TO INCREASE WATER PRODUCTIVITY THROUGHOUT PROPER INSTITUTIONAL ARRANGEMENTS AMONG GOVERNANCE HIERARCHY

Vadim Sokolov
SIC ICWC, 11, Karasu-4, Tashkent, 700187, Uzbekistan
e-mail: vadim@icwc-aral.uz

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Introduction

Water resources management is an art to supply the required water volume with acceptable quality at the proper place and in proper time. This is process which includes a few principal components: available water resources, engineering infrastructure, demands, allocation procedure, delivery service and finally – use of water (Fig.1).

Component	Tasks	Indicators
Available Water Resources	**Monitoring Development Protection**	**Renewability: Level/Volume/Quality/Variability**
Infrastructure	**Maintenance & Operations**	**Cost / Efficiency/ Life time**
Demands	**Assessment Demand Management**	**Level / Volume / Quality / Time / Address**
Allocation	**Inclusiveness Negotiations Regulations**	**Criteria of Equitable and Reasonable Share/Quota**
Delivery	**Good Service**	**Equitability/Stability Minimum of unproductive losses**
Use / Utilization	**Production / Water Saving**	**Productivity (more crop per drop)**
Product / MDGs	**Sustainable Development**	**Index of Non-Sustainable Use**

Governance

Figure1. Components of the water resources management process and indicators of implementation

Why Integrated Approach Needed?

In the reality water resources management process is not so simple. Try to imagine: is it easy to coordinate available water resources with demands within one hydrographic basin? At first glance, – yes, it is the proper engineering task. On the one hand, it is necessary to estimate available water resources such as precipitation, surface runoff, groundwater storage, return water, and on the other

hand, water demands of different economic sectors such as municipal water supply, irrigation, industry, hydropower generation, recreation, navigation, fishery, and of ecosystems. However, each component of the water balance is related to both the social situation and economic and political conditions. Diverse water sources, their interrelations, different sector and stakeholders interests, different impacts and consequences, various management tools and mechanisms, and complicated water infrastructure – all these components transform the proper engineering task into the very sophisticated co-ordination of huge number of links to keep the balance within this system. If we want to provide the balance of different interests, current and long-term goals, economic development and conservancy etc, then it is necessary to apply a holistic approach – so called Integrated Water Resources Management (IWRM).

What are basic IWRM principles, which identify its practical meaning? They are the following:

- The main IWRM objectives - sustainable, stable, reasonable and equitable water supply to all uses and nature.
- Water and environmental governance performed within hydrographic boundaries in accordance with the basin morphology.
- Management accounts all types of available waters (surface, underground, return) with consideration of the climatic conditions (precipitation and evaporation).
- Public participation not only in governance, but also in funding, maintenance, planning and development.
- Close coordination of water uses and plans among sectors and among levels of water management hierarchy.
- Information exchange, transparency, openness, accountability.
- Water saving and rational use, combat unproductive losses –the main priority for water users and water agencies.

Water Governance

It is not only just an engineering task to keep comprehensive balance – we need to establish proper "water governance" system as a basis for conducting water resources management process. The "governance" specifies rules of the game and provides regulatory mechanisms for water managers who are in charge for implementation of principles for water allocation, conservation, and monitoring. Within this system water users are responsible for rational and effective water use. Interrelations between water managers and water users (other stakeholders of the process) related to water resources management and use are included into the IWRM system, and the political "superstructure" provides the mechanism of "governance."

Main goal of the governance system is to provide equal and democratic opportunities for all stakeholders involved in the water resources management process. The main components of the water governance system are the following:

- Political commitment – through democracy development;
- Institutional arrangements – recognizing the integrity of water for nature and society within hydrographic boundaries;
- Legislative framework – adapting to IWRM principles;
- Financing and Incentives – through political decisions;

- Inter-sector integration – through proper co-operation platform;
- Public participation – through involvement into decision-making;
- Managerial tools and instruments – through legislation and economic incentives and technical modernization;
- Capacity development – raising human and technical potential.

