural phenomena in the runoff formation zone. Natural disasters occur practically in all districts in highlands. Only in 1998, natural disasters have caused damage to the national economy of the Republic of Tajikistan in the amount about US\$ 70 million.

Natural disasters cause great damage to the agricultural sector of Tajikistan. As a result of these events for recent 6 years (1990 to 1995), 332,000 ha under different crops were re-sown; 832 km of irrigation canals, 195 km of drainage network, 133 pump stations, and 332 water structures were destroyed or damaged. 376 production plants and other facilities of the national economy were damaged. Natural disasters can cause dyke breach of lakes created by landslips in highlands. Lake Sarez in Tajikistan is one of vivid examples of such an ecologically dangerous water body in the region.

In the runoff formation zone of the rivers Amu Darya and Syr Darya, widespread erosive processes wash out humus horizons, deteriorate physical, chemical and biological properties of soils, and as a result, large farming areas are out of operation or reduce their productivity. It is specified that a rate of water erosion can achieve about 180 ton/ha of material transportation on slopes with gradients less than 20°, 300 ton/ha on slopes with gradients less than 25°, and more than 860 ton/ha under gradients less than 30°.

Analysis of data shows that deterioration of soil conditions in irrigated areas occurs since 1990. Especially intensive deterioration is observed since 1995. During this period, the area with a critical depth of groundwater table has increased by 10,000 ha. The salt affected areas are also increasing. The total area of land affected by salt correlates with areas, where groundwater table (having salinity more than 2 g/l) is at a depth less than 2 m. An area with heavy saline soil correlates with the area, where groundwater salinity is more than 5 g/l. Thus, despite of full coverage areas (having shallow water table) by the drainage network, about 60 percent of these lands need to be reclaimed.

In Tajikistan, approximately 90 percent of agricultural output is produced on the irrigated lands. Agriculture is the largest water consumer utilizing up to 92 percent of water resources. About 70 percent of able-bodied citizens of the republic are engaged in agriculture, a share of which within the framework of GNP is around 25 percent.

Actually, water withdrawals in Tajikistan are about 20 percent of water resources formed within the country, or 11 percent of mean annual runoff within the Aral Sea basin. Return water amounts to around 35 percent of water withdrawal.

Water consumption (according to water withdrawal) of the irrigation sector dominates (92 percent) over other economic sectors: drinking and rural water supply (8.5 percent), industry (4.5 percent), and fishery (3 percent) [7, 21].

Total available land resources, which may be used for irrigation, are around 1.6 million ha, out of which about 720,000 ha was developed until now [9]. In the long-term outlook, increase in water consumption for social and economic development of Tajikistan in all economic sectors, including expansion of the irrigated lands area, is planned only at the expense of surface water resources. Drinking water supply of the population will be partly provided by ground water. In the long-term outlook by 2025, not less than 20 to 22 cu km of water will be required for developing all sectors of economy in the republic [9].

In the course of reforming the agriculture sector in Tajikistan, 344 out of 600 large-scale farms (collective farms and state farms) were restructured, and over 15,000 dekhkan (farmers) farms were created on irrigated lands earlier owned to large-scale farms [16, 17].

Due to drastic change in the number of farms, the management system of on-farm irrigation and drainage systems does not practically function. Because of large number of water users in the republic, the process of their integration into water users associations has started, but this requires long time. It is obvious from abovementioned, that the framework inherited from the former command-administrative system represents now the water resource management system in Tajikistan at the national level. Current problems in water resource management prove necessity of transition to IWRM

2. Enabling Environment for the IWRM Process: Evaluation of a Current Situation in the Country

The water legislation of the Republic Tajikistan is based on the Constitution of the Republic of Tajikistan and consists of the Water Code, laws, by-laws, and international legal acts signed by Government of the Republic of Tajikistan.

The list of laws regulating different aspects of water relations and economic activities are the following: the Water Code; the Law on Nature Protection; the Law on Subterranean Resources; the Law on Energy; the Land Code; the Law on Dekhkan Farms; the Law on the State Sanitary Supervision; the Law on Payment for Land; the Civil Code; the Criminal Code.

In November 2000, the new Water Code of the Republic of Tajikistan stating market mechanisms of water use was adopted. Based on this code, the Government of Tajikistan will establish the agency that will be responsible for governance of water resource use and protection and provide guidelines of establishing and functioning of water users associations. The new Water Code covers such issues as: (i) technical improvement of irrigation and drainage systems; (ii) strengthening rights and duties both water users and water suppliers; (iii) infringements are subjected to bringing to account. The new Water Code establishes the principles of the international co-operation in the field of water relations, on the basis of which Tajikistan provides: (i) sustainable developing the economy; (ii) water resource protection and rational use; (iii) observing the international water laws, mutually beneficial and friendly co-operation with riparian states; (iv) ensuring an overall ecological security; and (v) developing an international co-operation. International water relations of the Republic of Tajikistan with other states along with legislative acts of Tajikistan are also regulated by the international law acknowledged by the Republic of Tajikistan. The economic framework for water relations with other states is established on the basis of the international water law and interstate agreements.

Strategic planning in the context of integrated water resources management should proceed from the principle of economic value of water and partnership of countries in the region based on

mutual benefit. Political and legal frameworks for developing the water sector of the country under current conditions are legislative and program documents adopted by the Parliament and the Government of the Republic of Tajikistan. The major documents are the following:

- The Concept of Rational Use and Protection of Water Resources in the Republic of Tajikistan (2001);
- The Concept of the State Demographic Policies of the Republic of Tajikistan for the period of 2003 to 2015;
- The Program of Cotton-Growing Development in the Republic of Tajikistan for the period of 2000 to 2005;
- The Program of Grain-Growing Development in the Republic of Tajikistan for the period of 2000 to 2005;
- The Concept of Fuel and Energy Complex Development in the Republic of Tajikistan;
- The Poverty Reduction Strategy (2002).

These documents describe the current social and economic situation in Tajikistan as a whole, the population and its probable growth rates, and the needs for food, energy and raw material for the period till 2025.

Introduction of the IWRM principles was specified as one of the main objectives of achieving sustainable development in the document “Progress in Goal Attainment for Thousand-Year Development in the Republic of Tajikistan” prepared by Government (2003). The favorable political environment for introduction of IWRM principles has been created in Tajikistan. In addition, elaboration of the Law on WUAs and revision of the Water Code of the Republic of Tajikistan are envisaged.

Extensive establishing of water users associations (WUAs) is the important line of reforms in agricultural and water sectors under market conditions. On the basis of the Resolution of the Government of the Republic of Tajikistan (dated April 20, 2000, No 86/34) the joint order of the Ministry of Land Reclamation and Water Resources and the Ministry of Agriculture “On Approval of the Provisional Charter of Water Users Associations” has been issued.

In 2001, guidelines on WUA’s establishing and functioning under existing economic and legislative conditions in Tajikistan were developed.

First WUAs in Tajikistan have been created in July 2000. Within the framework of projects promoting privatization in the agricultural sector and financed by international financial organizations, forty water users associations will be established in an area of about 130,000 hectares.

According to the Concept of Water Resources Rational Use and Protection in Tajikistan, in particular, it is planned “...to implement gradual transition to the integrated method of water resources management within river basins rather than administrative units, to speed up water users associations’ establishing, to introduce water demand control into practice, to provide differentiation of payments for water and its delivery depending on actual conditions, to develop various forms of private, collective and joint-stock water use based on market economy principles”.

With a view of implementation of the Concept the following primary goals have been formulated:

- minimizing hierarchical levels of governance and organization departments;
- co-ordination of inter-state, interregional, inter-district and inter-sectoral interests at appropriate levels of sectoral and administrative governance;

- creating the public bodies participating in forming of water management authorities and the decision-making process regarding different aspects of water resources management and public awareness at all hierarchical levels;
- equitable representation of all stakeholders in management of irrigation canals to prevent administrative pressure and interventions by local authorities;

For approving the integrated water resources management principles and approaches in Tajikistan, within the framework of the Integrated Water Resources Management in Fergana Valley Project, pilot projects have been selected for implementing in the Sogdysk Province: (i) the Guljakandoz Canal, pilot sites located in head, middle, and tail sections of the canal, and the dekhkan farms association named after Khammadox. The project is designed to receive the following outcomes:

- Methodology for the integrated water resources management;
- Institutional development on the basis of participation of key stakeholders and social mobilization of the professional public;
- Capacity building of water management organizations and WUAs within the framework of pilot projects, with further introduction over the Fergana Valley (a communication network, an information system, training facilities, a set of simulation models, etc);
- Water management organizations operating within river basins;
- The reliable legal base including conflicts resolution mechanisms;
- Adequate and effective water supply systems;
- New opportunities for improving effective water use and saving;
- Submitting documents and recommendations to the state persons and other stakeholders concerning results of the project and experiments.

