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ICWC

achievements and challenges of the future: water cooperation on the way to sustainable development

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In April of the current year the Interstate Commission for Water Coordination (ICWC) celebrated its moderate anniversary in Almaty (Republic of Kazakhstan) – 15th jubilee of activities addressing international water management in the Aral Sea basin, carried out by joint efforts of five Central Asian States. It seems to me that the most appreciable evaluation of this laborious period has been made by Mr. Loic Fauchon, President of the World Water Council in the following statement, worded in his salutatory address to the participants of the Jubilee Conference:

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

Recognition should be granted for strategic insight displayed by political leaders of Central Asian countries, who in September, 1991 (as soon as only one month after disintegration of the USSR) initiated the special meeting of five republics (at that time) of the region. Participants of the meeting considered the issue of establishing ICWC and preparing the "Agreement between Republic of Kazakhstan, Kyrgyz Republic, Republic of Uzbekistan, Republic of Tajikistan and Turkmenistan on cooperation in the field of joint management with regard to water resources management and protection as applied to interstate water sources"; it was legally drawn up on 18th February, 1992 in Almaty and thereupon ratified by the Resolution signed by Heads of five States concerning the "Agreement on joint actions aimed at solving the water problems in the Aral Sea and Priaralye, on environmental enhancement and ensuring socio-economic development of the Aral Sea" on 26th March, 1993 in Kzyl-Orda (Kazakhstan).

Political will to develop cooperation had got reiterated corroboration in a number of subsequent decisions, programs and other documents. Among them are: - the "Resolution" adopted by Heads of States on the 11th of January, 1994; and - approved by them the relevant "Concrete Action Program for Stabilizing the Environment in the Aral Sea Basin for the Next 3-5 Years with a View of Social and Economic Development of the Region". The Parties participating in this Program approved the "Aral Sea Basin Program" (ASBP-1) that provided for principal lines of activities with respect to improving cooperation in the basin, alongside with the "Conception of solving socio-economic and ecological problems in the basin". All these documents served as a basis for activities carried out not only by ICWC, but also by other regional organizations, established within the framework of the International Fund for Saving the Aral Sea (IFAS): - national branches of IFAS; - Executive Committee of IFAS (EC-IFAS); - Interstate Commission for Sustainable Development (ICSD); - Regional Hydrometeorology Center, and others. Nukus, Dashhovus, Dushanbe declarations and subsequent intergovernmental Agreements between Republic of Kazakhstan, Kyrgyz Republic, , Republic of Tajikistan, Turkmenistan and Republic of Uzbekistan on "… the status of the International Fund for Saving the Aral Sea (IFAS)" of 1997, 1999, 2002 proceeded promoting at a later time development of the cooperation.

Significant importance should be attached to the "Agreement between Kazakhstan, Kyrgyzstan and Uzbekistan on water-power resources management in the Syrdarya river basin" of 1998 that formed the foundation for interaction between water and energy organizations.

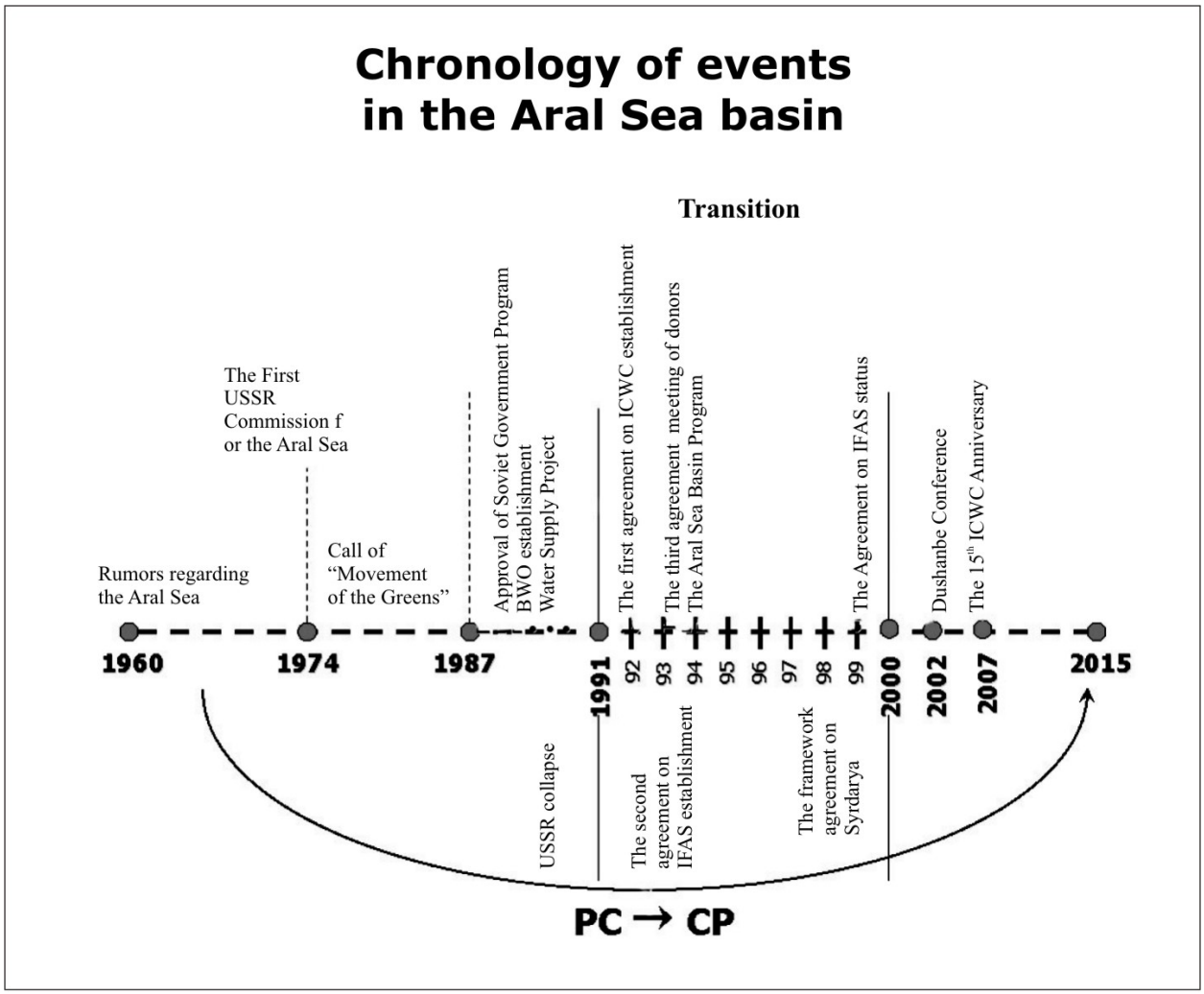


Fig. 1

An important contribution to strengthening cooperation between our countries has been made by international financial institutions and governmental agencies of development from various countries, such as: - World Bank; - Asian Development Bank; - UNDP; - ECE, GEF; - UN-ESCAP; - OSCE; - CIDA (Canada); - USAID; - Switzerland SDC; - GTC (Germany) and many others. Worthy of merit are the efforts undertaken within the framework of various target projects initiated by European Union including TACIS, INTAS, and others. One cannot but admit active participation of several international non-governmental organizations, such as: - World Water Council, Global Water Partnership; - International network of basin organizations, etc.

The main accomplishment achieved during the past years as a result of ICWC activities is the fact that despite all current complications, differences of interests between transboundary states and their principal water users (irrigation, hydro-energy), fluctuations in drought and high-water years – nevertheless national and regional water authorities managed to provide conflict-free water allocation and delivery necessary to meet water demands of countries in the basin.

In the process of persistent managerial improvements, organizational structure of ICWC has been formed as a combination of regular scheduled meetings of national water authorities Heads (ministers) and representatives of ICWC executive bodies functioning on the permanent basis. These meetings are held alternately in every country and chaired by a representative of the host party –

they determine goals to be reached by executive organs and national water management agencies for the period between ICWC meetings. Executive bodies (BVO "Amudarya", BVO "Syrdarya", Scientific-Information Center of ICWC, Secretariat and Coordinating Hydrometeorology Center) are loaded down with day-to-day activity. Their activity consists of the following functions:

- Joint planning of rivers flow regimes, reaching an agreement on these regimes and annual water allocation separately by vegetation periods and mean periods;
- Day-to-day operative management regarding releases, water distribution from interstate sources to national water authorities, monitoring of water flow and – at separate recording stations of BVO "Syrdarya" – of water quality;
- Continual augmenting capacity building of ICWC executive bodies through providing them with machinery, equipment, computers, improving communication systems; and also by way of organizing a network of training and professional development;
- Development of the regional information system, augmentation of its transparency, mutual trust and upgrading standards of knowledge;
- Implementation of joint regional projects based on unified essential principals;
- Development and application of IWRM both at the regional and national levels.

Joint efforts undertaken by representatives of all five countries within the framework of the last three items indicated at the end of the cited above list of ICWC executive bodies' functions are of great importance for enhancing mutual understanding, developing common approaches to water problems at the grass level, and creating the system of interaction. Great is unifying potential stored in such activities as joint mastering new technique, new knowledge, new technologies and skills with assistance of international experts, and there is nothing more consolidating than working hand in hand and face to face.

In this connection special emphasis should be put on the issue of developing training capacity and building the training network in Central Asia. This task has been successfully implemented owing to the efforts undertaken by ICWC, Canadian International Development Agency, Swiss agency of Development and Cooperation, USAID and a number of other organizations. As a result of these efforts a network of training centers has been established in the region enabling ICWC to ensure professional development of over 2000 specialists representing various levels of water use and management hierarchy. Considerable contribution to propagating cooperation is being made by the information program CAREWIB developed by joint efforts of SIC ICWC, GRID-Arendal, UNECE and Swiss agency of development and cooperation. The Program enjoys wide popularity both in the region and abroad. At the present stage further development of the Program is underway – the objective is to build up and apply in practice of water use and management National information systems that will be based on the unique Regional information system created within CAREWIB with the integrated interface enabling users to implement and improve the data base and the set of models coupled with GIS. Among new outputs of this system are information-analytical reports facilitating improvement of annual interstate water sources management.