The governance system is not static in time – it should be permanently adapted to changes: natural, political, social, economic and technological. To large extent, this can be referred to as management rule that is the most vulnerable part of the modern management system. It requires most attention of all specialists of the water sector because each basin, each sub-basin, and each water management or irrigation system, as each man, has its own characteristics. This is predetermined not only by specific landscape, configuration and lithography of a watershed, but also by conditions of water withdrawal and distribution (surface water sources or groundwater; regulated or unregulated flow), parameters of water delivery system; the combination of hierarchical water management levels, composition of operational works and others (Fig. 2).

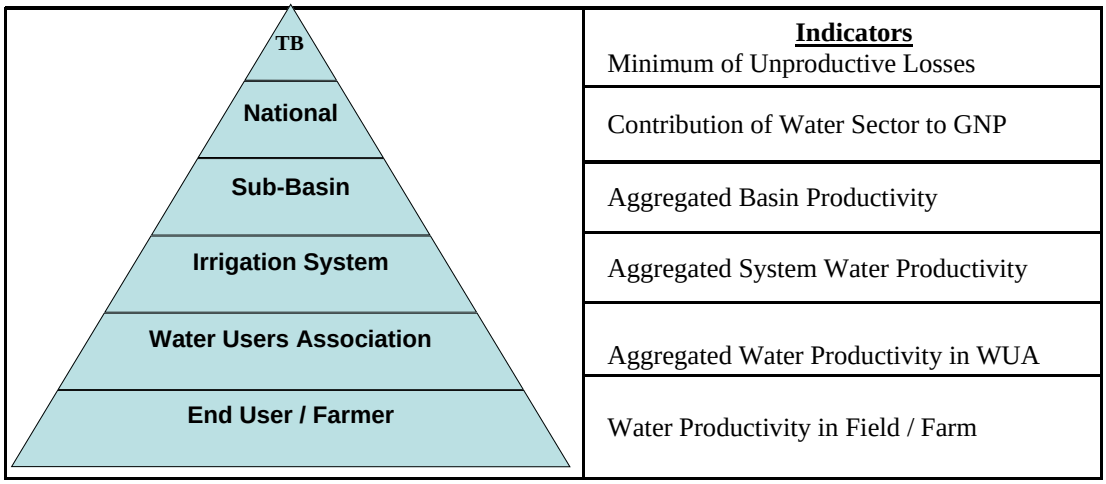

Figure 2. Principal Indicators for Different Levels of Water Governance Hierarchy

Hierarchy of Water Governance

From the above mentioned view point, the governance system should cover the hierarchy levels of water resources management The governance system covering the hierarchical levels should facilitate to achieve those indicators of water resources management process shown in Figure 1. To put IWRM into practice it is necessary to develop specific mechanisms providing incentives for water users and water management organizations in increasing the water productivity, and at the same time to assist them in achieving this goal. These mechanisms should take into account specific factors causing unproductive water losses, instability in water supply, and unevenness of water distribution. As a whole, the ranking of causes of water productivity reduction that arise within the irrigation system promotes the development of practical measures for achieving the basic criterion of IWRM – provision of "potential productivity" of the water by all water users or, at least, approaching to it (Figure 2).

Improve Water Productivity

As shown in Table 1 (below), the most approaches to improved water productivity are based on the engineering measures and IWRM tools in combination with organizational, legal, and financial measures. To implement these measures in the first place it is necessary to combine efforts of all stakeholders of water provision process starting from water management organizations, WUAs and ending by farmers themselves. Such joint efforts need agreed procedures and methods for stabilizing water provision, providing equitable water distribution, and establishing a proper public control by water users themselves. At the same time, the technical and financial assistance of the State and local governments is necessary. Finally, it is important to gain a general understanding of the importance for proper co-ordination of all water management hierarchy levels.

Table 1. Causes for water productivity loss within irrigation systems and mitigation measures