3. Willingness to Adopt the IWRM National Planning Process

Since 1996, by the Decree of the President of Tajikistan, the system of payment for irrigation water services to consumers was put into practice. It is an important factor of irrigation water saving. Introducing of economic mechanisms into water use practice is an important IWRM tool.

The main principle of governing the water sector is transition to a hydrological rather than administrative management framework. Therefore, in 2000-2001, measures on restoration of this principle have been implemented in those places, where it has been deranged in the course of reforms. In such a way, within the Khatlonsk Province, instead of two territorial water management organizations, one agency has been established; in the Rasht Valley within an upstream part of the Vakhsh River basin five Rayvodkhozoes were merged into one Rasht Water Management Administration. Thus, since 2002 the process of transition to water charging was started.

Due to changing agricultural output prices, estimation of water use efficiency should be based on the rate of water for producing a unit of product. This proposes an accurate record keeping both consumed water and output. Introducing the economic mechanisms into water use practice in Tajikistan was powerful stimulus to establish accurate water record-keeping especially in the zones of pumping irrigation.

Owing to difficulties of the transitional period, payment for water services does not cover the standard expenses related to water delivery. Therefore, low water tariffs do not effectively stimulate water users' activity. A major incentive for a water user, a top yield (profit) at the least consumption of resources (including water), will be completely operable when a real cost of water supply will be achieved, at least, at the level of cost price.

The existing administrative-territorial management system under market economy conditions loses the initial basis that it, in practice, results in decline of management efficiency.

Under current conditions, the basin management system is more effective. It will allow establishing more effective systems of water supply and accounting as well as mechanisms of payment collection for water services and water use monitoring.

Strengthening the water resources management framework enables the Ministry of Water Resources to proceed to governance based on market principles and becomes an all-sufficient economic organization, which will pay taxes. The ministry will not be financed from the state budget and will be self-support and self-financing organization. To this end, the payment for water delivery to consumers is introduced. The legal base is available. In the future, the regional and territorial water management organizations will be transformed to basin water management administrations (4 to 5 associations) serving the main watercourses of the republic.

Current district water management organizations will be integrated according to the basin principle, and the irrigation systems distributing water among water users associations will be established. These systems will also provide drainage water disposal.

Payment for water resources and transportation of water through the irrigation network to offtakes of water users can be collected by the Ministry of Water Resources or the Tax Inspection, and funds are transferred to the special bank account and can be used only under instructions of the Ministry and only for needs related to O&M and technical development of water infrastructure.

Establishing WUAs over the whole territory of the republic and transition to the hydrological principle of water management are the base for broad application of IWRM principles, as an alternative to the command management system.

Main lines of state policies in the field of water resources rational use and protection were specified in the Concept of Water Resources Rational Use and Protection in the Republic of Tajikistan (approved by the Government of the Republic of Tajikistan on December 1, 2001, No 551). In accordance with the concept, it was determined that water demand within the next 10 to 15 years and long-term outlook will depend on achievement of sustainable economic development, a demographic situation, planning and implementing measures on consecutive improving a well-being of the population, and development of all sectors of economy. Food supply issues become graver, and in order to settle these problems it is necessary to increase productivity of existing farming areas (mainly irrigated lands) and develop new irrigated areas.

The Poverty Reduction Strategy provides for developing some documents for the following aspects:

1. Reforms of the water sector governance;
2. Elaborating the legislation for water resources management that stipulate functioning of independent water providers, and water users associations;
3. Preparation of a list of top-priority water infrastructure to be rehabilitated;
4. Gradual rise in tariffs for water services in accordance with rise in tariffs for power supply; complete covering of operation cost of irrigation systems.
5. Investment projects.

Privatization and reforming of enterprises and organizations, forming the competitive environment should play a positive role in development of market relations. The investment

policies and strengthening of the material base of organizations should promote these processes. In the field of pricing and the price policy, Tajikistan prefers a combination of free pricing (as the system of the state order has been cancelled), a flexible antimonopoly policy, and creation of equal economic conditions for all enterprises irrespective of ownership and management forms.

In the field of taxation, policies stimulating agricultural production was adopted. Introduction of the single fixed land tax, not depending on results of economic activities, and simultaneous exemption from all other taxes are provided for. The system of tax and custom privileges exists and is improved. The reduced tariff for electric power supply to the pumping irrigation zone was adopted and is now operative. In essence, the tariff for water supply from the state irrigation systems, which covers no more than 30 percent of operation cost of water management organizations is also preferential, and at the same time water supply is not completely paid. By the decision of the Government of the Republic of Tajikistan, an annual 10 percent increase in payment for water services is stipulated. Achieving full payment for water services, as predicted, is expected not earlier than in 2006.

Ranging of priorities at national and river basin levels is as follows:

At the national level:

- improving an insufficient level of utilizing enormous hydropower resources and providing power independence of the country;
- food security, employment and reduction of poverty of the population;
- rehabilitation of the water infrastructure;
- increase of state financing for operation, maintenance and rehabilitation of water infrastructure and developing economic mechanisms of water use;
- improving access of the population to drinking water supply and sewerage systems and rehabilitation of existing infrastructure.

At the river basin level:

- developing of mechanisms of joint water and hydropower resources management, conflicts prevention and resolution, especially in dry years;
- developing of co-ordinated criteria and techniques for development and making bilateral and multilateral treaties regarding interstate water issues;
- developing of the up-to-date strategy of interstate water allocation and economic mechanisms for water use for the whole region.

For example, the important section of the Naryn-Syr Darya reservoirs cascade is the Kayrakum Reservoir of seasonal regulation with the total capacity of 4.6 km³. At the same time, the largest reservoir of this cascade, the Toktogul Reservoir, provides over-year regulation, but not seasonal one. In the interests of irrigation, first of all, in Uzbekistan and Kazakhstan, the Kayrakum Reservoir regulating about 5.2 km³ out of necessary 6.0 to 6.2 km³ in a growing season plays a critical role. However, due to its work under irrigation regime the Tadjik party is burdened with production costs and financial losses. In addition, 54,000 ha of the most fertile lands are expropriated for reservoir construction.

The Nurek Dam on the Vakhsh River provides seasonal regulation of water resources in the Amu Darya river Basin. In the Soviet time the "co-product" (in summer) electric power of this hydropower station was supplied to consumers in the Central Asian republics. Tajikistan was receiving necessary electric power and fuel resources as compensation in winter. At present, the situation has radically changed, in summer, energy of the Nurek hydropower plant can not be sold,

and water is released to neighboring countries for irrigation use, at the same time, in winter Tajikistan has to buy electric energy from abroad twice more expensively.

Current problems of water resources use and protection as a whole are grouped in the following matrix of basic cause-and-effect relations [2].

Basic causes	Consequences
1. Inefficient operation of irrigation systems	<ul style="list-style-type: none"> ○ water table raise ○ drainage tube-wells fail ○ soil salinization ○ unproductive water losses in conveying network and under water applications.
2. Inefficient operation of sewer systems and treatment plants	<ul style="list-style-type: none"> ○ deterioration of equipment ○ infringement of service regulations ○ overload of treatment plants capacities ○ insufficient providing with disinfectants ○ silting of bio-ponds
3. Disorder application of mineral fertilizers and agrochemicals	<ul style="list-style-type: none"> ○ over-application ○ unorganized storage and warehousing ○ soil pollution; ○ groundwater and drainage water pollution.
4. Unsatisfactory condition of tailing dump of mining industry	<ul style="list-style-type: none"> ○ placement of tailing dumps within water protection zones ○ necessity to implement rehabilitation of dormant and operable tailing dumps ○ necessity of construction of extra observation wells outside tailing dumps.
5. Insufficient and inefficient legislative framework.	<ul style="list-style-type: none"> ○ disregard of agreements between countries of the Central Asian region ○ absence of monitoring mechanisms of water use agreements and risk of conflicts ○ necessity of developing new legal and economic mechanisms of water allocation and use.
6. Insufficient financial base	<ul style="list-style-type: none"> ○ a transition period in the economy ○ minor emphasis regarding environmental issues in the national plans ○ degradation of the water infrastructure, reducing its safety.
7. Shortcomings of planning and water resources governance	<ul style="list-style-type: none"> ○ poor inter-sector coordination ○ inadequate reaction on emergencies ○ worsening water record-keeping ○ difficulties with water use forecast ○ raise of water shortage and conflicts

4. Enabling Environment for IWRM National Plan Implementation

Consecutive Steps of introduction IWRM principles in Tajikistan:

Institutional Reforms

- Establishing the Sectoral Inspection to regulate economic relations between water suppliers and users and to supervise rational water use of (the State Water Inspection);
- Establishing the department for supporting water users associations establishing and functioning;
- Establishing the scientific-information centre of the Ministry of Water Resources, the water management database and information system, publishing the periodic bulletin on the water sector profile of Tajikistan, information and advertising activity promoting investments to the water sector;
- Establishing the department of the state register of water infrastructure and granting permissions for special water use;
- Establishing the department of international water relations and legislation;
- Improving the legislative base for the water sector.