Alongside with these positive trends in activity of ICWC, the state of affairs with regard to transboundary waters management and use in terms of future

prospect cannot be considered sufficiently sustainable. Comparison between actions to be fulfilled as defined in the Regional water strategy (box 1) reveals that execution of long-term works has been being performed much slower than day-to-day and annual management. This disadvantage is caused by a number of reasons – both external and internal.

Box 1

Progress of Regional cooperation for 10 years

Activities according to general clauses of Regional water strategy	1996	2006
1. Development of principal provisions of cooperation:		
• **attribution the control object**	-	+
• **elaboration of transboundary waters volume**	-	-
• **recognition of the Aral Sea and Priaralye as water users**	-	+
• **reconciling the volumes of transboundary waters conservation**	-	-
2. Pilot projects of water productivity improvement	-	+
3. Enhancing commitment to rights and obligations regarding transboundary waters management	-	-
4. Development of water allocation/distribution general principles	-	-
5. Adjustment of development projects on the basis of models optimization	-	**Results of GEF activities are not approved**
6. Determining quotas for return waters	-	-
7. Creation of regional information system	-	**+ completed**

External challenges are determined by the presence of certain destabilizing factors (box 2):

- Population growth, - though the rate is slowing down in comparison with the last quarter of the XX-th century, still it amounts to not less than 1.5% per year resulting in the annual increase of half a million people, thus requiring additional 700 million m^3 annually proceeding from assumptions that minimal water ration constitutes 1200 m^3 per capita/year;
- Urban population growth and expansion of urbanized territories at the account of irrigated lands entails additional demand for excess water

volumes and concurrently necessity to replace lands removed from irrigation with new areas;

- Crop pattern change due to development of farming, tendency to harvest aftercrop and cultivate high-yielding crops;
- Build-up of ecological awareness entails increase in ecological demands of rivers for special nature protection releases and delta releases. So, if in the past the Amudarya delta demand was estimated in the "Schemes" of 1984 as 3.2 km^3 for the average year, then current volume of these water demands are determined as 8 km^3 for the average year and 3.5 for the low-water year:
- Climate change, that reveals itself as increase in water consumption by crops, in more frequent occurrence of floods and droughts that is in recurrence rate of extreme cases;

Box 2

Sustainable development – can it be achieved?

Destabilizing factors	Counteractions
Population growth	**Rate of use reduction**
Augmentation of anthropogenic load on water and land	**Reduction of losses, increase in specific water productivity**
Rise in prices on components of consumption	**Improvement of economic efficiency and reduction of costs**
Enhancement of pollution and wastes	**• recycling water supply;** **• technological improvements;** **• polluter pays**
Water resources depletion	**Frugal use, legal limitations**
For each factor of tension	**Measures to mitigate**

- Ongoing decline in world prices on agricultural production in conjunction with increase in prices on material resources makes irrigated farming very unprofitable though development of irrigated agriculture is an unavoidable necessity in consideration of its great social importance for the region (≈ 60 % of the population live in rural areas);
- Increase in hydropower resources use through constructing hydropower station in upper reaches of rivers and tributaries thus escalating competition not between volumes of water use, but between regimes of water resources use - when priority is set in the interest of generating maximum amount of hydro energy, especially in winter, as well as upgrowth of electricity generation for export;
- Possible increase in water withdrawal by Afghanistan - as political situation in the country will be becoming more stable this factor would also entail some influence on water use conditions in the region. At present, there have already appeared certain documents indicating that Afghan government intends to make specific demands regarding water of the Amudarya River, believing that in bygone days, interests of this country had not been taken into consideration within the "Scheme of integrated water resources use".

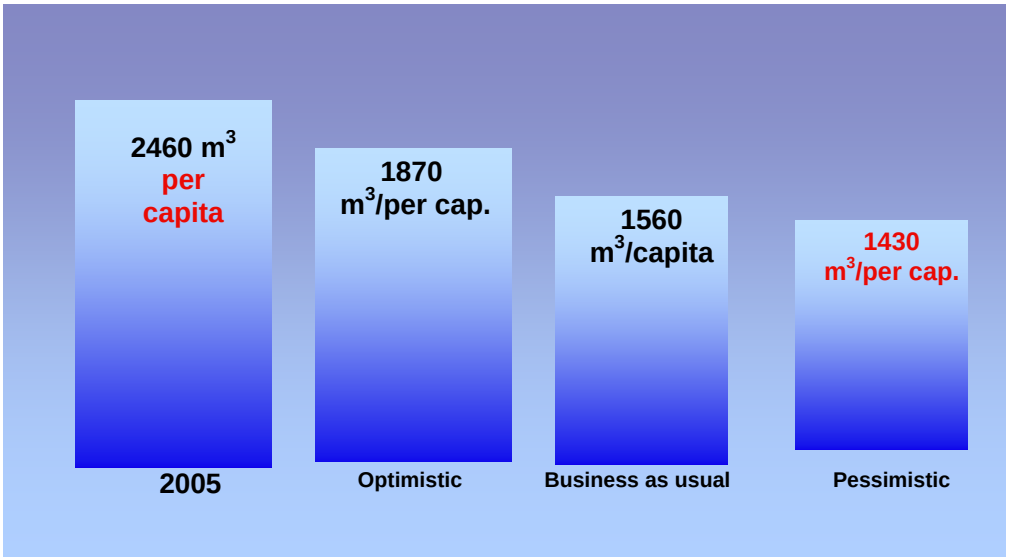
In addition – constant rise in world prices on electric power and projected twofold price increase on energy by 2025 would make other types of water resources use, irrigated agriculture including, absolutely non-competitive as compared with hydroelectricity generation. Nevertheless, socio-economic magnitude of irrigation in the region cannot be disputed or infringed – this can trigger social uprising considering rather low level of income in rural areas in all countries of the region.

A number of internal challenges should be added to the above-named list of factors. They reflect problems to be tackled related to water resources use. These challenges can be met and taken under a definite control, above all through implementing IWRM in the region. Among these in the first place are:

- Insufficient regard to water as the extremely scarce resource on the part of state/governmental management;
- Deterioration of accuracy in water accounting, this resulting in water flow losses along river channels by almost twofold!!!
- Aging of water infrastructure in all units of water infrastructure, intensifying unproductive losses and impairing managing ability;
- Low level of investments in reconstruction and modernization;
- Increase in number of water users;
- Insufficient funding for operational services and subsequent flow-out of experienced professionals.

Review of the current situation gives grounds for making a distressing forecast regarding dynamics of water availability in the region for the period till 2030. Apparently, as Fig.1 demonstrates, volumes of available water supply would diminish. So, the present average regional level of 2460 m^3/per capita/year would be reduced down to the following indicators:

- In optimistic variant – to 1870 m^3/per capita;
- In "business as usual" variant – to 1560 m^3/per capita;
- In pessimistic variant - to 1430 m^3/per capita.



What can be expected in 2030?

Fig. 2

This chart implies that during low water years the above indicated figures are to go down by 20-25%, and taking into account characteristics of entropy in large hierarchy systems, a significant part of end users will be supplied with water at the level of 50% less of their demand.

Likelihood of such anticipation implies working out some kind of imperative measures that could provide for survival strategy and sustainable development of the region. Ignoring the facts would necessitate living in the region that is doomed to "convulsive" decision-making, conflicts, mutual distrust.

Nowadays in water resources use and management there is no way for achieving own welfare by way of infringing upon the rights of other water users or at the expense of those who got in trouble. It is more so that the whole water system is closely interconnected and no one can be absolutely self-independent. It is well-known that every action causes counteraction and when arrogant vanity overwhelms an issue of disagreement, evil relationship tension emanates and even starts rapidly spreading over to other spheres of interaction between the countries. It concerns both - upper levels of water hierarchy (basin, interstate management) and all lower layers of relations between provinces, districts, WUAs, separate water users.

It is necessary to meet current and future challenges building up water relations on the basis of the integration strategy at all levels of hierarchy – integration of all kids of waters, integration of water users between themselves and with water management authorities, integration of interests of every sector of economy and nature demands. These integration processes should be oriented at potential water productivity, minimization of unproductive losses, sustainability, assurance of stability, equity of water allocation and distribution between all stakeholders.

Unfortunately, "Underlying Principals of Regional Water Strategy" worked out in 1995 with support of the World Bank failed to be realized in the WEAMP ("Haskoning") project in the framework of which they were meant to transform into an orderly strategy of regional and national development. Three scenarios that had been developed offer one undoubted conclusion – challenges of the XX-th century can be met only if parameters of cooperation and development of Central Asian states are coordinated and adjusted. Therefore, it is necessary by joint efforts of all countries to work out a new unified Regional strategy. For this purpose all pertinent mechanisms should be utilized – organizational, institutional, legal, financial, planning, managerial and technical.

Conception of such a Strategy should be based on the following requirements:

- Sustainable and secure water supply for sectors of economy and natural complex of all countries is impossible to achieve without ensuring stable and reliable transboundary water resources management, including surface flow, underground and return waters;
- Long-term goals cannot be considered without analysis of the above stated destabilizing factors. Apart from expected climate change impacts on future water supply of the region there are other factors, which will exert influence on water availability and delivery, such as population growth, augmentation of possible water withdrawal from the Amudarya River by Afghanistan, as well as deterioration of management regarding worn-out infrastructure of the republic, especially pumping complexes.
- Therefore, the conception should take into account maximal and minimal parameters of external challenges, but at the same time outline clear rules and conditions for internal challenges scenarios. Special attention

should be given to change of rivers flow regimes by water reservoirs in flow formation zones (Kambarata, Rogun, Dasht-i-Djun, Yavan, etc.);

- The conception should reflect those political and economical changes that have been taking place in all countries of the region, consider their specific conditions, especially those pertinent to water use and management caused by accelerated introduction of market economy mechanisms. It should also take into account world practice trends to overcome growing water scarcity.

In this connection, one of the main goals of the conception is to be preparation of water sector in every country of the region for transition to Integrated Water Resource Management (IWRM). It implies application along with hydrographical approach – introduction of wide scope public participation involving water users in the process of managing and maintaining water systems as well as integration of hierarchy levels aimed at reduction of organizational losses and joined use of surface, underground and return waters.