Hierarchical level	The problem existing	Mitigation measures	
		Type	Brief description
Basin	Instability of head intake and water disposal due to the following causes:		
	• Political tensions;	legal	Agreements
	• Breach of the water supply schedule;	organizational	Establishing a management body or developing the regulations
	• Excessive water diversion at upstream intakes;	legal technical	Agreements and fines Distribution accuracy due to applying SCADA
	• Underestimate of water losses at upstream river sections	technical	Monitoring and evaluation of flow rates and water losses
	• Unstable flow modes in rivers	technical	Runoff control, use of drainage water
	• Uncontrolled water distribution	technical	Improving the water management system
Irrigation system	• Lack of the system of water resources planning, distribution and dispatching	technical	• Developing and putting operational rules into practice • Drafting the plan and its adjustments
	• Lack of water distribution discipline	technical	• Regulations for water monitoring and records • Introduction of the GIS and water use plans
	• Water over-diversion against schedule	organizational, economic	• Applying of penalty provisions
	• Lack of water keeping records	technical	• Improving the water monitoring system • Introduction of the SCADA • Establishing the management information system
	• Lack of the proper water distribution procedures	technical	• Introduction of water rotation • Use of all types of water resources
Farm	• Lack of the water use plan	technical	• Water use planning and training
	• Improper irrigation methods	technical	• Recommendations on irrigation technique and methods
	• Lack of adjustments in accordance with weather conditions	technical	• Extension services

Sectors and Stakeholders Coordination

Important that governance system should provide horizontal integration among different stakeholders and sectors. A platform for effective participation in decision-making process of different stakeholders (government, NGOs, science, private sector, professional organizations) and sectors (agriculture, hydropower, nature, water supply and sanitation and etc.) should be created. The main criteria for evaluation success of this integrity are: inclusiveness (each stakeholder can show its interest); equity (opportunities – rights for equal access to water); transparency; effectiveness; accountability; coherency (to listen others); responsiveness; comprehensiveness; ethical considerations. Unfortunately, the listed criteria could not be assessed by numerical indicators.

The Government should those frames, within which water management agencies should operate for the interests of all economic sectors and stakeholders. The management system should provide conditions for achieving (or approaching to) the maximum water productivity and economic value by all water users (in irrigated farming, industry, and domestic water supply) and for successful livelihood. It means that the minimum water volume should be used to fulfill biological demands for production or technologically needed water consumption. At the same time minimizing water losses over all the technological cycle including water intake, water conveyance, water supply, and water use (so-called potential water productivity). Such an approach needs in the clear-cut co-ordination of all technological processes as well as the observance of other technological requirements (non-related with water resources).

For instance, in irrigated farming it means the need to follow all procedures of land reclamation, soil treatment, soil fertility conservation, selection of crop variety etc; correspondingly in the water supply sector - the rules and regulations of sanitation, combination of wastewater treatment and use etc; and in industry – introducing the advanced production technologies, regeneration (cyclical) water use, wastewater disposal and recycling etc. Thus, activity within IWRM often goes beyond “pure” water resources use and conservation, and includes all water-related spheres.

Water Policy and Legislation

It is obvious that the political environment using specific financial instruments (tariffs for water and the system of penalty sanctions and incentives) is encouraging all water users to reduce their water demand. At the same time, “governance” encourages to use social instruments – traditional methods of economically sound water use, and public participation in decision-making. All these and other factors should be taken into consideration for establishing strict rules of game. No doubt, that the effective water resources policy should be based on strong legislative framework, including:

- Definition of roles and responsibilities of the Government, water governance institutions, stakeholders, users;
- Definition of social, economic and ecological value of water;
- Definition of strong position concerning institutional reforms, privatization, roles of local administrations and stakeholder participation;
- Definition of water rights, WUA roles, rules of game among sectors;
- Definition of interrelations between sectors – agriculture, energy, environment and others, and links with general socio-economic development.

It is important to note that in the process of IWRM implementation, there is not any need to seek universal and stereotyped approaches that are acceptable for different stakeholders (this principle is clearly stated in the GWP IWRM ToolBox, 2003) however, at the same time, more or less general rules regarding the institutional framework should be formulated. To put IWRM principles into practice indisputably should be based on the political will and appropriate social environment in the country. Its initiation cannot be an instantaneous action and has to develop gradually and quite systematically. Therefore, transition towards IWRM requires ensuring the thorough understanding and through developing an action plan.