Developing New Water Laws and Revising Current Laws

- The law on water users associations;
- Revising and amending the Water Code of the Republic of Tajikistan.

Developing Draft Resolutions of the Government

- Procedures of granting of the right on water infrastructure management to local and foreign legal persons on the contractual basis;
- The plan and procedures of stage-by-stage transition to the basin water resources management system. Delimitation and developing structural models of the basin water management organizations (BWO, BWA, Water District, Water System, etc.);
- On the procedure of introducing the State Water Infrastructure Register of the Republic of Tajikistan;
- On the procedure of water fund formation and use, approval of regulation and limits for water demand and use;
- On the procedure of developing and approval of the Integrated Water Resources Use and Protection Action Plan in the Republic of Tajikistan (The Water Action Plan);
- On the state support of drinking water supply sector;
- On the procedure of the indemnification of damage caused by physical and legal persons regarding the water infrastructure;
- On the procedure of privatization of the water infrastructure.

Formulation of Strategy

Public and institutional measures:

- promoting sustainable development of the economy, water resources rational use and protection based on observance of international water law principles;
- participation in developing of a up-to-date strategy of interstate water sharing and economic mechanisms of water use for the whole region;

- acknowledgement that water is the economic good and establishing economic mechanisms of water use, supporting regional efforts regarding joint water resources management, creating and strengthening mechanisms of conflicts prevention and resolution, especially in dry years;
- providing a reliable forecast of water availability and making mutually acceptable trade-offs under conflicts resolution in the field of water use at the regional level;
- implementing gradual transition to the integrated water resources management within the river basins, acceleration of establishing water users associations;
- introduction into practice water demand management, developing various forms of private, collective and joint-stock water use;
- establishing institutional framework for governance in the water sector proceeding from market conditions at the level of appropriate ministries and departments;
- acceleration of restructuring large state and collective farms and transition to establishing private dekhkan farms as major factor increasing in agriculture productivity;
- the state support system of the agricultural sector, developing farmers initiative and farms' associations, providing land reclamation and ensuring water supply; economic incentives for water saving.

Educational and propagandizing measures:

- water sector manpower training on the up-to-dated basis;
- institutional assessment and reforming water management organizations;
- building-up the public opinion regarding issues of rational water resources use and protection.

Legal measures:

- developing coordinated criteria and techniques for preparation and making bilateral and multilateral treaties concerning interstate conflicts resolution;
- developing model regulations and charters of new institutional structures in the water sector adapted to market conditions;
- developing draft laws of the Republic of Tajikistan: “On Water Charging”, “On Water Resources Monitoring”, “On Drinking Water Supply”, and “On Water Users Associations”.

Financial measures:

- developing economic management mechanisms in the water sector under market conditions including financial mutual relations between water suppliers and consumers, between different organizations taking participation in O&M of irrigation systems and extension services;
- gradual transition to the financial system under which payment by farmers together with the state subsidies will cover water services cost to avoid decline in irrigation systems efficiency;
- providing for annual funds within the framework of republican and local budgets, and also funds based on the land tax for land reclamation and rehabilitation of the water infrastructure;
- elaborating and introducing the obligatory mechanism of fund collection for land appropriation and investing these funds to development new irrigation schemes and land reclamation, and improving land productivity;
- private and foreign investments for operation and rehabilitation of the existing irrigation and drainage infrastructure, and developing new irrigated lands;
- improving tax and tariff policy in order to increase irrigated farming efficiency;
- gradual achieving the level of normative financing for irrigation systems;

- inventorying basic assets of irrigation systems to specify necessary financial resources;
- priority financing the most unique and vulnerable waterworks;
- prioritizing construction and operation of drinking water supply systems within the framework of the state policy;
- developing and application of state-of-the-art technologies of irrigation, as well as in the course of transition to market economy, preferential power supply in pumping irrigation zones, which are the residence area and a source of life-support for about 2 million inhabitants of the country.

Ecological measures:

- phased settling of harmful water impact problems (floods, waterlogging of farming land, settlements, engineering infrastructure, etc.), prevention or elimination of natural disasters consequences;
- maintaining national interests of Tajikistan in case of construction of waterworks in the territory of neighboring states;
- elaborating and implementing the program of land reclamation;
- inclusion of integrated water resources protection issues into the state ecological programs;
- forecasting catastrophic motions of glaciers on the basis of appropriate glaciological studies.

Technical measures:

- elaborating and implementing the program of short-term and long-term measures on rehabilitation and further development of irrigation and drainage systems;
- enhancement of efficiency of inter-farm and on-farm irrigation systems, improving irrigation techniques, implementing capital and routine land leveling and rehabilitation of irrigation systems on the basis of long-term programs;
- rational water use on the basis of improving a division into districts according to soil, agricultural and landscape conditions and water requirements, introduction of the scientifically-grounded irrigation regimes and up-to-date water-saving technologies, improving land reclamation conditions;
- inspecting the water infrastructure, including pump stations, and scheduling their rehabilitation;
- implementing the phased program of rehabilitation and construction of water supply and sewer systems;
- elaboration of the Recreation and Sport on Inland Water Bodies Plan, and construction of special reservoirs for these purposes with reservation of appropriate territories.
- equipping irrigation systems with water-gauges and severe water record-keeping to introduce normalized water use in farms.

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TURKMENISTAN



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1. National Water Resources Status and Main Issues with Current Management

Available water resources of Turkmenistan are pooled with a country's share in runoff of transboundary rivers Amu Darya, Murgab, Tedgen, Atrek, runoff of small rivers originating on the northeast slope of the Kopetdag mountains, groundwater and return water forming within the country and inflowing from the Republic of Uzbekistan through interstate drainage canals. Data on available water resources of Turkmenistan is given in Table 1.

Table 1 Water Resources of Turkmenistan (a year of 50 percent probability)

River; Gauging Station	Runoff, Mm ³	Note
Amu Darya; Kerki	22,000	According to the Interstate Treaty
Murgab; Tagtabazar	1,550	
Tedgen; Pulikhatum	770	
Atrek, Chat	170	
Small rivers	310	
Groundwater	470	Actual water withdrawal
Return water	5,350	Data of 2002
Drainage water inflowing from the Republic of Uzbekistan	3,781	Data of 2002

Thus, about 82 percent of available water resources of Turkmenistan are formed within transboundary basins and allocated according to interstate agreements. Probable groundwater reserves are about 2.0 billion m³/year, but their basic pools are mainly located in the south and southeast parts of the country in un-reclaimed and waste territories. Return water (mainly drainage water) formed both in Turkmenistan and adjacent territories contains residues of mineral fertilizers, pesticides, harmful mineral salts and other pollutants and under current conditions is not suitable for household and industrial water supply and is of little use for crop irrigation and water supply of grasslands.

On August 15, 2003, the major provisions of the National Development Program by 2020 were approved at the XIV Joint Meeting of the Council of Elders of Turkmenistan, the Public Council and the National Movement "Galkynysh. According to this program, along with high-rate developing of mining and processing industry, construction and other sectors of the national economy it is planned to increase agricultural output in order to meet the needs of the population in food and industry in raw material as well as to enlarge export resources of the country.

It is planned to increase an irrigated area by 2010 up to 2,240,000 ha and by 2020 up to 4,000,000 ha. Water resources are the limiting factor for irrigated area expansion. The agricultural

sector of Turkmenistan consumes 90 percent of all available water resources. Insignificant part of water resources is used for water supply to the population and other sectors of economy.

Recent decades, water resources of the country are used in full and consequently development of water-consuming manufactures, including further expansion of the irrigated area, is possible only due to effectiveness increase of water resources use, improving water resources management, and involving in use of return water. Therefore, water sector developing predetermines overall development of all sectors of national economy of Turkmenistan. The role of water resources management in implementing national development programs and action plans is great. Under achieving specified high goals of economic development and planned welfare increasing of the population, Turkmenistan is guided by full and effective utilizing its share of transboundary water resources and domestic water resources. At the same time, major attention is given to nature preservation and maintaining ecological safety of the country.

At present, major causes of low efficiency of water resources use are the following:

- A low engineering level of irrigation systems (earth irrigation canals, poor equipping with control structures and gauging facilities);
- An appropriate level of rational irrigation water use cannot be provided due to poor land leveling;
- Efficiency of water application techniques employed is low;
- A high water table of groundwater causes secondary salinization and the need of leaching over most of the irrigated areas and results in additional consumption of river water;
- The current water resources management system within administrative boundaries is a cause of organizational unproductive losses of irrigation water;
- Drainage water disposal in upstream parts of river basins results in water salinity and pollution increase in middle and downstream parts, that causes water stress of crops under irrigation by such a water and decline in crop productivity.