The set of measures should be stipulated in the conception as the particular goal aimed at providing nature complexes of the deltas with water, protection of the rivers, water bodies and retaining necessary bio-diversity based on water conservation and efficient water resources use.

It is obvious that major efforts along the lines of water conservation and efficient water resources use should be directed at reduction of common of water withdrawal from all sources during the period of 2015-2025. This is the task of primary importance for countries of the region and the desired target provides for reduction of common withdrawal (in all sectors of economy) at least by 20% in 2025.

Indicative of such water saving is the fact that total water withdrawal from transboundary waters during vegetation in 2007 (low-water year) was reduced down to 44.1 km3 as compared to 49.7 – 50 km3 in 2005 … 2006 without any damage to crop yield, since other crop yields in all countries turned out to be higher just this year.

The current organizational structure of water resources management at the interstate level suffers from a number of disadvantages, which have not yet been overcome. Though it is ICWC (with its bodies) that is entrusted with direct water allocation management, still in addition there are three more parallel structures at the interstate level that are in some respect involved in both - management process proper and consideration of issues on its long-term development and improvement. These are IFAS, ICSD and Energy Council of Central Asia/UDC "Energia".

IFAS and its local bodies, meant to coordinate activities related to attracting investments in the ASBP-2 program, must take part in drafting Agreements and completing them to the stage of signing, as well as other documents, designed to improve management (rules, procedures, etc.), but they are insufficient - with the exception of its several local branches, which have been performing properly, doing useful work in Priaralye.

Driven by excessive ambitions, they often cause contradictory collisions and parallelism in functioning. Regional Center of hydrometeoservices, which had to be established within the structure of IFAS and designed to ensure accuracy of accounting and forecast, unfortunately for the meanwhile has not yet been functioning in a mode meant to improve management.

ICSD in its activity has been keeping aloof; it is linked with ICWC only by the Memorandum of cooperation, though this Commission can take part in transboundary waters quality management.

Hydro-energy sector has been exerting great influence on management of river regimes, that is coordinated but rather feebly through Energy Council of Central Asia and UDC "Energia".

Truth to say, representatives of nature protection agencies participate in national working groups, established by ICSD for management improvement, but their participation is conducted outside of the sphere of ICSD's activity. On the same field of action Regional Ecological Center (REC) with its branches performs its functions. (Fig. 3)

Apart from this one more interstate organization – "EuroAsEC" periodically happens to be involved in discussions on issues of water resources management. There is a high-level group on water-energy resources; these issues are touched upon at meetings of ShOOS, etc. Exposure of water management system to regional influence generates every now and then nervousness and instability in water delivery along transboundary waters as it shown in Fig. 3 and Box 4 depicting results of analysis with regard to water distribution and delivery along the Syrdarya river for 2007.

Summarizing the current state of transboundary water management it can be asserted that ICWC copes efficiently enough with all complexities of day-to-day and year-term management, but has been somewhat slow when solving long-term and strategic tasks

Box 3

Regardless the fact that actual inflow to the Toktogul water reservoir was above the forecasted volume (deviation – 7%), the schedule of releases from the reservoir was disordered and actual releases turned out to be lower than the planned ones by 1.08 m^3 (deviation - 15.5 %). At the end of vegetation the Toktogul accumulated by 1.8m^3 more that it had been planned. Releases from the Toktogul were irregular: during first decades of June and July the releases were less by 161m^3/sec (29 %) and 209m^3/sec (32 %), whereas in the beginning of September they even exceeded planned values by 63m^3/sec (21 %).

This situation could not be compensated by releases from the Andidjan water reservoir, which due to insufficient inflow to the reservoir (forecast exceeded the fact by 27%) turned out to be less than the planned ones by 0.7m^3/sec (deviation - 27%). Actual impoundment of the Andidjan water reservoir turned out to be approximate to the planned one by the end of vegetation.

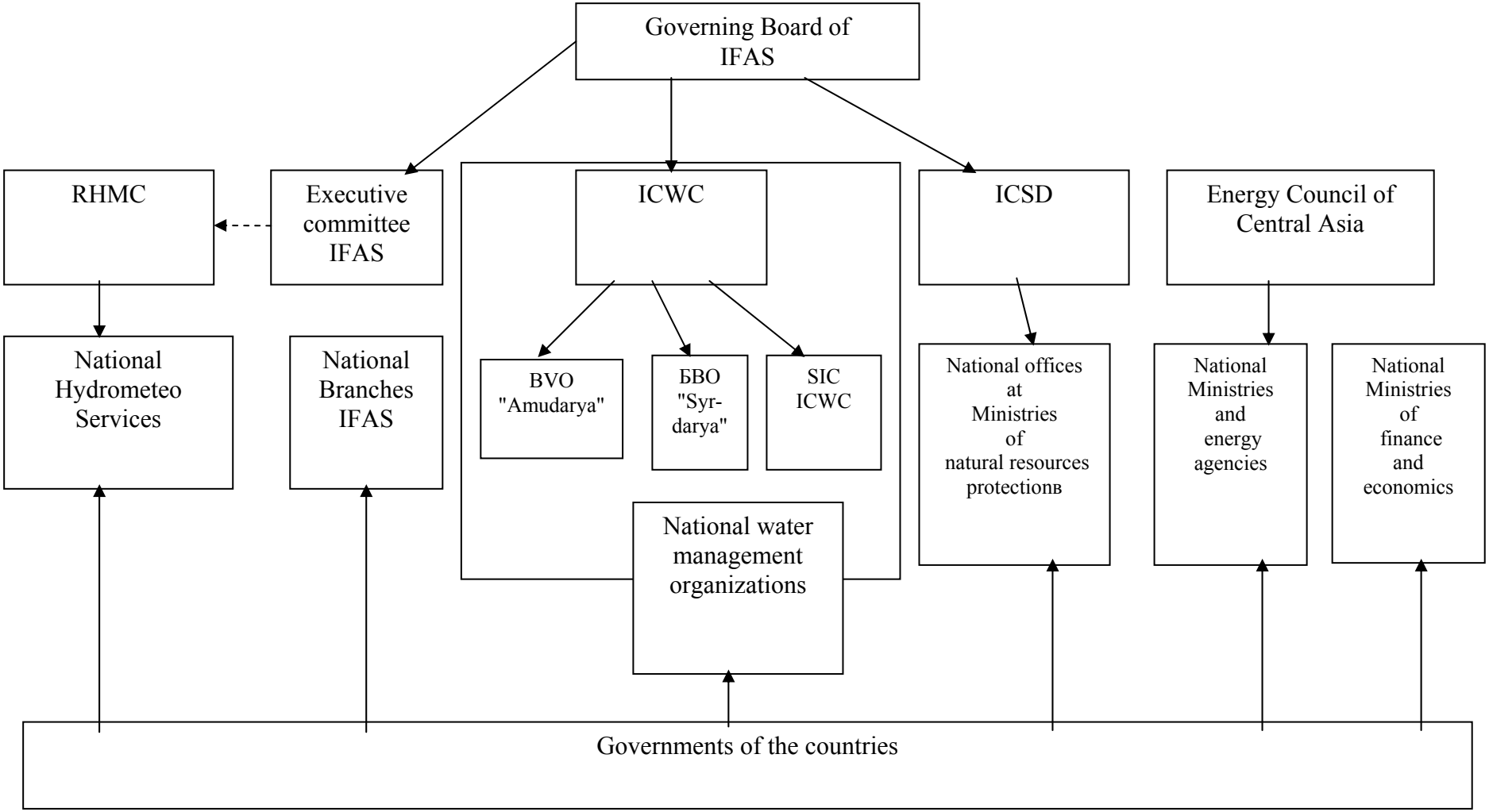


Fig. 3 Current water resources management structure at the recommended level

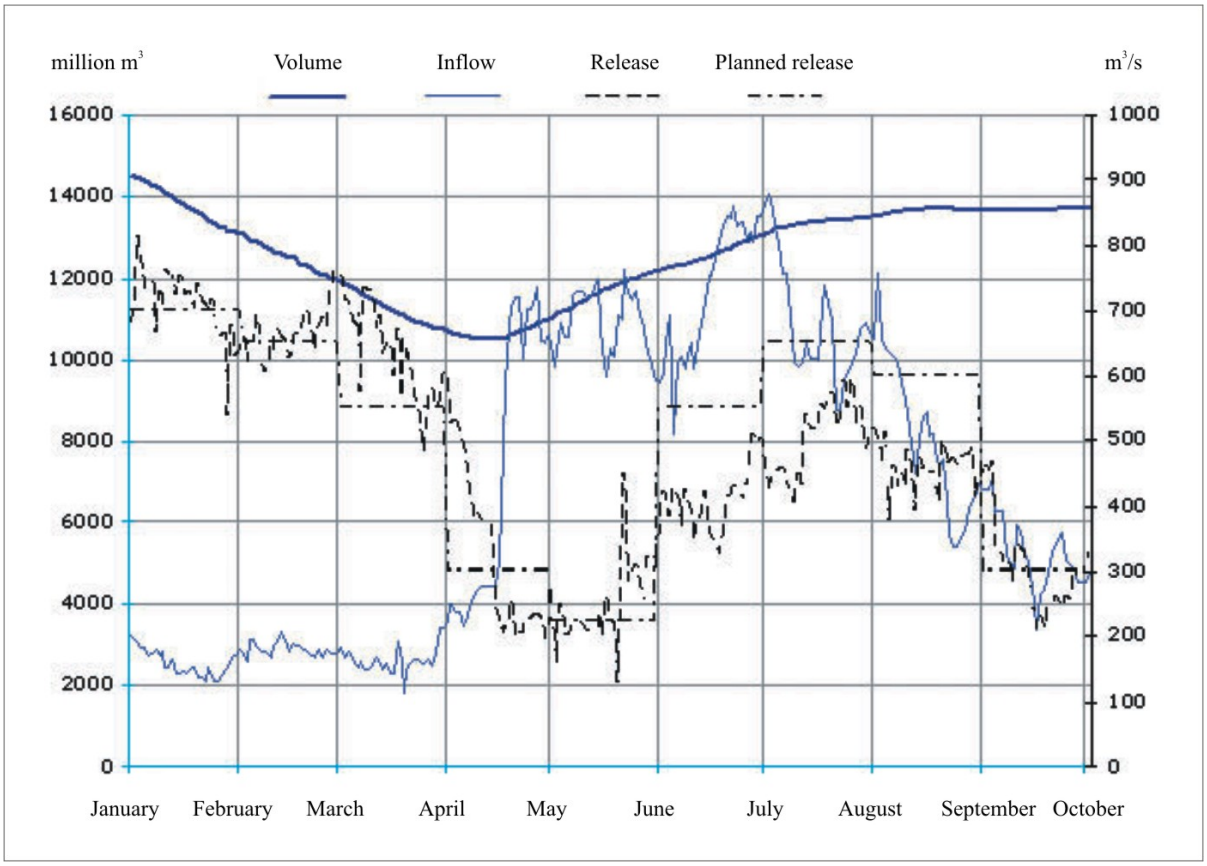


Fig. 4 Operation of the Toktogul water reservoir

Such organizational forms of regional structures are required that would ensure clear outline of their responsibilities and rights, order of financing, coordination with national organs related to water management entrusted with confidence and transparency of their operation.