IWRM Planning

A policy of water resources development should be built based on the strategic planning in order to predict and mitigate destabilizing factors such as the population growth, climate changes and their impacts on availability of water resources and water demand, changes in the set-up and development of water-consuming sectors, and especially dynamics of market relations (prices, global impacts etc.) in timely manner. It is necessary to keep in mind that owing to a complexity of water infrastructure and numerous actors in the water sector (water management organizations and water consumers) practically covering the whole society it is impossible to obtain a fast result of water sector reforming. Therefore, the reforms require a certain time and funds that has to take into consideration also the use of transboundary water sources and forecasting the policy of riparian countries (the co-operation with other riparian countries should be built up on the basis of the interstate agreements, joint plans and actions in conformity with the international law and regulations).

Transforming the IWRM concept into a national action plan is based on the following fundamental activities:

- Developing the strategy for IWRM implementation;
- Establishing the training system for improving the understanding of IWRM principles at first among water professionals and then among communities' leaders (especially NGOs' leaders), and for disseminating knowledge at first among those people who involved in the pilot projects and then among proper stakeholders at all levels of water management hierarchy;
- Social mobilization of water users and other stakeholders; and
- Drafting the national IWRM plans and their approval by the governments.

IWRM Progress in Central Asia

A move of Central Asian countries towards IWRM principles (rather than towards new programs of technical rehabilitation since it was before) is based on the following regional "Road Map" (see Figure 3):

1. Mandatory preparation by each country the National IWRM and Water Efficiency Plans in co-ordination with Strategic Planning provisions. Under financial support of the Norway International Development Agency through the GWP and UNDP, Kazakhstan commences such activity, and by the end in mid 2007 it will be a good example for other countries in the region.

The principal goal of preparing the National IWRM Plan is to develop the efficient framework for putting IWRM into practice and to specify objectives, tasks, phases and scope of works, impacts, and mitigation measures combating destabilizing factors.

2. The sub-regional component for Central Asia has been developed by UNEP Collaborating Centre for Water and Environment (UCC-Water) and UNEP in close consultation with GWP CACENA (and coordinated with UNDP and UNECE). The programme intends to involve the IWRM National Councils established under the "IWRM Fergana Valley" Project supported by Swiss Development Cooperation. The development objective of the sub-regional work programme is: acceleration of the implementation of the IWRM 2005 target in three countries of Central Asia. The outputs foreseen are:

- Sub-regional report on progress on IWRM 2005 Target and IWRM Planning
- Completed national road maps/work plans for implementation of the IWRM target (for three countries: Kyrgyz Republic, Tajikistan and Uzbekistan).
- Needs assessment for support to implementation of IWRM reforms as identified in road maps and work plans.
- Capacity built on IWRM planning for key water managers and decision makers

3. Providing the political will and commitments regarding IWRM and settling water-related problems. As a practical matter, the proposal of water professionals from Kazakhstan and Kyrgyz Republic regarding establishing the Coordination Water Committees at the level of the Government/the Parliament under the direction of Vice-Premier with involving NGOs seems to be the sound decision.