Return runoff from the territory of the Republic of Tajikistan within the Amu Darya river basin, is about 4.5 cubic km per a year, and about 6.5 million tons of salts are dumped into the river, as well as water is contaminated by mineral fertilizers, pesticides and other pollutants.

About 750 million m³/year of drainage water and approximately 3.0 million tons of mineral salts are disposed into the Amu Darya River from the irrigated lands areas of the Republic of Uzbekistan through South and Makhankul Main Collector-Drains.

Annually, approximately 1.3 cu km and around 2.7 million tons of mineral salts were disposed into the Amu Darya River from irrigation areas of the Lebap Province of Turkmenistan. Owing to the beginning of construction of the Turkmen Lake of the Golden Century, drainage water disposal into the Amu Darya River from irrigated areas of Turkmenistan has stopped, and drainage waters are now disposed into the Turkmen Lake of the Golden Century (the Karashor depression). It has allowed to improve considerably river water quality and to solve many severe environmental problems of Turkmenistan and the region as a whole.

Specific threats to water quality of rivers Amu Darya, Murgab, and Tedzhen occur due to the crisis events on the territory of Afghanistan related to consequences of military operations and uncontrolled use of natural resources resulting in intensive erosive processes. Poor sanitary-and-epidemiologic conditions in Afghanistan also cause anxiety as most of the catchments of these rivers are in the territory of this country. Microbiological analyses of water samples collected at the gauging station “Kelif” (inlet to the territory of Turkmenistan) have shown exceeding of the permissible concentration levels according to Coli Index, that is evidence of contamination by

decomposition products of organic matters (fecal discharges, excrement of animals, decomposition products of dead animals and vegetative residues, etc).

Currently the water resources management framework in Turkmenistan is presented by the three-level hierarchical system. A principle state agency regulating water resources use is the Ministry of Water Resources of Turkmenistan within the framework of which there are water management associations "Suvkhodjalik" that are operating in five administrative provinces. The next management level is water management organizations subordinated by provincial water management associations "Suvkhodjalik", which are working within district administrative boundaries. This management system does not provide, in full measure, effective utilization of water resources and equitable water supply over all parts of the river basin, in particular, during periods of intense water consumption and in dry years.

At the on-farm level, self-governmental water institutions (water users associations or water users groups) were not still established, and water resources management at this level is carried out by water professionals from district water management organizations and farmers associations or water users themselves. Water consumption and water productivity are estimated, over districts or farmer associations and by averaged indicators.

As is obvious, to implement large-scale plans by proposed technical and institutional measures by 2020 within the framework of the national economy as a whole and in the water sector in particular, will be rather difficult task. Broad introduction of IWRM in many respects would promote solving specified problems. However, starting environment for IWRM introduction is rather inconvenient and demands large-scale preparation implementing and significant time.

2. Enabling Environment for the IWRM Process: Evaluation of a Current Situation in the Country

Overall, the IWRM concept is something new for the public of Turkmenistan though basin water resources management principles were employed by water management organizations for a long time. In such a way, until recently, the Tedgen Irrigation Scheme Administration (TISA) was serving water users of three administrative districts; there are water management associations "Karakumdarya" and "Turkmendarya", which are operating based on basin principles.

However, information on basin and other principles of IWRM had not been wide disseminated among key politicians and professionals engaged in water issues. Therefore, we consider untimely to assert that the political will and interest to IWRM principles were generated. Only the most educated part of managers and experts of the water sector have sufficient information on IWRM principles; there are certain studies regarding transition to IWRM under O&M of some main and inter-farm irrigation canals. At the same time, under appropriate political support of decision-makers, they are ready to launch the large-scale public awareness and disclosure campaign.

At present, conditions for the wide participation of stakeholders in introduction of the IWRM principles are not prepared. Water management bodies, which are engaged in water withdrawal, water delivery to all water users over the country, rivers training, flood and drought control, preventing waterlogging and salinization of irrigation lands, and other issues related to harmful impacts of water, do not have an appropriate status and authorities, as well as are not institutionally co-ordinated with all water-consuming sector of economy, i.e. the legislative basis for regulation of water relations need to be radically improved.

Current distribution of duties in water resources management among different ministries and departments breaks the principle of unity of all waters. Therefore, for example, groundwater

quantity and quality management is responsibility of geological agencies; drinking water supply and sewerage of settlements are responsibility of local governments; water supply and waste water disposal of the industrial enterprises are responsibility of appropriate ministries and departments, water quantity monitoring is responsibility of hydrometeorological services; water quality monitoring is responsibility of nature protection agencies; microbiological monitoring is responsibility of public health services; management of irrigation systems and return water is responsibility of the Ministry of Water Resources of Turkmenistan. At the same time, interrelations, information interchange and co-ordination of actions related to these issues are not sufficient.

Training of farmers and in particular water workers is routinely conducted at regional seminars organized at the beginning of field works (soil leaching, preparation for cotton and spring-sown crops sowing, water applications in growing season, pre-sowing water application and sowing of winter wheat, etc.). Both water professionals of provincial and regional water management organizations and farmer's associations are participated in these seminars. Seminars for exchange of experience and new information are held in the Turkmen Agricultural University' campus a few times a year, including the mandatory seminar at the beginning of April prior to the national holiday "Drop of Water is a Particle of Gold". Presentations of this celebratory seminar are published as the special proceedings.

Personnel of water management organizations of Turkmenistan are permanent participants of seminars in the Training Center of the SIC/ICWC being held in Tashkent or Urgench. At seminars in the Training Center, they receive information on IWRM.

Record-keeping of water resources quantity is respectively conducted: (i) in surface water sources by the National Committee on Hydrometeorology; (ii) groundwater by the Ministry of Geology; (iii) return and drainage water by the Ministry of Water Resources; and (iv) industrial and household sewage by both local executive authorities and appropriate ministries and departments, which supervise industrial enterprises releasing industrial waste water. Record-keeping of water resources quality in a scale of the country is conducted by agencies of the Ministry of Nature Protection, in sources of drinking water supply and communal water use – by agencies of the Ministry of Public Health correspondingly. Record-keeping of irrigation water quantity and quality is conducted by water management bodies. Record-keeping of water use is conducted by water consumers, statistical reporting on water use according to the Form 2-TP (Vodkhoz) on all branches of economy is conducted by water management bodies.

Water management organizations have database on irrigation land status, records of water use, water applications schedule.

Main principles of IWRM are not included in the current legislation of Turkmenistan, though some water management systems are functioning based on the basin principle.

At present, a new version of the Water Code providing for adoption of the water law and by-laws is under preparation in Turkmenistan. The working group on drawing up of a new version of the water legislation includes experts of different ministries and departments, mainly experts in water management. Necessity and opportunities for transition to the IWRM principles, as well as necessity of institutional reforms in the water sector, will be incorporated in the draft of the new Water Code. Currently, a special state body on regulation of water use in all sectors of economy is the Ministry of Water Resources of Turkmenistan, and a special state body on water resources protection is the Ministry of Nature Protection of Turkmenistan.

Irrigated agriculture consumes more than 90 percent of supplied water resources. Mutual relations between state water management agencies and agricultural water consumers are built up on the contractual basis and regulated by the special resolution of the President of Turkmenistan

“On Economic Incentives for Commodity Producers in the Agricultural Sector” according to which water management agencies are responsible to provide water supply in scheduled volumes and time and land reclamation services, and agricultural water consumers are responsible for rational and efficient irrigation water use and transferring 3 percent of water services cost to a bank account of water management organizations. A mirab (irrigator) of the farmer’s association is monitoring execution of mutual obligations of the parties and is the representative of Rayvodkhoz (a district water management organization), where he gets his wages.

With a view increasing responsibility of water consumers for efficient utilization of water resources and partial covering of expenses of the state water management organizations maintaining irrigation systems, the President of Turkmenistan has issued the special resolution “On Introduction of Payment for Water Use for Some Categories of Water Consumers and Excess over Planned Water Use under Irrigation” according to which since March 1, 1994 a payment for water use by industrial enterprises and also other irrigation water users whose activity is not related to an irrigation is put into practice, as well as a payment for excess over planned water use under irrigation according to a consolidated tariff.

3. Willingness to Adopt the IWRM National Planning Process

The national water strategy of Turkmenistan is based on the National Program of Social and Economic Development of Turkmenistan by 2020, essence of which consists in increasing productivity of land and water resources by improving irrigation land conditions and regulating capacity of water basins, efficiency of irrigating systems, decrease of specific irrigation requirements per an irrigated hectare, application of high-effective technologies in all water and economic activities.

There are not special programs and projects for implementing the IWRM principles.