The following variant is suggested as to the organizational structure of interstate management which would enable to avoid doubling and distribute precise responsibilities among its participants. The Mekong Commission structure has been taken as a prototype but specific features of our regional organization are considered. (Fig. 5)

It would be expedient if the UN could have heeded, at last, to the calls by Presidents of Uzbekistan in 1997 and Kazakhstan in 2005 and decided to take the Aral Sea management under its aegis similarly to the Mekong river (Vietnam) management.

The case in point is not about creating some new organizations or formation – the point is about attaching certain rigidity, uniformity and subordinacy to the five verticals of the regional-national interrelations enabling decision makers and stakeholders to eliminate all existing shortcomings, defects and imperfections and concurrently involve all these organizations in real water and nature resources management at the present and future levels, enhancing their effectiveness and responsible accountability. At that, the current budget for maintaining all existing organs will be enough to fund the new structural scheme of regional cooperation.

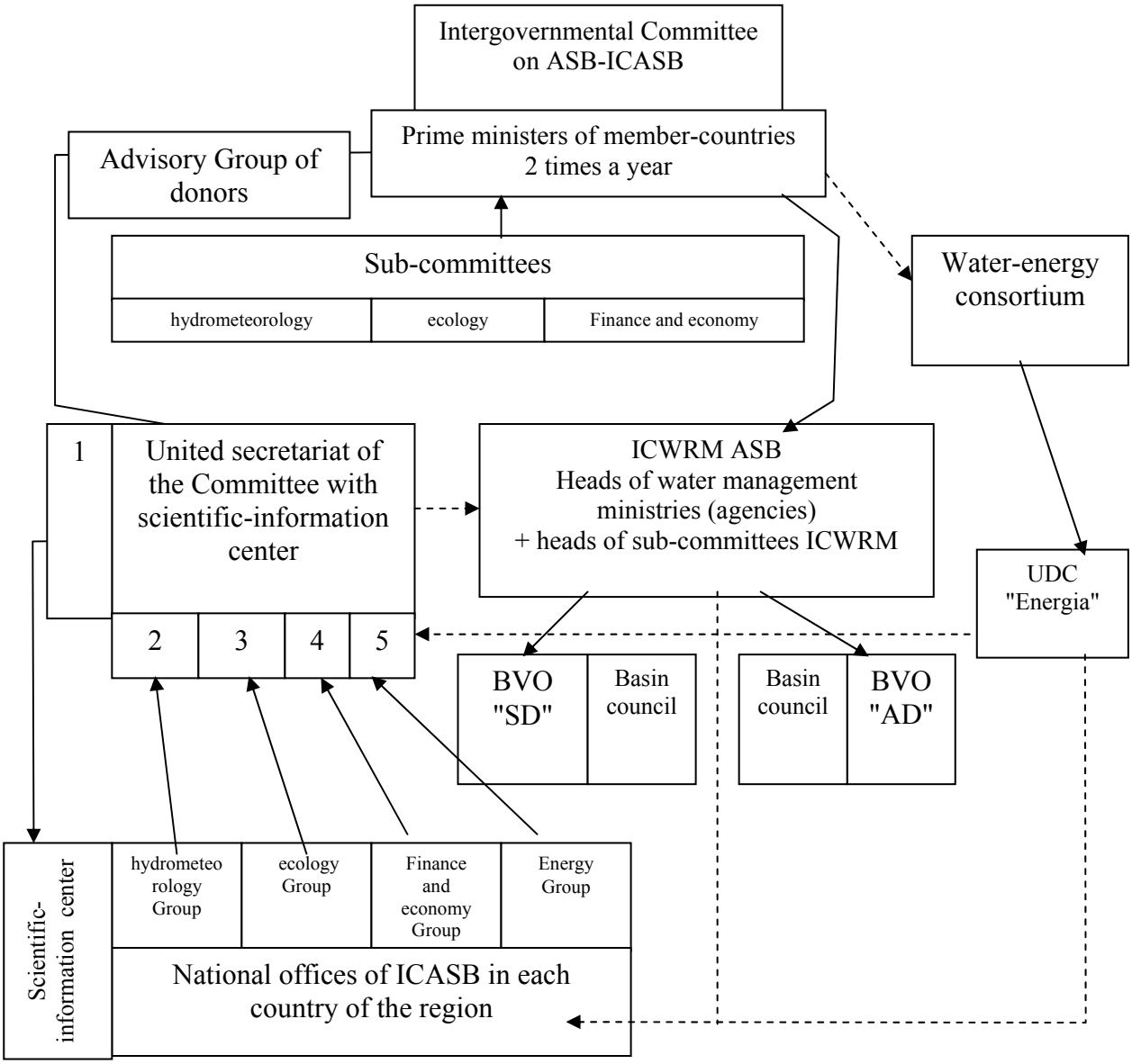


Fig. 5
Proposed scheme of an organization of regional cooperation in ASB

The hierarchy is crowned by the Interstate Committee for the Aral Sea Basin (ICASB), headed (considering special significance of water factor) by prime ministers of all countries, in turn chairing the Committee meetings held strictly 2 times a year before the vegetation period and after it. The Committee is comprised of Ministers and a deputy foreign minister (or heads of national agencies) correspondingly assigned to 5 sub-divisions – of water resources, hydrometeo services, nature protection, energy, economy and legal issues. Meetings of the Committee are held on fixed days strictly in compliance with standing orders without preliminary concordance, since the experience of ICWC functioning proves that assemblage of plenipotentiaries often used to be turned out into a long procedure of concordance: a host country conducting a meeting → to all ICWC members → requests to national governments → inter-agencies concordance → repetition of concordance for reaching consensus about the date. For the last 5 years there were 4 cases when ICWC members failed to be present and signed the documents *post factum*. The Committee should replace ICWC Board, presentation

lever of which at preset shifted from the initial rank of vice-premiers down to somewhat mixed level of representation (vice-premiers beside deputy ministers).

The United Secretariat with the Scientific-Information Center will play the role of a unified integrated executive body responsible for planning, inter-coordination, financing and ensuring efficiency of water resources management. The Secretariat is designed to execute the functions, which have been hitherto performed (or have to be performed) in a disjoint mode by SIC ICWC (box 1), Regional Hydrometeo Center (box 2), SIC ICSD (box 3), Executive Committee of IFAS (box 4) and in addition Energy sector Group is to be established that will represent UDC "Energia" (1-2 persons) in this Secretariat. Experience gained by the Mekong Commission has proved expediency of appointing a non-national of any country of the region at the head of this kind of a Secretariat, whereas the personnel should be based on citizens of regional states. Taking into consideration that Presidents of Kazakhstan N.A. Nazarbaev and of Uzbekistan I.A. Karimov have been more than once putting forward proposals about instituting the Commission for the Aral Sea Basin under the aegis of the United Nations Organization, it would be expedient to put at the head of the Secretariat a UN representative and imparting diplomatic status to the Secretariat and ICWRM ASB. The Secretariat will work in close coordination with the Advisory Group of donors, also created under the aegis of the United Nations Organization.

ICASB establishes national offices of ICASB in each country – they are meant to replace IFAS branches, ICSD branches, SIC ICWC branches and REC branches. ICWC, as the main organ of water resources management, is to be removed from the narrow framework of its current functions – purely insuring cooperation between water management organizations. Retaining its current functions, ICWC will widen scope of its activities including quality and return water management together with a sub-component of water resources protection, coordinating regimes of HPS and water reservoirs directly with representatives of the energy sector, etc. For this purpose, it being as the core of direct water management in the region, at present and for the future, ICWC will be slightly transformed the Commission on Management of Water resources in the Aral Sea Basin (CMWASB) is to be established in the capacity of the Executive body of the Committee, comprising of water management agencies of member countries and heads of Regional Hydrometeorology Center, sub-committee on water resources protection (former ICSD), sub-committee on finances and investments (former EC IFAS), comprised of ministers (or deputy ministers of finances), sub-committee on energy, head of UDC "Energia" (or a representative of Energy Union of Central Asia). All these heads of sub-committees are to be rotated taking turns every six months in the alphabetic order.

National offices include specialized sections acting on behalf of corresponding ministries and agencies focusing on implementing measures planned by ICASB meetings along the lines of improving the system of transboundary waters management.

At that, coordination of specialized sections' activities is carried out by corresponding sub-committees by way of holding semi-annual (quarterly) meetings through departmental officers of corresponding national ministries and agencies. This approach should assign such departmental officers for constant long-term specialized work in the field of transboundary waters and ensure continuity of opinions, since frequent rotation of departmental representatives in working groups and consequent inconstancy of their opinions often hinders preparation of principal decisions, agreements and procedures of work.