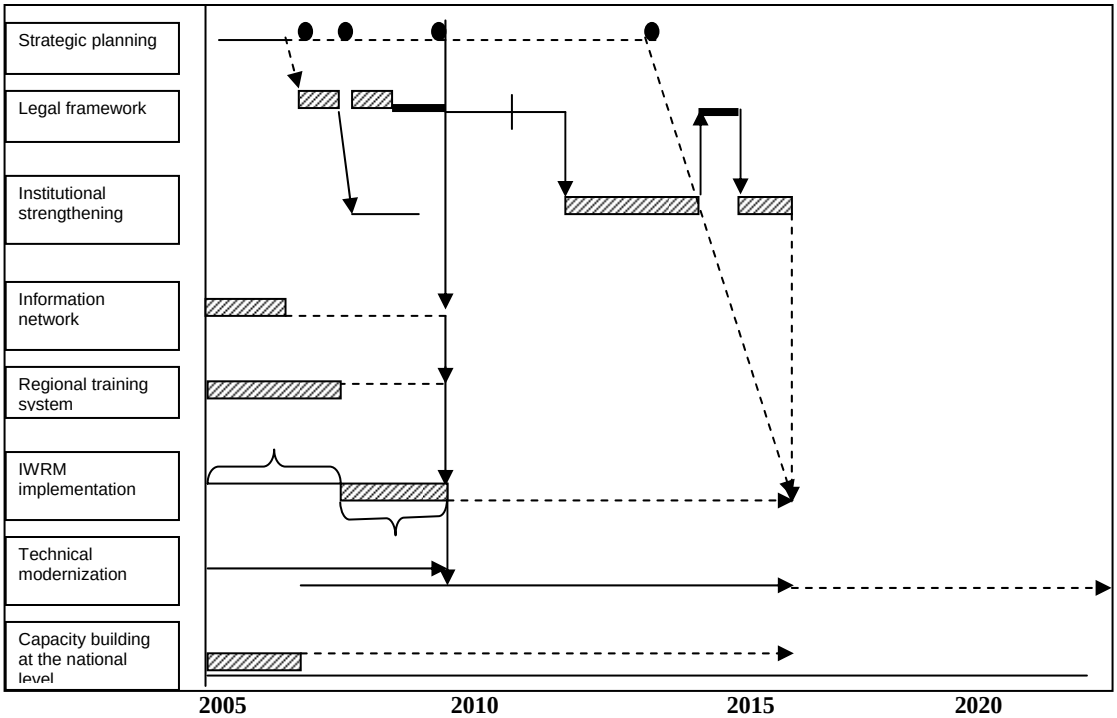

Figure 3. Regional Road Map to support IWRM implementation

4. Wide public participation in water management at all hierarchic levels. To this end, it is necessary to ensure the legal registration of the Public Water Bodies and WUAs, to develop the financial mechanisms for their involvement, and to provide training and wide popularization of IWRM principles and achievements with water users' participation.

5. Establishing the network of training centers and managing the coordinated training process over the region.

6. Legal and financial justification of IWRM and establishing its legislative basis, improving water charging mechanisms, legal and financial coordination of efficient water use aspects at all hierarchic levels; specifying the role of the Government in the case of WUAs, etc.; establishing water-saving funds; elaborating the environmental water requirements and ensuring nature priority under water allocation procedures.

7. Technical measures:
    a. Introduction of water record keeping;
    b. Participation of hydro-meteorological services in IWRM;
    c. Establishing the extension service for improving the water productivity;
    d. Computerization of managing the irrigation systems; and
    e. Water-saving interventions.

At the same time, the mechanism of interstate consultations to coordinate water sharing, a regime of water use at transboundary rivers, and further economic development keeping in mind the regional interests was established. An analysis of the water management situation in the region has revealed the following destabilizing factors:

- Demographic growth and stability of rural population (the poorest part);
- Applying the water-sharing principles developed by former centralized water management agencies of the USSR that were included into the Basin Master Plans of Complex Water Resource Use and Conservation – they neglected the needs of ecosystems;
- Disputes among the countries regarding water and energy resources and lack of mechanisms to tackle this issue;
- Uncertainties related to global climate changes;
- Lack of conflict resolution mechanisms and procedures to recover losses due to breaching the existing agreements on water sharing;
- Insufficient information interchange among riparian countries, first of all, exchange of hydro-meteorological data to ensure the more accurate forecast of water availability and to improve transboundary water management;
- Lack of policies and programs for regional economic integration, and insufficient co-operation to improve the irrigated farming productivity on the basis of a model that enables optimizing the rural labor in the region; and
- Vagueness of information sharing and consultation about prospects of water use by Afghanistan etc.

Also interstate consultations and exchange of experience regarding the following internal (national) water challenges are extremely useful:

- water scarcity and pollution at the national level;

- supplying the population with safe drinking water;
- low water and land productivity or low output of an irrigated hectare;
- insufficient developing of the national legislative regulations;
- high-accumulated depreciation of assets owned by water organizations;
- an insufficient material and technical basis of water organizations;
- inability of water users to pay for water delivery services;
- institutional issues (organizational and governing shortcomings);
- the poor cross-sectoral integration (between main water users);
- shortcomings of the personnel policy in the water sector;
- return flow management issues; and
- transboundary ground water use.

Indicators on IWRM Implementation

To follow the development and success of IWRM it is important to have a number of indicators. To demonstrate the practical meaning of indicators shown in Figure 1 - we can by illustrating some examples below.

Table 2 presents the observed indicators during the first and second years of the pilot project "IWRM in Fergana Valley" interventions along three irrigation canals located in different countries. The situation was improved by new institutional arrangements with water users involvement into decision-making process and by application of a number of managerial tools (model for water delivery scheduling and operative monitoring).