In 2001-2002 under financial support of UNDP and the World Bank, the National Environment Action Plan of the President of Turkmenistan Saparmurat Turkmenbashi (NEAP) was developed. The NEAP is an integral part of the National Program of Social and Economic Development of Turkmenistan and provides for:

- environment enhancement in Turkmenistan, prevention of its deterioration and sustainable environment functioning;
- mitigation of adverse environmental impacts on health of the population;
- improving natural resources protection and use;
- active participation of Turkmenistan in international cooperation solving national and global environmental problems.

Among major national environmental problems of Turkmenistan, along with others, are the following:

- water resources scarcity for irrigation;
- pollution of surface and groundwater by drainage, industrial and household discharges in provinces including a Turkmen part of the Pre-Aral region;
- drinking water scarcity in some districts of a Turkmen part of the Pre-Aral region and in Balkan Province;
- environmental contamination by enterprises of the gas-and-oil producing industry and the energy sector;
- pollution of the Caspian Sea by oil, oil products, industrial and household waste water.

Drinking water supply and sanitation issues are included in the NEAP in the section “the List of Major Investment Nature Protection Actions”.

In conformity with the current legislation, the state agencies responsible for water resources use and protection accordingly are the Ministry of Water Resources and the Ministry of Nature Protection and their regional offices. BWO "Amu Darya" carries out functions of water distribution and other economic activities within the Amu Darya transboundary river basin. There are a few NGOs related to water issues in the country (the Turkmen Geographical Society "Ecofund", NGO "Katena", the Turkmen Nature Protection Society, etc.), but their influence on formation of public opinion is insignificant yet. Information interchange at the national level and between national organizations and BWO “Amu Darya” is made through telephone (a departmental telephone line), postal and electronic communications.

The National IWRM Plan should be elaborated under supervision of the Cabinet of Ministers of Turkmenistan with active participation of the Ministry of Water Resources of Turkmenistan, its Research-and-Production Institute “Turkmensuvilimtaslama”, local water management organizations at provincial and district levels. The State Committee of Hydrometeorology, the State Committee of Geology, the Ministry of Nature Protection, the Ministry of Public Health and Drug Industry, the Ministry of Agriculture, the State Committee of Fishery, local governments, Committees of Medzhliisa (the Parliament) have to be also involved in development of this plan.

Proceeding from multi-purpose water resources use and the water infrastructure, their development should be based on coordination of inter-sector interests and prospects of development of the economy, as a whole. At the same time, it needs to be taken into account relations between water supply, sanitation and health of the population, as well as between economy and environment.

Now and in foreseeable future, problems of conflicts regarding water among consumers are not expected, excluding for the Turkmen part of Pre-Aral Region (mainly Dashoguz Province) and the Balkan Province (the southwest of Turkmenistan) where because of water resources scarcity, in particular in dry years, tension related to with water supply for irrigated agriculture is observed. But at the same time, the water legislation proclaims a priority of drinking and household water supply.

The existing system of administrative-territorial management, and sometimes inconsistency of actions at different hierarchical levels of water management do not promote rational and efficient utilization of water resources and result in severe organizational water losses.

The absence of uniform water policy and inter-sector coordination results in sectoral isolation of water use and impedes putting water-saving technologies into practice.

The water sector of economy of Turkmenistan provides water for the needs of economic development of the country and also meets the social needs of the civil society, maintains the drainage water disposal system, solves nature protection problems. The water infrastructure is used to solve important ecological problems and to prevent harmful impacts of water events.

The Ministry of Water Resources, as the main agency regulating water use, operate and maintain all large water-intake structures, reservoirs, pump stations, inter-farm irrigation and drainage systems, water receivers of return water, other hydraulic-engineering infrastructure, etc. The Ministry of Water Resources has funds from the state budget for O&M of above water infrastructure and also for the maintenance of organizations, which are carrying out researches, design work and field surveys, repairing, transport and communication services, supervision and monitoring, and administrative functions.

Water supply and sewerage of cities and settlements, irrigation and drainage of these territories are provided by specialized organizations at the expense of the municipal budget.

Additional sources of financing economic activity are the following:

- assignments to budget for paid water use by industrial enterprises and other water users activity of which is not related to irrigation, as well as payment for excess over planned water use under irrigation according to a consolidated tariff;
- assignments to budget by farmers' associations, at a rate of 3 percent of output cost produced under conditions of an on-farm lease contract, which are allocated for O&M of on-farm irrigation and drainage networks.

4. Enabling Environment for IWRM National Plan Implementation

Appropriate political support at the top level is necessary for implementing the IWRM principles. One of priority ways of achieving political support is disclosure of IWRM advantages and providing multifarious and complete information to decision-makers (the President, the Medjilis (Parliament), the Cabinet of Ministers, the Ministry of Economics and Finance, the Ministry of Agriculture, the Ministry of Nature Protection, etc.). In our opinion, the most effective way of informing the top management of the country is presentation of multifarious reviews by the international organizations, including the GWP, with specific and comparative data on putting the IWRM principles into practice in the CIS and far-abroad countries, positive examples of water resources management to meet social, economic and ecological needs and water saving. In addition, national experts should persistently work forming the positive public opinion regarding the IWRM process through mass media as well as learning by the IWRM principles of water professionals.

The effective way shifting public opinion and providing political support to IWRM principles is implementation of one or two pilot projects (an irrigation canal system), which in actual practice of Turkmenistan could demonstrate all positive aspects of IWRM, including economic efficiency.

The National Social and Economic Development Program by 2020 provides for high rates of development of all economic sectors of Turkmenistan predetermining reforms of the water sector. In this context, IWRM principles implementation would promote achievement of planned goals. Taking into account that the IWRM is an innovation for the public of Turkmenistan, possible terms of putting IWRM into practice are 10 to 15 years.

The GWP can promote putting IWRM principles into practice both by informing decision-makers about positive aspects and perspectives of the IWRM process and by searching donors and technical assistance for establishing small pilot projects.

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UZBEKISTAN



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1. National Water Resources Status and Main Issues with Current Management

Mean annual runoff of both rivers Amu Darya and Syr Darya amounts to 133.6 km³. A share of Uzbekistan is of 72.4 km³ including 61.6 km³ for irrigation and 11.3 km³ for other needs of economy. At the same time, there are large-scale ground water resources in the territory of the Republic of Uzbekistan; their volume is estimated about 18.45 km³. 3.37 km³ out of 7.8 km³ of usable ground water resources are used for drinking water supply.

Additional volumes of water resources in Uzbekistan are return and drainage water formed within irrigation areas. On the average, for the period of 1990 to 2000, the total volume of return water was varying from 28 to 33.5 km³ per year (depending on annual water availability). 13.5 to 15.5 km³ of return water are annually formed in the Syr Darya River basin and 16 to 19 km³ in the Amu Darya River basin. More than 51.5 percent of the total volume of return water is released through collector-drains into rivers, about 33 percent into desert depressions, and only 16 percent of return water is reused for irrigation. 80 percent of water resources of Uzbekistan are transboundary water.

In the republic, farmlands are mainly irrigated with river water. Depending on annual water availability, the volume of water withdrawals over Uzbekistan varies over the range of 50 to 64 km³/year.

Actual water requirements considerably exceed a water limit allocated to Uzbekistan according to the interstate agreement (72.4 km³ in a 90-percent probability year). Estimated available water resources over Uzbekistan are 59.2 km³. Water use per sectors of economy can be presented as follows:

In total	<i>59.2 billion m³,</i>
including	
Household needs:	<i>4.10 billion m³,</i>
Industry:	<i>1.39 billion m³</i>
Fishery:	<i>1.32 billion m³</i>
Agriculture	<i>52.4 billion m³</i>

Apparently, basic volumes of water resources are used for irrigation, i.e. for crop farming. Conflicts regarding fresh water use are widespread over the world; and they are closely related to current politically tense relations between states (the conflict between Pakistan and India, India - Nepal - Bangladesh). At the same time, in most cases the states located in upstream dictate their conditions to downstream states affecting water resources quantity and quality. From this point of

view, in Central Asia, the Republic of Tajikistan and the Republic of Kyrgyzstan, which are located in the runoff formation zone, are in more or less favorable conditions. Other states, including the Republic of Uzbekistan, are dependent, to a certain extent, with respect to water quantity and quality. Despite of numerous international agreements regarding water resources use, most of the so-called "solved" problems are potentially renewable conflicts. Conflicts take place under use of water resources of the rivers Amu Darya and Syr Darya and large-scale reservoirs such as Nurek, Togtogul and some others.

Long-term studies within transboundary river basins in our region show that discovered risks are related to floods (in wet years and winter seasons), droughts in dry years, river water pollution due to great volumes of drainage water disposal, recession of the Aral Sea level, and desertification of the deltas area.