The suggested scheme will enable the management to achieve the following goals:

- Concentrate all guidance and decision-making activities relevant to the Aral Sea Basin water and natural resources management at the level of prime ministers, including development of major items of annual and long-term strategic planning, promoting speeded up formation of an unified scope of legal regulatory norms application with regard to interstate relations, solving principal problems of financing, allocating expenses, and organizing interaction between sectors of economy. This approach will secure prevention of any sectoral interference and obstacles.
- Retain orderliness of management at the national level in various sectors of water use, coordinated and controlled in compliance with regional regulations, constrains and requirements through the United Secretariat of the Committee and ICWRM;
- Augment the potential of interstate efforts, since transformation of ICWC into ICWRM will signify not only change of the name but involvement of additional regional management actors - representatives of other sectors and agencies alongside with water sector (and agriculture): - energy, hydro-meteorology services, nature protection, economics - and enhance the status of this interstate entity through attachment to its activity representatives of Ministries of foreign affairs;
- Avoid parallelism, latent competition and dissipation of resources both national means and those of donors' organizations, focusing them on implementing clearly defined arrangements by the Committee of the basin;
- Incorporate into the system Water-Energy Consortium in the capacity of financial mechanism designed to coordinate interests of energy sector and scheduled water use regimes;
- Involve hydro-meteorology services and ecology protection establishments in the unified system of management and participation in activities of ICWRM. In that case these agencies will be required to accordingly secure more adequate organization of accounting and forecasting of water situation, assume more responsibility for reliability of forecasts, attain integrity and higher responsiveness in providing hydro-meteorology data and work out precise order of water quality control, participation in defining quotas of discharges and their management for nature protection purposes.

But the most significant outcome of the suggested scheme is generating conditions under which disconnected organizations start actively interacting with ICWC in water management, in preparation of legal and material basis, in capacity building through direct participation of senior officials in activities of ICWC (CMWASB) with a deciding vote; former ICSD in the form of sub-components on ecology will elaborate constraints and recommendations regarding management of return waters, quality, make requirements and conduct control over meeting delta/river water demands as nature objects. Taking into account "consensus" rule this will put a new impetus to decision making and implementation.

In terms of organizational improvement, transition to application of IWRM principles at the basin level will be of great importance. It means that performance of BVO functions should be supported by establishing Basin Councils in each basin involving representatives of provinces, principle water users (HPS), delta

associations and authorities and other stakeholders. Such community organizational structures will follow the model of Canal Committees (or Unions of Water Users) established within the framework of IWRM "Ferghana" project on pilot canals of the Ferghana Valley. These community public organizations will participate in coordinating plans and regimes of water bodies operation, control their realization, assist BVO in attracting means to improve operation and maintenance, development and modernization.

Along with these institutional principles, organization of basin Committees or Councils is also of great importance regarding basins of small transboundary rivers. Apart from two large rivers in the region there are more than 20 rivers which used to be tributaries of the Amudarya and Syrdarya and now disconnected from them. By analogy with the would-be Chu-Talas basin authority, similar organization should be established along the Zarafshan, Kafirnigan and 20 rivers more, mostly in the Syrdarya river basin. At present, such like works have been launched within the framework of the "IWRM Ferghana" project on the Shahimardan (Kyrgyzstan-Uzbekistan) and Hodjabakirgan (Kyrgyzstan-Tajikistan) rivers. It is expedient to spread similar works to all other transboundary small river basins.

Development of legal basis of interstate cooperation

At present there are several principal interstate Agreements relevant to Central Asian water resources management: two framework Agreements – of the 18th of February, 1992 and on the Syrdarya river of 1998, as well above mentioned Agreements and Declarations concerning ICWC.

Formerly, the text of "General provisions of the Regional water strategy" had already stipulated further development of the framework agreements through working out more detailed issues.

Preliminary analysis reveals that while the general policy of interstate agreements is right and adequate to the regional situation and they had been worked out in compliance with international law, still there is a necessity to further develop and elaborate them as well as to give more precise definitions to some provisions.

Legal and judicial support of water strategy is envisaged in the form of elaborated set of principal provisions and agreements, which would clearly regulate both – development of water strategy and its realization adhering to clauses of rules and propositions of law which might be pertinent to water resources management and which must ensure sustainable development in conflict of interests conditions.

To a first approximation, such documents should cover the following issues:

- inclusion of all transboundary waters(surface, underground, return) in the sphere of ICWC influence;
- more precise definition of BVO functions and its structure taking into consideration the strategy being developed for the purpose of as full as possible coverage of every river's channel by BVO performing capacities;
- rules for joint use of all types of water;
- legislation and standards on water quality, wastes limitations and particular ingredients in water;
- procedure for drafting and approval of decisions made by interstates organs;
- procedure for disputes settlement and arbitration;
- responsibility for violation of quotas, regimes, rules and for water pollution, failures in water delivery to the Aral Sea;

- safeguard of water structures and watercourses of international significance;
- responsibility for generating the common array of information;
- procedure of joint works on rivers, lakes and watercourses;
- assessment of damages and order of compensation for them, including compensation for flooding of lands, deterioration of water quality, etc.

- In addition, the following definitions are required to be further considered and reflected in relevant international documents:
- concept and provision of equal water use rights;
- criterion of joint water use efficiency;
- priority of common-basin interests over national ones and limits/jurisdiction of this priority.

At the same time, a number of constituent documents/instruments of international organs need to be amended by additionally including into them some items relevant to:

- constitution and membership of the organ;
- authorities and responsibilities;
- procedures of decision making;
- funding of interstate arrangements and activities.

Elaboration and drafting of these documents had been started within the WARMAP EU project, and then ICWC proceeded with this work (with participation of EC IFAS) supported by the RETA 6163 project of the Asian Development Bank. At present, ICWC has already approved the text of the "Agreement on information exchange", prepared for submitting to ICWC consideration the "Status of ICWC" and the "Agreement on improvement of ICWC organizational structure" (apparently it will be discussed and adjusted at the meeting of ICWC in October, 2007). A new text of the "Agreement on water and energy resources of the Syrdarya river use" has been prepared. There are five discrepancies in this Agreement that need to be settled by the countries, which fail to reach consensus on that score for along time.

A need for developing a legal basis of interstate relations had been reflected in a considerable part of ASBP-2 program, approved by heads of States in 1996. This program includes not only Agreements, which have been in the process of elaboration within the framework of RETA 6163 program but also some procedures and recommendations on rules of operation supplemented to these Agreements. Thanks to support by ADB this work has been stated and developing, though there is some time lag. As to other pending documents, difficulties should be noted relevant to approval of the "Status of Water-Energy Consortium"(WEC) the main obstacle lie here in wide variety of different approaches to concepts of such an interstate economic entity – different concepts correspond to views and positions of countries matching their interests. One party suggests WEC as a supplement to the existing structures, another group of countries are in favor of a substituting them.

The origin of difficulties hindering progress in formation of the cooperation legal basis is caused on the one hand by absence of a permanent group of interstate experts that could tackle the above stated problems on a constant basis, and on the other hand – by a very complex system of adjustments of various views, coordinating them and approval. Drafts of the above listed documents are worked out by National and Regional working groups (NWG and RWG) within ICWC. Various countries have different approaches to appointing members of their National working groups. Tajikistan has approved membership of its NWG by the

resolution of the government, all others – barely co-ordinate with the government inclusion of experts from various ministries in their NWG.

Next, the procedure of drafting and coordinating continues moving in the following way: NWG submit their proposals as to the texts of documents (draft Agreements, agendas, procedures) to RWG, then, at the meeting of RWG with participation of 2-3 representatives from each NWG an agreed text is worked out, which is returned back to NWG. As a consequence of their coordination with Governments and other agencies, different opinions emerge entailing changes in texts agreed at RWG meetings. After that the procedure repeats its circle. As applied to some agreements, e.g. on the Syrdarya river, there have been already 9 such like interpretations, and all the same, there still remain definite discordant paragraphs. This situation is subject to changes in NWG membership, rotation of senior officials in national agencies and - sometimes absence of adequate mandates from a government.

In case the above offered structure (Fig.4) is accepted, all elements of this process will be functioning within the framework of interaction between structures of the Interstate Committee and its regional and national organs, which will be entrusted with wide latitude of governmental powers determined by the high State's mandate of their members. Control exerted on the part of Prime Ministers and participation of Foreign Affairs Ministries' representatives in the procedure is meant to emphasize a higher status of drafted documents and speed up procedure of their processing.

FINANCIAL INSTRUMENTS of interstate cooperation are at present represented by way of participation of the countries in maintaining interstate organizations, carrying out necessary works at transboundary water structures on its own territory or on agreement (request) of the other country at water facilities of a ICWC member state on payment for certain contract obligations regarding use of another country's territory. Within the framework of implementing activities stipulated by the RETA 6163 ADB program ICWC working groups have carried out data collection as to costs incurred by the countries on maintaining interstate watercourses and regional organizations. Initially, despite some discord of technique nature, the parties managed to make an assessment that is reflected in Table 1 compiled for ICWC members.

Box 4

What is the approach to conflict resolution or conflict avoidance?

- **Learn to listen all but not selectively;**
- **Learn to understand the opinion of the counterpart (or be in his/hers place);**
- **Having understood your counterpart, try to find the direction where you can meet his interests half-way and urge him to do the same!**
- **Trust! Do not think bad about the counterpart!**
- **Overcome "ego"! It is your enemy and the friend of your enemies!**

Table 1

CONSOLIDATED REPORT ON INVENTORY

Of works carried out by countries regarding maintaining of the Amudarya and Syrdarya water resources joint management as of 2006

	Types of activity / costs	*Kazakhstan /thus.$*	*Kyrgyzstan /thus.$*	*Tajikistan /thus.$*	*Turkmenistan /thus.$*	*Uzbekistan /thus.$*	***Total***	***%***
1.	Works related to maintaining transboundary river channels - rectification works, bank-protection and other берегозащитные и иные flood-control measures	14298.3	536.4	2750.0	4897.2	3433.9	25915.8	42.6
2.	Maintaining and damage control works at structures of interstate significance, including works for ensuring security of hydraulic structures	3300.0	1906.8	3230.0	2179.1	15195.1	25811.0	42.4
3	Maintaining interstate organizations in the field of water resources management	307.0	32.2	347.3	3543.0	2859.7	7089.2	11.6
4	Hydrometeorology services providing information on accounting and forecasting of transboundary waters	1074.5	165.8	10.0	78.8	663.6	1992.7	3.3
5	Другие мероприятия				44.2		44.2	0.1
	TOTAL:	18979.8	2641.1	6337.3	10742.3	22152.3	60852.9	100.0
	Total %	31.2	4.3	10.4	17.7	36.4	100.0	

	Kazakhstan	*Kyrgyzstan*	*Tajikistan*	*Turkmenistan*	*Uzbekistan*	***Total:***	
Allotment shares of general water withdrawal, including internal (domestic) sources, %	11.2	4.3	10.2	22.9	51.4	100.0	
Withdrawal, , including internal (domestic) sources, km^3, (2003)	11.6	4.4	10.5	23.7	53.1	103.4	
Common expenses on maintaining joint management in the basin (according to inventory results)	18979.8	2641.1	6337.3	10742.3	22152.3	60852.9	
Costs of $1m^3$ of water withdrawal ($\$/m^3$)	0.164	0.060	0.060	0.045	0.042	0.059	

Consolidated data reveal that the countries bear rather irregularly distributed load, in terms of amount of costs for 1 cubic meter of water withdrawal from the river.