Table 2. Basic Water Allocation Indicators over the Pilot Canals in Fergana Valley

Pilot canals	Water availability, % of demand		Reliability, % of applied		Efficiency		Specific water provision, x1000 m3/hectar	
	2003	2007	2003	2007	2003	2007	2003	2007
South Fergana Canal (Uzbekistan)	91	96	92	96	0,88	0,90	12,6	10,8
Aravan-Akbura Canal (Kyrgyz Republic)	76	96	90	92	0,74	0,75	11,6	11,4
Khodjabakirgan Canal (Tajikistan)	82	88	70	78	0,80	0,82	14,6	13,5

Table 3 presents the basic indicators for evaluation of water use on the farm level. These indicators were observed in Fergana Valley within the above mentioned project. It could be realized that if farmers follow to proper recommendations they can obtain more "crop per drop" of water.

Table 3. Basic Indicators of Water Use in the Pilot Farms in Fergana Valley

Pilot Farm	Specific Water Intake, x1000 m3 / Hectare			Cotton Yield, Ton / Hectare			Water Productivity, Ton per 1000 m3		
Year	**2002**	**2003**	**2005**	**2002**	**2003**	**2005**	**2002**	**2003**	**2005**
Sayed (Tajikistan)	7,3	5,9	6,7	2,8	2,9	2,99	0,37	0,45	0,49
Bakhoriston (Tajikistan)	13	7,6	8,82	2,5	2,7	3,1	0,19	0,35	0,36
Sandyk (Kyrgyz Republic)	6,0	5,5	6,2	2,7	3,1	3,6	0,47	0,56	0,57
Khojalol (Kyrgyz Republic)	18,8	12,5	10,4	2,6	3,0	3,07	0,14	0,21	0,30
Nozima (Uzbekistan)	6,7	3,5	4,5	2,4	2,0	2,8	0,36	0,58	0,62
Turdali (Uzbekistan)	4,0	3,4	3,3	3,5	3,9	4,6	0,88	1,14	1,40
Tolibjon (Uzbekistan)	9,4	5,9	5,8	3,7	3,6	3,7	0,40	0,61	0,71

The Way Forward

The practical progress in reforming water management in Central Asia countries can be obtained by applying IWRM principles described in this paper and by resting on appropriate institutional, engineering, and other measures under sufficient funding that needs to be allocated. The main measures include the following:

- Providing sustainable water provision, equitable and regular water sharing between sub-basins and irrigation systems along with significant reduction in unproductive water losses on the way to water users;
- Introduction of the democratic principles into the water management practice by using a participatory approach and involving all stakeholders in the process of step-by-step transferring the governing functions to lower levels of the water management hierarchy as well as allowing active participation on an equal footing with the Government in supporting and developing of water supply systems;
- Solving of some social problems related to equitable water supply of the population, especially ensuring safe drinking water;
- Settling environmental problems related to water sector's activities; and
- As a final goal, increase in the efficiency of water and land use.

REFERENCES

Dukhovny V.A., Sokolov V.I. Integrated Water Resources Management: Experience and Lessons Learned from Central Asia towards the Fourth World Water Forum. SIC ICWC/ GWP CACENA, Tashkent, 2005. 96 p.

IWRM ToolBox. Sharing Knowledge for Equitable, Efficient and Sustainable Water Resources Management. Version 2. GWP, 2003. 157p.

IWRM Principles Implementation in Central Asia and Caucasus. The report of GWP CACENA. Tashkent, 2004. 129p.

"The proposed framework for transition towards integrated water resources management in the Fergana Valley with active water users participation". The IWRM-Fergana Project Document, SIC ICWC, IWMI, SDC, Tashkent, 2004.

Proceedings of the ICWC and the UN ESCAP workshop on strategic water resources planning and sustainable development in Central Asia. SIC ICWC. Cholpon-Ata, August 27-30, 2002.

Sokolov V. Experiences with IWRM in the Central Asia and Caucasus Regions. Water International, Volume 31, # 1, p. 59-70, March 2006

Asia-Pacific Regional Document (4th World Water Forum). Document of the Central Asia Sub-Region. pp. 21-39. Mexico, 2006