Preventive measures need to be implemented to decrease these risks because they are less capital-intensive than disasters' consequences elimination. At the same time, management of risks has to be made at the river basin level. Provisions for transition from administrative-territorial management of irrigation systems to basin principles of water resources management were approved by the Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No 320 "On Improving Activity of the Ministry of Agriculture and Water Resources of the Republic of Uzbekistan"; and this is first strides of the Republic of Uzbekistan on the path to IWRM. At present, necessity of transition to IWRM is caused by the lack of management incentives on large-scale irrigation canals at the national level, inconsistency of their operational regimes, local administrative barriers, insufficiency of the water record-keeping and other reasons. The IWRM principles should be put into practice at regional and national levels taking into account the following aspects:

Political aspects:

- Developing guidelines for the regional agreements on water sharing. The key question is "equitable" water allocation rather than "equal" one;
- Putting into practice agreements at bilateral, basin, regional and global levels.

Technical aspects:

- Developing integrated approaches in order to solve issues of water resources quality and quantity at regional and national levels;
- Establishing the framework for information interchange and technical cooperation promoting trust and partnership in the future;
- Promotion of demand management and effectiveness increase of water resources use.

Financial aspects:

- The external financial assistance to basin water management organizations introducing IWRM principles;
- Mechanisms providing state and private investments.

2. Enabling Environment for the IWRM Process: Evaluation of a Current Situation in the Country

Taking into account water strain in the Central Asian region, including the Republic of Uzbekistan, and severe damaging the national economy and the nature owing to water scarcity, it is now necessary to develop measures for transition to the IWRM principles and to promote rational water use.

The basic theoretical and practical grounds of the IWRM are described in a scientific literature, in particular, in proceedings of the SIC/ICWC, research and design institutes. Practical application of the IWRM principles is demonstrated within the framework of the pilot project being implemented in the Fergana Valley under the direction of Professor V.A. Dukhovny. Outcomes of this pilot project are described in proceedings of the SIC ICWC and used by key experts and politicians engaged in water issues. In 2003, by the Resolution of the Cabinet of Ministers of the Republic of Uzbekistan, the National Council headed by the First Deputy Minister of Agriculture and Water Resources, who is, at the same time, Director General of the Department of Water Resources, had been created. Main activity of this Council is discussion and decision-making regarding water management problems at regional and national levels. In 2003, in the Republic of Uzbekistan, the former regional departments of water resources management were reorganized to Basin Irrigation Systems Administrations, and the Public Councils responsible for public awareness related to the IWRM process were established. Outcomes of the IWRM process achieved at regional and national levels are discussed at conferences and meetings with participation of key executors of the projects, for example, the International Scientific-Production Workshop of the NATO “The Integrated Water Resources Management within Transboundary Basins - Interstate and Inter-Sectoral Approaches” held in Bishkek (23–27 February 2004).

Economic reforms effecting in the agricultural sector have resulted in disintegration of state farms and collective farms, and their replacement by shirkat, private and dekhkan farms. Creation of private farms was considered as a perspective form of land use more adapted to current social and economic conditions. However, created private farms experience financial difficulties and problems related to supplies of machinery and materials, fuel, seeds, fertilizers, etc.

In 1999, on the basis of established farms and under the lack of the paid water services system, water users associations (WUAs) have started to be created according to the territorial principle. At present, there are 268 water users associations in the Republic of Uzbekistan, which serve 21,290 farmers and cover the irrigation area of 668,000 ha. Considering the WUA activity results, it is possible to note the following:

- Mechanisms of mutual relations between the WUA’s administration and members of WUAs have been not established;
- Since private farms are created on the basis of gone bankrupt collective farms, farmers are insolvent; assignments to the budget of WUAs by WUAs’ members are not carried out;
- Regulations of state financial supporting WUAs are not specified;
- While water in Uzbekistan is free-of-charge, farmers have not incentives for water saving, and it is difficult to solve conflicts related to water distribution and financial issues arising between WUAs’ members and WUAs.

Despite of enormous efforts of the state, currently WUAs cannot play a key role in establishing the IWRM principles in Uzbekistan. Training of water professionals and other stakeholders (ecologists, power specialists, and others) is one of the most important programs of the Department of Water Resources of Uzbekistan, which is implemented in cooperation with the ICWC and the SIC/ICWC. In 2000, the Training Center has been established in Tashkent under financial support of the CIDA and the McGill University. At present, branches of this Training Center operate in Osh, Kyzylorda and Urgench.

The primary goal of this Training Center is a raising the level of water professionals' skill and capacity building in five Central Asian republics. Workshops concerning the IWRM issues are routinely held. Basic regulations and legislative framework of the IWRM are developed. The IWRM process is regulated by the following legal documents:

- The Constitution of the Republic of Uzbekistan adopted in 1992;
- The law of the Republic of Uzbekistan "On Nature Protection", which establishes basic mechanisms of water quality management (1992);
- The law of the Republic of Uzbekistan "On the limiting water use in the Republic of Uzbekistan" (1993), which regulates limiting water use caused by water resources scarcity in the region. This law takes into account the key IWRM principles;
- The Decree of the President of the Republic of Uzbekistan "On Accelerating Reforms in the Agricultural Sector" (2003) which provides for putting in practice the integrated water resources management at the national level by means of transition to basin principles of water resources management.

The Decree emphasizes importance of institutional reforms, capacity building and development of human resources as well as legislative framework of the IWRM.

3. Willingness to Adopt the IWRM National Planning Process

After disintegration of the Soviet Union there was not the only regional body coordinating activity of water management organizations in the Central Asia leading to problems in water resources allocation and use. Based on the initiative of five states, the Interstate Coordination Water Commission (ICWC) has been established in 1992.

The agreements on the joint water resources use and protection of transboundary watercourses, the Agreement of Heads of States dated March 26, 1993, and establishing the ICWC, have enabled successfully enough to develop cooperation in the field of water resources management in the Aral Sea Basin, at the same time, signatures of Water Ministers of five countries of the Central Asia have legal force. The Aral Sea Basin Program approved by Heads of States on January 11, 1994 in Nukus is also of great importance.

On the basis of subsequent numerous "Agreements" and other documents adopted at regional and national levels, main provisions of the water sector development strategy have been improved. National groups of experts were working out the strategy for their own countries.

The major objective of the strategy is development of overall principles and criteria of water sharing, rational water use, protection of water resources, and preparation on their basis of drafts of the interstate and national normative and legal acts regulating water resources sharing and protection. Proceeding from this, water strategy is subdivided into two basic mainstreams:

1. Principle political trends in developing the water resources management system, including:
 - transition to integrated water resources management at interstate and national levels;
 - water supply as a mainstream of development;
 - developing the mechanism of joint planning of water resources use.

2. Developing the mechanism providing sustainable water resources management:
 - improving the institutional framework of water resources management;
 - developing the legal and normative basis;
 - developing the human potential;
 - economic mechanisms and mutual relations;
 - establishing information system and database providing the decision-making process for governance.

National water strategy of Uzbekistan provides for sustainable long-term development ensuring reliable water supply of irrigated lands, increase of welfare of the population, integrated development of economy, and environment safety.

To improve water resources management in the region (the Aral Sea basin) and in the country, Uzbekistan participates in development of the regional and national programs financed by international donors (under partial financing by the republic). The pilot project “IWRM in the Fergana Valley” being implemented under financial support of the Swiss Development and Cooperation Agency (SDCA) is the most important among pilot projects are being recently carried out. The object of this project is to develop integrated approach to water resources management for three main irrigation canals in the Fergana Valley crossing territories of Kyrgyzstan, Tajikistan, and Uzbekistan.

The SDCA has approved the new project “Automated Management of Irrigation Canals in the Fergana Valley” which is sequential of the abovementioned project. In addition, the US State Department has approved an initial phase (6 months) of new project “The IWRM in Lower Reaches of the Amu Darya and Syr Darya Rivers” launched in the beginning of 2004. The main purpose of this phase of the project is to define the IWRM implementation actions and pilot projects in the Aral Sea coastal zone.

The Amu Zhang Water Resources Management Project, including rehabilitation pump stations and the main irrigational network is commenced in 2003 (ADB).

The Feasibility Study for the Amu-Bukhara Canal Pumping Cascade Rehabilitation Project was developed in 2003.

In 2004, the Government of Uzbekistan has signed the loan agreement with the World Bank for financing the Drainage, Irrigation and Wetlands Improvement Project Phase-I, which includes the construction of the South Karakalpakstan Main Drain in the Republic of Karakalpakstan. The sustainable development and poverty reduction strategy with emphasis on construction of water supply and sanitation infrastructure remains a priority line in the action plan of the Republic of Uzbekistan at the national level and will be implemented with financial assistance of international donors.

During recent ten years, the project financed by the World Bank within the framework of the program "Clean Water and Sanitation" are implemented in the Khorezm Province of Uzbekistan and in Karakalpakstan. The Lake Sudoche Rehabilitation Project financed jointly by GEF and the World Bank, which provides for wetlands restoration and environment improvement in the Amu Darya delta was being carried out since 1999 until 2002.