Proceeding with this analysis, the working group came to the agreement about the list of expenses and services, which should be taken into account while defining more accurately amount of costs for 2006. However, some issues remained outside of calculations – particularly, items of distribution of profit shares and compensation for losses (damages), which, in the opinion of some countries, they do not receive in addition from their neighbors. Particularly it concerns assessment of damages caused because of generating less electricity than one's due in winter time by hydropower facilities operated by the countries located in flow formation zones as compared to their full-scale hydropower capacity. Since there are no clear recommendations on the part of International Water Law as to such like precedents, it is impossible to definitely design a mechanism of analogous calculations. However, combination of principles of "equitable and reasonable water use" and "do not harm, but if harm - pay" enables outlining some definite approach that we (Dukhovny, Sorokin) have detected while assessing impacts of operating the Vaksh river cascade, including Rogun exerted on the Amudarya river downstream water structures.

Table 2 adduces collation of the various cascade operational regimes with socio-economic outputs of irrigated agriculture in middle and lower reaches of the river on the territory of Turkmenistan and Uzbekistan for the period till 2055 under retaining current development trends. It is assumed here that prices on electricity and agricultural production will be retained at the current level under some increase in electricity charges in winter as compared to summer – correspondingly 0.02 and 0.015 $ for one kilowatt-hour. Five combinations of three regimes (energy, irrigation and combined) are considered under two variants of dam watermark elevation level at the Rogun hydro scheme (1240 and 1290) in comparison with the current operational regime of the Vaksh river cascade (Table 2).

Table 2

Collation of various operational regimes and parameters of the Rogun hydro scheme with their impact on indicators of socio-economic development for the period of 2005-2055 (mln. $/year)

Variants	**Production losses of irrigated agriculture and related sectors of economy per year**	**Decrease (-) or increase (+) in losses per year with regard to current regime of the Nurek river taking into account input from generating electric power**	**Generation of electric power by the Rogun hydro scheme in terms of money**	**Aggregate gain against the current regime of the Nurek**
Retention of current regime of the Nurek river	94.71	-	-	-
Energy regime water mark - 1240	211.3	116.59	162.35	45.76
Energy regime	174.6	79.89	194.71	114.82

Variants	Production losses of irrigated agriculture and related sectors of economy per year	Decrease (-) or increase (+) in losses per year with regard to current regime of the Nurek river taking into account input from generating electric power	Generation of electric power by the Rogun hydro scheme in terms of money	Aggregate gain against the current regime of the Nurek
water mark -. 1290				
Irrigation regime water mark - 1240	59.2	-35.5	159.39	194.89
Irrigation regime water mark - 1290	37.85	-56.86	188.41	245.27
Irrig-energy regime water mark – 1240	76.18	18.53	194.84	176.31

If to adhere to the "do not harm" principle, then the amount of aggregate gain expected from the Rogun hydro scheme should be adjusted by the value of production losses at middle and lower reaches caused by this water scheme construction. In this case both variants of energy regimes become less efficient as compared to the rest of three other regimes. At that, advantages of a combined irrigation-energy regime become more evident, since increase in generating electricity almost up to the level of the energy regime results in reduction of irrigated agriculture losses as compared to the current regime of the Nurek in average by 18.5 million USD a year.

International practice (Canada and the USA) suggests some proper approach to solving this problem by means of separating functions between water management in water reservoirs and water releases from HPS introducing payment for water delivery through turbines and accordingly water delivery for irrigation and other demands on the commercial competitive basis. Some elements of similar interested motives are assumed as a basis in elaborating a water-energy consortium (WEC), the concept of which had been put forward at the high level, but unfortunately failed to get common understanding and interpretation on the part of all countries of the region. One group of developers suggested accepting WEC as a financial mechanism regulating releases regimes agreed with ICWC, others conceived it as some super-uniting authority controlling all regional water and energy resources.

More weighted and valid interpretation of the idea has been proposed by "EuroAsEC" (E.Vinokurov, Funding of the Central Asian water-energy complex, 2007), who suggests to establish WEC in the capacity of a "permanent interstate organ performing functions of an investments coordinator and a water-energy complex dispatcher". This approach also suggests that WEC in future would administer development of the regional hydro-energy potential, untapped capacities of which are reckoned up to more than 15,000 megawatt coupled with several Thermal Power Stations designed to recuperate winter electricity deficit. The given point of view concerns nearly to the WEC concept developed by SIC ICWC implying

that this structure is meant to be precisely as an financial instrument for regulating, first and foremost, necessary releases regimes, and only after that, to attract investments in future development. In our opinion, the Water-Energy Consortium should be established in the capacity of:

- an organizational structure that can arrange by way of maneuvering fuel/energy resources of Central Asia and financial means arranges these resources regular exchange ensuring strict implementation of coordinated plans of water distribution and delivery to the countries and their systems as well as of releases from water reservoirs set by ICWC taking into account social and ecological demands of each country;
- an operator of energy and fuel cross-flows ensuring secure provision of regional countries with fuel resources and electricity necessary for regular life support and economy functioning;
- a financial structure designed for attracting means in all possible projects of developing new hydro power capacities to be operated under coordinated between countries management terms and releases regimes.

MECHNISM OF PLANNING regarding water distribution and regimes of releases from multi-purpose water reservoirs (with hydro-power stations) may be significantly improved with participation of WEC regional branches. At present, ICWC at its meetings approves only quotas of water allocation/delivery and recommends releases regimes to be coordinated with energy sector organizations, owners of HPS. This kind of coordination (including compensation arrangements regarding electricity and fuel delivery) conducted with participation of senior officials of national energy agencies can be delayed sometimes till June and in fact frustrates a normal planning order before the hydrological year (the 1st of October) and vegetation period (the 1st of April).

Other measures to improve planning system should include contemplating augmentation of hydrometeoservices' forecasts accuracy regarding natural inflows to water reservoirs from flow formation zones as well as, in particular, of forecasting lateral inflows taking into account formation of return waters. At present, as CARWIBH's analytical findings reveal, under average annual accuracy of inflow forecasts for vegetation periods within the range of 17-35 %, forecasts of inflow for the period of April-June by some water reservoirs differs from the expected by more than 50%.

Such deviations make actual operational regimes of interstate water management complex extremely unstable at the beginning of vegetation periods. Nowadays both BVOs have become proficient in computer methods of planning and adjustment of plans according to forecast amendment and changes in current water management situation. However, certain measures are required tj make this planning more efficient through improving coordination of activites carried out by hydro meteorology services of five countries of the region, active capacity building and achieving more close cooperation between national and regional water management agencies. Specifically, there are in store the following measures:

- establishing a unified system of water accounting and monitoring of river water flows, including transboundary components and underground waters;
- ensuring more accurate data collection and constant control over river flow losses in the river channels that have lately increased by 2 times;

- organizing reliable hydro meteorology and climate forecasts putting special emphasis on forecasts of low-water and high-water years by months.

Unfortunately, efforts undertaken by various donors, first of all by SDC, to promote establishment of a Regional Hydrometeorology Center are confronted with ambitions and commercial egoism on the part of some national services. In case of implementing the suggested transition to the organizational structure of regional water cooperation under the leadership of Governments of five countries, these unfavorable tendencies would be overcome proceeding from vital necessity to strengthen cooperation between countries in the field of international water resources management in the interests of all states for survival in conditions of increasing water scarcity.

STRATIGIC PLANNING system should become the corner stone of the approach to planning mentioned above, which will enable decision makers to create the basis and platform for future water survival of the region regardless all complexities of national interests and regional constraints. This, of course, will require not only funding but also absolutely new principles of joint activities – not just involvement of foreign experts, who can only produce a non-binding report – but joint variant planning of alternative development prospects by national institutes of strategic studies with participation of water management agencies on the basis of inevitable search of commonly acceptable decisions.

Elaboration of such a document will be constantly monitored by the Basin Intergovernmental Committee and ICWRM (transformed former ICWC) that through its United Secretariat with the Scientific-Information Center will strive for achieving consensus between the countries in working out Development Strategy and preparing this document for approval by Governments of all countries in the form of a special Agreement on Long-Term Development and Planning, implying as the constrain to all kinds of available water resources.

Consideration of climate peculiarities is very meaningful for strategic planning when working out future water policy of the region as whole and every state in particular. By the example of calculation of long-term water regimes and use/consumption in the Chirchik river basin (part of the Syrdarya river basin) it is obvious that, despite variation of different models and situations, there is a quite clear pattern of changes: - comparability of extreme years fluctuations with average flow parameters being retained for a long term period and constant increase in water demand due to augmentation of evapotranspiration. Therefore, we have to stop ignoring possible climate changes and work out pertinent arrangement aimed at adaptation to climate change.

Table 3

Collation of calculation variants regarding two possibilities of climate change (Chichik-Ahangaran-Keless basin)

	Total resources		Water demands	
years	BAU/**ECHAM**	OPT/ **HadCM2**	BAU/**ECHAM**	OPT/ **HadCM2**
2006	7908	8019	4778	4968
2011	8841	9404	4714	5404
2016	7263	7540	4714	5188
2021	6662	6944	5299	5258
2024	5154	5871	5362	6270

MANAGEMENT MECHANISMS regarding cooperation assume in the first line creation of a transparent mutually accessible regional Information System encompassing each river basin system linked with national information systems working on the principle of an "information sieve" and unified morphologic construction of regional, basin and national systems.