Sustainable development i.e. providing sufficient standard of life of the population (increase of income, employment, etc.) including reliable water supply, is the mainstream of the state policy of the Republic of Uzbekistan. The Department of Water Resources subordinated to the Ministry of Agriculture and Water Resources of the Republic of Uzbekistan is the main agency responsible for water resources management and development at the national level.

Until 2003, water resources management in Uzbekistan was organized according to territorial-administrative principles. The Ministry of Agriculture and Water Resources and its Department of Water Resources were legislatively charged with functions of water resources control and management. Further, administrative functions are transferred to basin irrigation systems management organizations; their number over Uzbekistan totals eleven organizations, which are responsible for O&M of main irrigation canals. All mutual relations with water consumers are regulated at the level of basin irrigation systems management organization and their subordinated divisions.

The rivers Amu Darya and Syr Darya, after disintegration of the Soviet Union, became Transboundary Rivers. Therefore, since 1991, five states of Central Asia have made the joint official statement, and in 1992, has been established an Interstate Commission for Water Coordination (ICWC) with two executive agencies - BWO "Amu Darya" and BWO "Syr Darya" to which the water infrastructure related to interstate water resources management was transferred for temporary use. Activity of ICWC and BWOs in the field of interstate water resources management has proved, as a whole, correctness of the chosen way. In 2003, by the Resolution No 320 of the Cabinet of Ministers of the Republic of Uzbekistan (on July 21, 2003) the National Water Council, which organizes routine meetings four times a year to discuss the most severe problems of water management and mainstreams of the water policy of the Republic of Uzbekistan, has been established. Information interchange on all water problems, at regional and national levels, is mainly carried out at seminars held by the Training Center of ICWC and its branches, and through the Internet ("ICWC Press Release").

The main coordinating agency in developing the IWRM National Plan is the Ministry of Agriculture and Water Resources of the Republic of Uzbekistan with its Department of Water Resources and departmental research and design institutes. The developed documents are reviewed and approved by the Cabinet of Ministers of the Republic of Uzbekistan.

Water conflicts (they occur mainly in dry years) between upstream and downstream water consumers occur where the IWRM principles are not provided or were not put into practice. These are some parts of the river basins, mainly in upstream or downstream, where irrigation canals are operated according to the territorial principle of water distribution. In the course of putting the IWRM into practice, these conflicts will be eliminated. Despite of the interstate agreements and measures adopted at the national level in the field of water resources use, in the long-term outlook, most likely, at the regional level the countries located in the runoff formation zone will have benefits in water resources use; and the water resources status will depend on them in many respects.

Long-term experience shows that at the national level Governments should solve problems of water governance. Governments develop a water policy, constitute laws, and put into practice decisions in the field of water management. The Republic of Uzbekistan is establishing the institutional framework for river basins management to resolve conflicts related to water distribution. Governments constitute an economic and financial policy in the field of water resources management, approves appropriate regulations, rights and duties of water users. At the same time, Governments, with the help of interstate partners and donors, strengthen the IWRM mechanisms and conclude treaties related to the transboundary water providing fair water resources use. According to regulations of water resources management in Uzbekistan, the large-scale water infrastructure (reservoirs, waterworks, control and similar structures, main irrigation and drainage canals) is operated and maintained at the expense of the state budget; and there is responsibility of state for implementing the basin water resources management and the IWRM principles (towards the level of water users associations). In the transition period (prior to real financial capability of WUAs) on-farm irrigation and drainage network are transferred simultaneously to water users associations with annual funding for covering O&M expenses. In the future, this on-farm infrastructure should be maintained by WUAs from funds formed by collecting payment of WUAs' members for water services.

Currently the state finances construction and O&M of the water supply and sanitation infrastructure, which is a priority under allocating budgetary funds. Reduction of the state budgetary financing allocated for maintenance of the water sector has resulted in depreciation and obsolescence of waterworks and another water infrastructure. Physical deterioration of basic assets exceeds normative rates 2.6 to 3.3 times. Significant funds and material resources are necessary for their maintenance in a state of operability.

Subsequent investments for developing the water infrastructure should be addressed to three main activities:

The first activity is improvement of water management at the on-farm level. Due to establishing private farms, the number of water consumers has sharply increased and necessity of creating WUAs has arisen.

The second activity is to provide joint work of WUAs with the top management hierarchies; reforming overall water resources management in the Republic of Uzbekistan (establishing of ten basin water management organizations, etc.).

The third activity is rehabilitation and remodeling of the water infrastructure, which have been constructed 50 to 60 years ago and by present time, physically and morally, become outdated.

4. Enabling Environment for IWRM National Plan Implementation

Though still early to speak about full success, but a specific preparatory works for implementation of general IWRM principles are already started in Uzbekistan. A water crisis is usually the crisis of water management where the state political support in implementing the IWRM principles is not provided. Taking into account features of the transitional period in the Central Asian states, water resources management without conflicts will be established where the governmental agencies responsible for water resources management will be able to carry out an effective policy and to develop the legal framework for water distribution and management adequate to national interests and economic needs.

Basic elements of the framework for political promoting the IWRM process are the following:

- A correct assessment of a situation and selecting the optimum national policy including an advanced legislative basis and financing;
- Institutional framework and functions distribution at different administrative levels;
- Governance tools necessary for modifying water resources use;
- Management of risks shall be provided at the river basin level at all stages.

The government of Uzbekistan has created the legal basis (and, partly, economic basis) and is ready to act as the coordinator and regulator of the IWRM process in the Republic of Uzbekistan. The Ministry of Agriculture and Water Resources with its Department of Water Resources and new-created basin water management organization as well as BWOs Amu Darya and Syr-Darya at the regional levels will play a key role in this process.

With a view of the further implementing the IWRM principles at the national level, “The National Strategy of Water Governance and Investments by 2010” which covers political, legal and economic aspects the IWRM introduction was developed in Uzbekistan. At the same time, the Republic considers a variant of stage-by-stage transition to the IWRM until 2010. The IWRM principles in developed countries such as France, England, the Netherlands, Canada, the USA and others were long ago put into practice; and, therefore, the GWP has wide experience of generalization of the IWRM practice taking into consideration conditions in these countries. It would be useful to apply this experience for introduction of the IWRM principles in the Republic of Uzbekistan. It is necessary to put in practice the IWRM tools developed by the GWP and to adapt them for conditions of the Republic of Uzbekistan.

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CONCLUSION

As shown in the above review, transition of the water sector to governance based on IWRM principles is in progress, in those or another form, in all countries of Central Asia and Caucasus. However, it is necessary to pass through more deep reforms in order to provide water services ensuring the required level of welfare of the population including sustainable environment and adequate social and economic conditions in countries of the region. What general conclusions can be drawn based on analysis of the current situation?

First of all, it is necessary to highlight that countries of Central Asia and Caucasus highly perceive the IWRM principles but they are at the different levels of readiness to develop and implement appropriate plans. It is only clear that successful implementation of IWRM can be provided due to the gradual process of dialogue and development. The overall requirement to all countries is that their governments must develop the adequate legislative basis and play the role of the co-ordinator and regulator of IWRM processes. Co-ordination inter-sectoral bodies for the river basins should be established under supervision of the Governments. Some countries of Central Asia and Caucasus have already made initial steps in this direction.

There is proper understanding in all countries of Central Asia and Caucasus that participation of all stakeholders into the process of water resource planning, financing and governance should result in success of reforms in view of social stability and welfare of the whole population. Clear-cut policies and legislative basis need to be provided at all levels of the managerial hierarchy. In addition, the powerful and stable governmental body (such as the Ministry or Department of Water Resources) must ensure a management succession and support of stakeholders. This aspect is not perceived in some countries of the region.

The legislation of most of the countries have not clearly stated the water rights or they are not enough acknowledged. In all countries of Central Asia and Caucasus the legislative reform is in progress to delineate more clearly these rights within the framework of IWRM process. Clear-cut and effective mechanisms are needed to resolve fairly and promptly all conflicts related to water issues. Some countries have already developed appropriate mechanisms for water conflicts settling within the country. Some transboundary issues also needed to be considered.

The general shortcoming peculiar to all countries without exception is deficiency of necessary information on the process of water resource use and management, and available data are not disseminated among stakeholders at the proper volumes and proper time, or used irrationally for decisions-making related to water management.

Tariffs providing complete reimbursement of costs, the principle: “polluter pays”, requirements to subdivide costs, and other economic tools may be efficient mechanisms for achieving social objectives within the IWRM framework (in comparing with attempts to implement direct regulation). However, the countries of Central Asia and Caucasus are not yet ready to put these tools into practice in the near future, it should be the gradual process, which follows the general economical upturn.

Observance of the rules and regulations of IWRM requires that developing of water policies, general water resources governance and management (providing water services), and financing of water services be implemented by the co-ordinated (centralized) bodies that should be transparent for the civil society. This issue should be also settled almost in all countries of Central Asia and Caucasus.

At the same time, support for implementation of the IWRM national plans is necessary in all countries of Central Asia and Caucasus, even in more advanced countries regarding the IWRM process (including Kazakhstan, where the IWRM national plan is already supported by the

Government of Norway). Summary of external financial assistance needed for developing and implementation of the IWRM plans is given in Annex 2.

Annex 1 Social and Economic Indices Countries of the Region

AZERBAIJAN				
	1990	2000	2015	2020
The population, million people	7.175	8.04	8.73	8.94
Urban population, %	54	52	54	56
Rural population, %	46	48	46	44
	1993	1995	1999	2000
GNP per capita (USD 1995-const.)	455	361	383	422
GNP, total (billion USD, 1995)	3.4	2.4	3.1	3.4
Input of agriculture, %	28	27	19	19
Input of industry, %	34	34	33	38
Average annual increase	1991-1997	1998-2000		
% of GNP	-9.3	9.5		
% of the population	1.3	0.9		
ARMENIA				
	1990	2000	2015	2020
The population, million people	3.55	3.79	3.81	3.79
Urban population, %	67	67	70	71
Rural population, %	33	33	30	29
	1990	1995	1999	2000
GNP per capita (USD 1995-const.)	1,542	768	921	976
GNP, total (billion USD, 1995)	5.5	2.9	3.5	3.7
Input of agriculture, %	17	42	29	25
Input of industry, %	52	32	32	36
Average annual increase	1991-1997	1998-2000		
% of GNP	-5.8	5.5		
% of the population	0.9	0.4		
GEORGIA				
	1990	2000	2015	2020
The population, million people	5.46	5.26	4.47	4.58
Urban population, %	55	56	61	64
Rural population, %	45	44	39	36
	1993	1995	1999	2000
GNP per capita (USD 1995-const.)	1232	351	493	502
GNP, total (billion USD, 1995)	6.7	1.9	2.5	2.5
Input of agriculture, %	32	52	36	21
Input of industry, %	33	24	23	23
Average annual increase	1991-1997	1998-2000		
% of GNP	10.6	2.6		
% of the population	-0.4	-0.3		
TAJIKISTAN				
	1990	2000	2015	2020
The population, million people	5.3	6.1	7.1	7.6
Urban population, %	32	28	30	33
Rural population, %	68	72	70	67
	1992	1995	1999	2000
GNP per capita (USD 1995-const.)	740	407	357	386
GNP, total (billion USD, 1995)	4.1	2.4	2.2	2.4
Input of agriculture, %	27	38	19	19
Input of industry, %	45	31	25	26
Average annual increase	1991-1997	1998-2000		
% of GNP	-9.1	5.8		
% of the population	1.5	1.1		

UZBEKISTAN				
	1990	2000	2015	2020
The population, million people	20.5	24.9	30.6	32.5
Urban population, %	40	37	38	41
Rural population, %	60	63	62	59
	1992	1995	1999	2000
GNP per capita (USD 1995-const.)	517	446	473	485
GNP, total (billion USD, 1995)	11.1	10.2	11.5	12.0
Input of agriculture, %	35	32	34	34
Input of industry, %	36	30	25	23
Average annual increase	1991-1997	1998-2000		
% of GNP	-2.3	4.2		
% of the population	2.1	1.7		
TURKMENISTAN				
	1990	2000	2015	2020
The population, million people	3.7	4.7	6.1	6.4
Urban population, %	45	45	50	53
Rural population, %	55	55	50	47
	1992	1995	1999	2000
GNP per capita (USD 1995-const.)	2,088	1,296	1,194	1,377
GNP, total (billion USD, 1995)	8.5	5.9	6.1	7.2
Input of agriculture, %	n/d	17	28	27
Input of industry, %	n/d	69	46	50
Average annual increase	1991-1997	1998-2000		
% of GNP	-8.9	13.9		
% of the population	2.7	2.3		

THE KYRGYZ REPUBLIC				
	1990	2000	2015	2020
The population, million people	4.40	4.92	5.84	6.16
Urban population, %	38	34	36	38
Rural population, %	62	66	64	62
	1992	1995	1999	2000
GNP per capita (USD 1995-const.)	520	331	382	399
GNP, total (billion USD, 1995)	2.3	1.5	1.9	2.0
Input of agriculture, %	39	44	38	37
Input of industry, %	38	18	27	29
Average annual increase	1991-1997	1998-2000		
% of GNP	-6.5	3.6		
% of the population	0.9	1.6		
KAZAKHSTAN				
	1990	2000	2015	2020
The population, million people	16.74	16.17	15.96	16.07
Urban population, %	57	56	58	60
Rural population, %	43	44	42	40
	1992	1995	1998	2000
GNP per capita (USD 1995-const.)	1,690	1,263	1,325	1,515
GNP, total (billion USD, 1995)	27.4	19.9	20.0	22.5
Input of agriculture, %	27	13	9	10
Input of industry, %	45	27	31	35
Average annual increase	1991-1997	1998-2000		
% of GNP	-6.9	3.5		
% of the population	-0.8	-1.0		

Annex 2: Assessment of the costs required for the National IWRM planning in the Countries of Central Asia and Caucasus

(000' US\$)¹³

Activities/ Phases	Armenia	Azerbaijan	Georgia	Kazakhstan	Kyrgystan	Tadjikistan	Turkmenistan	Uzbekistan
I. Public awareness on IWRM, political will & support for the reform process building	145	165	165	85	110	145	165	145
I.1. Development of communication strategy	10	10	10	5	5	10	10	10
I.2. Initiation of meetings with politicians, mass media, general public and donor community	30	30	30	20	20	30	30	30
I.3. Establishing CWP (Country Water Partnership) as a leadership for progress.	25	25	25	0	25	25	25	25
I.4. Implementation of a series of target workshops for participants of the CWP network.	40	50	50	30	30	40	50	40
I.5. Public awareness campaign	40	50	50	30	30	40	50	40
II. Establishing the framework for inter-sector co-ordination	70	70	70	20	50	70	70	70
II.1. Design of the framework	10	10	10	0	10	10	10	10
II.2. Facilitation of stakeholders' meetings and round tables	50	50	50	20	30	50	50	50
II.3. Developing the a formal platform for the network operation (preparation of a statute, establishment of communication procedures, etc).	10	10	10	0	10	10	10	10
III. Capacity Building	510	620	620	360	370	420	520	420
III.1. Developing the Information System (data base, modeling, etc)	150	150	150	100	100	100	100	100
III.2. Benchmarking of the IWRM planning process	10	10	10	0	10	10	10	10
III.3. Assessment of training needs	10	20	20	10	10	10	20	10
III.4. Training of «trainers» on IWRM process	40	50	50	25	25	25	50	25
III.5. Developing an appropriate system of incentives creating «enabling environment» for IWRM implementation.	30	40	40	25	25	25	40	25
III.6. Strengthening the institutional capability (office equipment, communications facilities, monitoring equipment, etc).	120	150	150	100	100	150	150	150
III.7. Training courses for relevant stakeholders	150	200	200	100	100	100	150	100
IV. Overview of on-going activities that the IWRM plan can build on.	55	65	65	35	35	35	65	35

¹³ Estimation made together with the consulting company COWI (Danmark) for presentation to the EU Water Initiative

Activities/ Phases	Armenia	Azerbaijan	Georgia	Kazakhstan	Kyrgystan	Tadjikistan	Turkmenistan	Uzbekistan
IV.1. Identification of the IWRM functions and assessment of WRM status	20	30	30	15	15	15	30	15
IV.2. Identification of relevant experiences from other than water-related planning	10	10	10	5	5	5	10	5
IV.3. 3Compilation ofand distribution among all relevant stakeholders of the information on IWRM planning successes and failures	25	25	25	15	15	15	25	15
V. Developing the IWRM plan and transition strategy	360	455	455	185	280	320	455	320
V.1. Reforming political, legislative and financial frameworks	75	100	100	50	75	100	100	100
V.2. Establishing an appropriate institutional framework with clear tasks and responsibilities	30	50	50	0	30	30	50	30
V.3. Development of relevant management tools	150	200	200	100	100	100	200	100
V.4. Identification of stakeholders groups affected by reforms positively or negatively, and selecting the most appropriate mitigation measures	40	40	40	20	20	30	40	30
V.5. Identification of funding requirements for IWRM plan implementation	15	15	15	5	10	15	15	15
V.6. Restructuring of current budget allocations	10	10	10	5	10	10	10	10
V.7. Application of the GWP ToolBox as a check list	5	5	5	5	5	5	5	5
V.8. Co-ordinadion the IWRM plan and transition strategy	15	15	15	0	10	10	15	10
V.9. Establishing of the National Steering Group	20	20	20	0	20	20	20	20
Total:	1,140	1,375	1,375	685	845	990	1,275	990