Such system have been developed within CAREWIB project for upper levels of water hierarchy (region, basin, country) and it even partly covers the level inside the country in the form of so called "planning zones" that coincide with administrative borders of provinces or are included in them. With the help of GIS, planning zones are coupled with sub-basins and subdivided into irrigation systems and drainage water catchments. Fig. 5 demonstrates a morphologic scheme of the Syrdarya river basin with subdivisions into "planning zones" (PZ), Fig. 7 shows how these PZ are linked with irrigation systems on the example of CHAKIR (Chirchik, Ahangaran, Keless) sub-basin. The information system includes the database, GIS system and a set of auxiliary models enabling users to solve problems of operational management and long-term planning coupling of which is shown in Fig. 8 and 9.

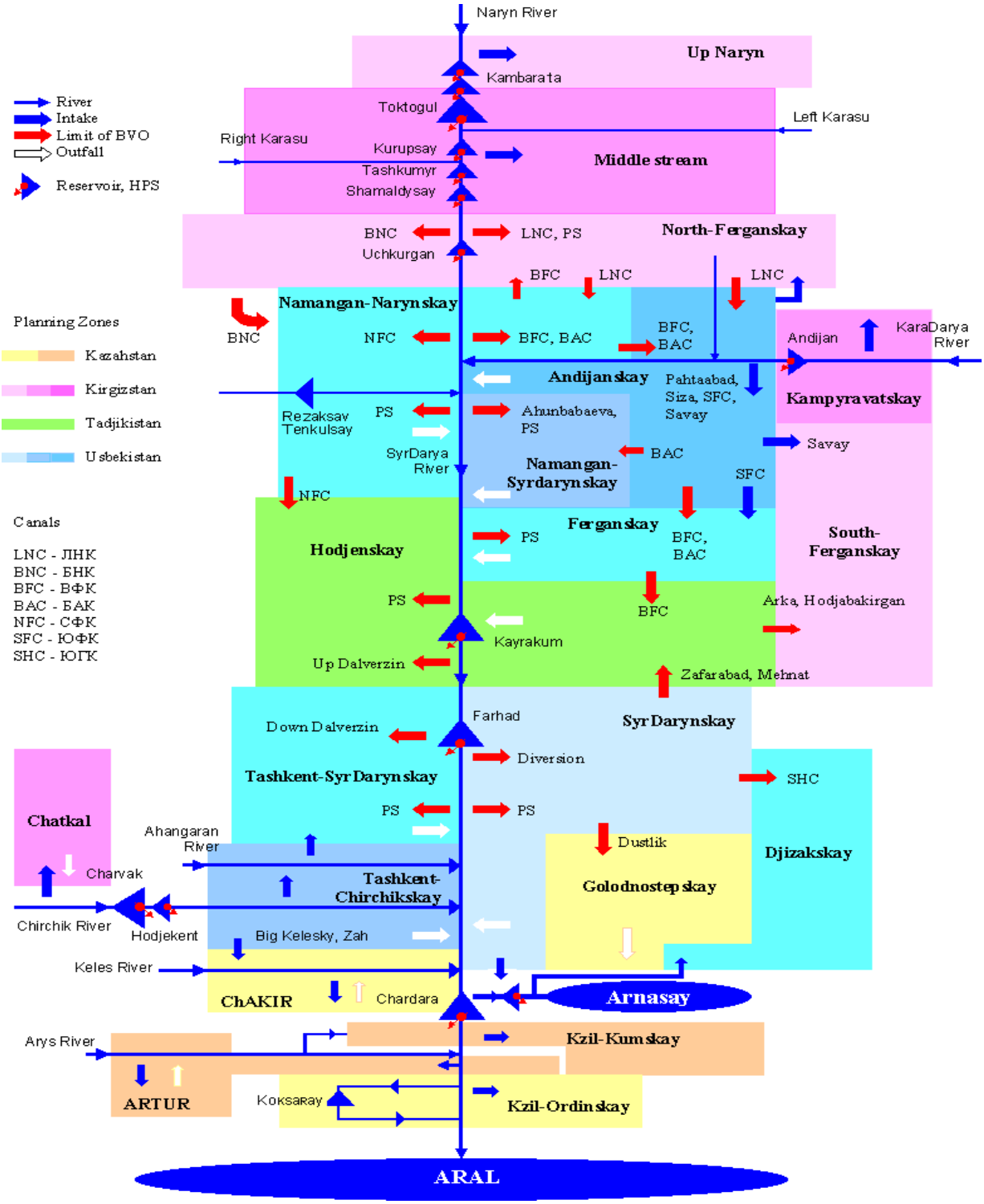


Fig.5: Morphologic scheme of the Syrdarya river basin

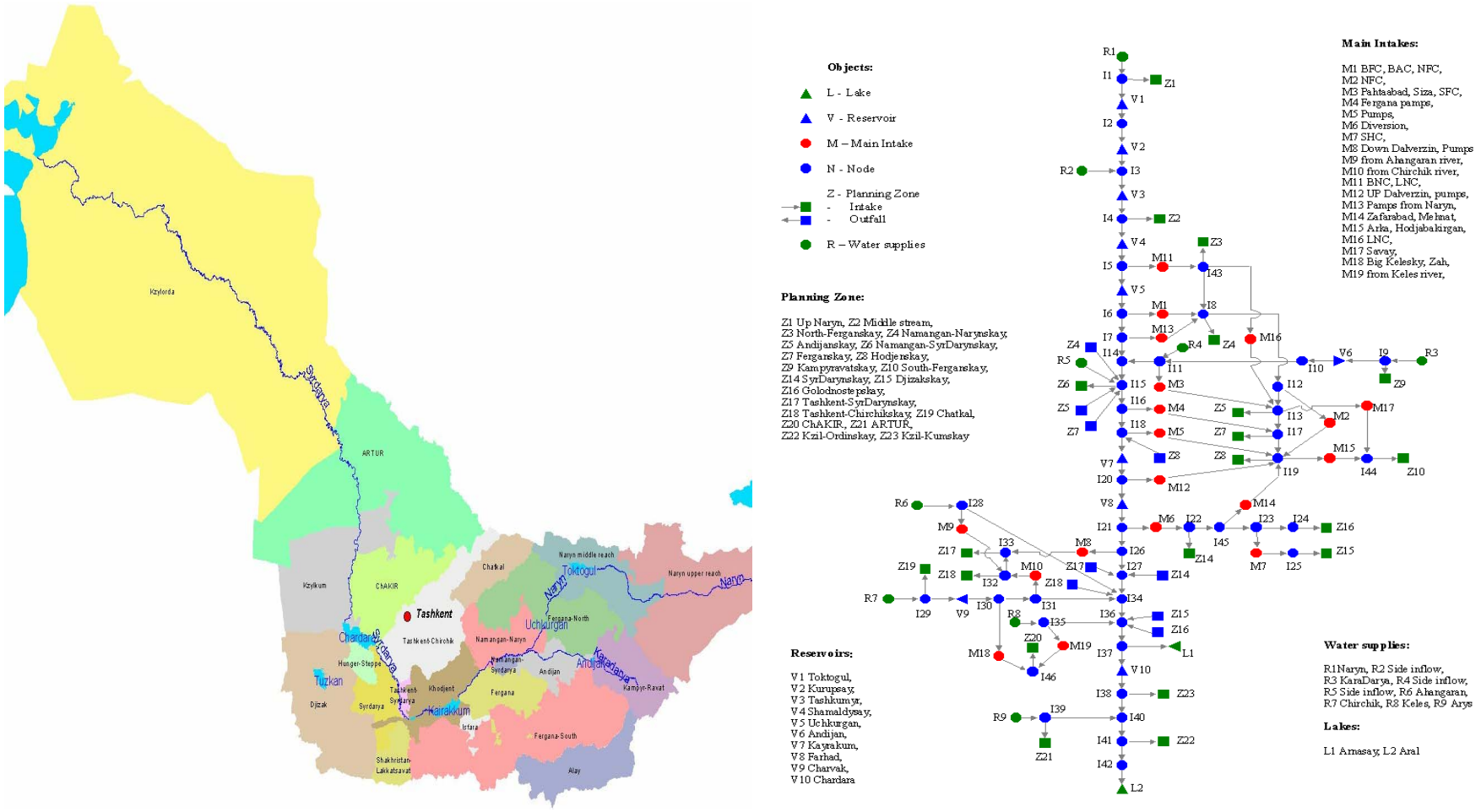


Fig. 6
The Syrdarya river basin. Planning zone and the scheme of modeling

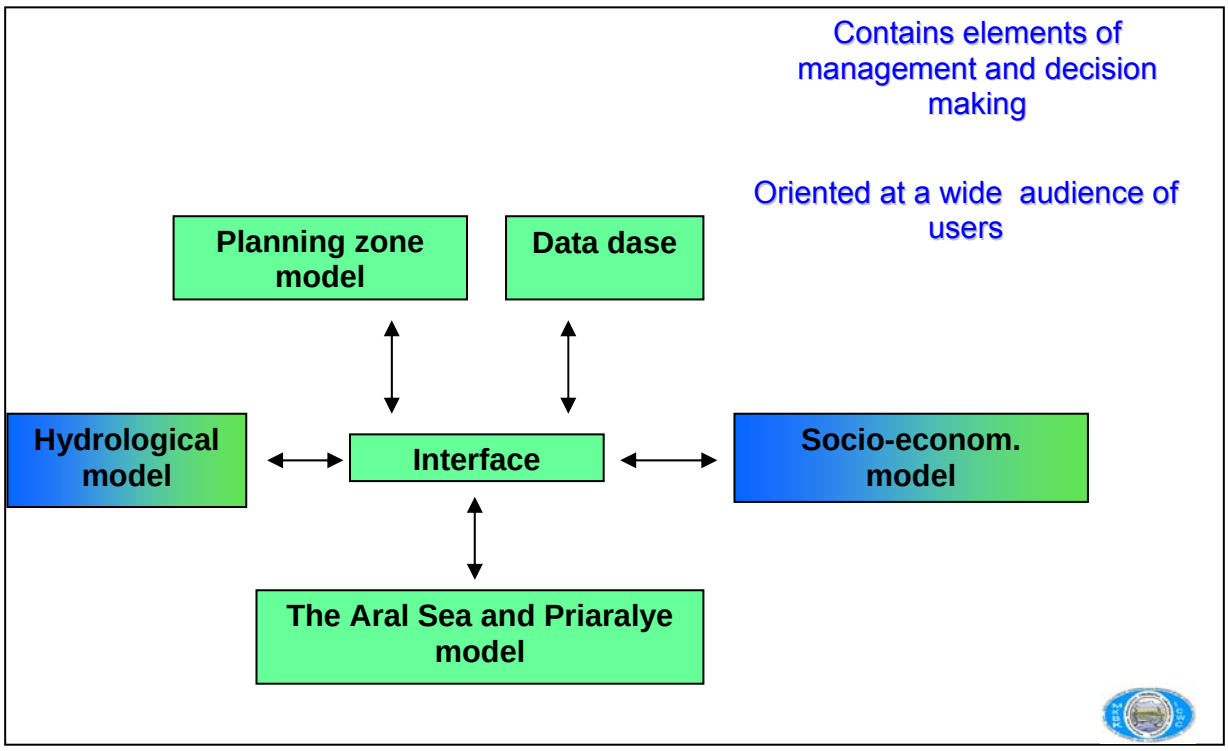


Fig. 7
Hydrological model (HM) of the Amusdarya basin in a set of ASB-MM models

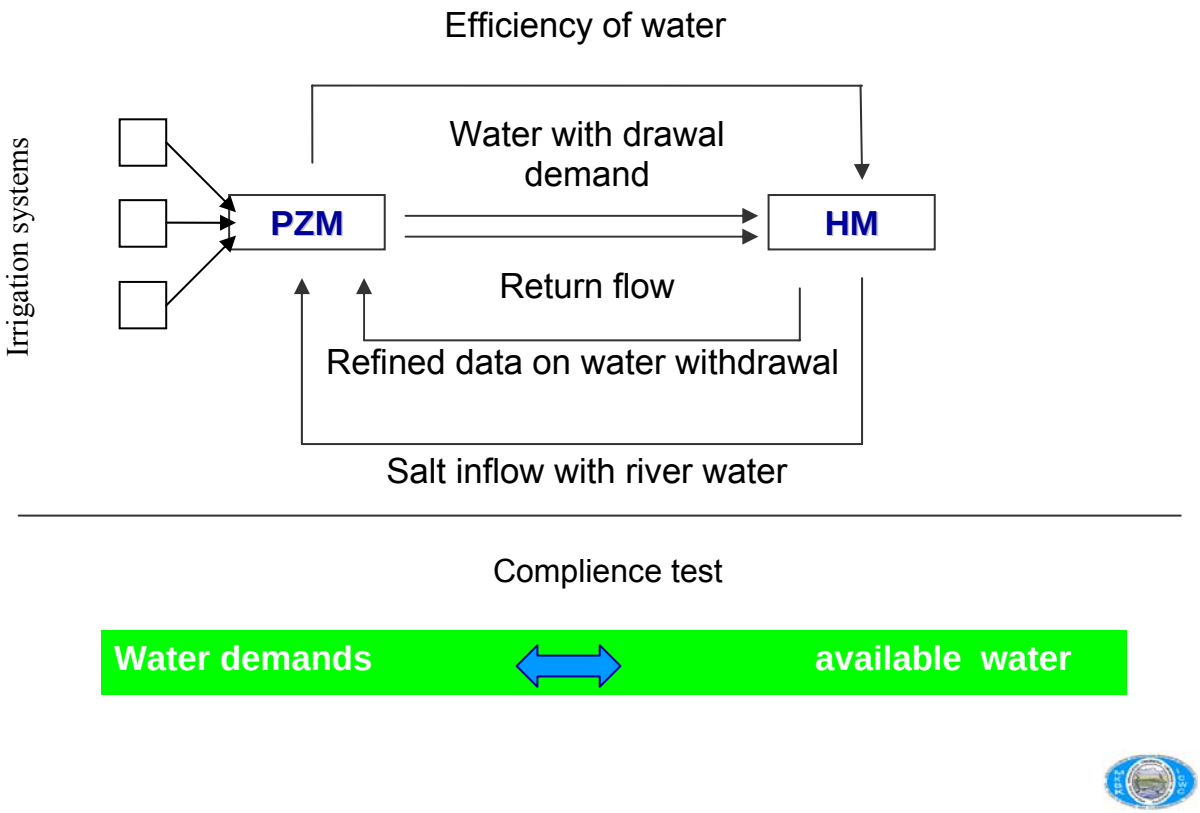


Fig. 8
Relation between HM and the planning zone model (PZM)

The set of models suggested for planning and assessment of management results enables users to constantly make correctives in water distribution so that to achieve maximum observance of planned water delivery quotas by each zone, by each country and by each water management district and planning zone. At that, the mechanism of models developed by us (it has already been tested on three large canals in the Ferghana Valley within the "IWRM Ferghana" project) based on assessment of uniformity of water allocation facilitates achieving both – necessary volumes of water supply and needed stability. At the same time, socio-economic blocks of the models make it possible to calculate consequences of one or another principle of water allocation, their impact on productivity of agriculture and development of secondary sectors of economy so that "changes fiends" could comprehend and evaluate consequences of their own agitated activities.

Involvement of stakeholders in water management is another important instrument of management. The experience gained on the South-Ferghana Canal (SFC) where this IWRM approach had been pioneered proved that – combination of a hydrographic management method on the area of about 100 thousand ha with participation of stakeholders enabled water users to reduce the volume of water delivery along SFC by 18% as compared to 2004 (Fig. 10) without any special investments but expenses for improving hydrometrics. (Box 5)

SFC. Actual water delivery. Vegetation

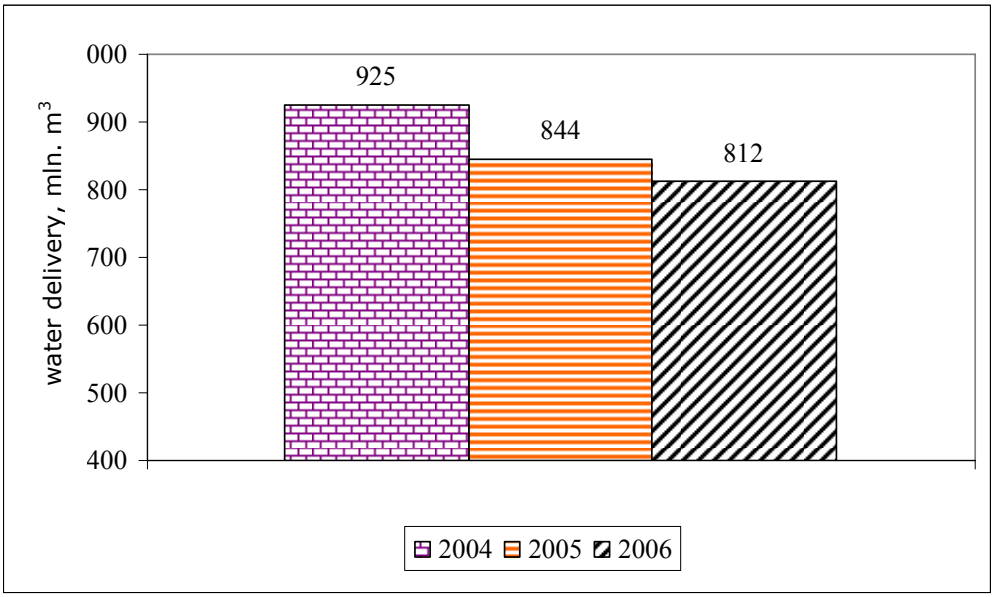


Fig. 10

Box 5

«IWRM is the system of management based on accounting of all kinds of resources (surface, underground and return waters) within hydrographic boundaries. This system links interests of different branches and water use hierarchy levels, involves all stakeholders in decision making, contributes effective use of water, land and other natural resources in the interests of sustainable satisfaction of water requirements of the public and nature»

Similar involvement of water users in the form of establishing Basin Councils attached to BVO "Amudarya" and "Syrdarya" will enable water management to improve coordination of work carried out by various water development and use organizations along river channels and at the same time assist both BVOs in maintaining order and discipline of water distribution. Experience of operating CWC on SFC as well as activities within other pilot projects demonstrates that monthly meetings of Water Councils or Water Committees members ensures public involvement in water management in the capacity of not only controllers but also as parity participators, who will be responsible for maintaining scheduled regimes and withdrawals at every separate sectors of the river. With this purpose it is expedient to organize structure of Water Councils as an assemblage of separate cells – each responsible for a curtain balance section of the river so that firstly – to supervise observance of water distribution and use parameters within the given sector and secondly – to represent interest of this sector at regular meetings of Water Council members.

It is of great importance that the downstream and delta water authorities should be involved in this public participation process with their demands relevant to tail parts of the rivers, which often, especially during low-water years, find themselves infringed upon their water users' interests. At that, Water Councils with participation of all the river sectors' local community supervisors will promote more clear ecological water demands both – for the delta and separate river basin parts with the purpose of saving the river as a nature object. To ensure this Water Councils must include as their members water users and representatives such as - province authorities of water management, owners of water reservoirs and hydro power stations as well as representatives of fishing industry and municipal structures as well as representatives of Agencies and Ministries of nature protection and use.

One additional element of management is professional development and training of personnel working in water management organizations, operating water structures on the rivers, staff of BVO, national water management structures and representatives of water users. Thanks to the assistance rendered by the Canadian International Development Agency (CIDA) and Swiss SDC with participation of other donors the ICWC Training Centre (TC) was established in 2001. The ICWC TC for the period till 2005 had conducted training of more than two thousand people along such lines as IWRM principles, introduction of up-to-date methods of water use, international water law and on a number of other themes – at that funding on the part of donors had not been too burdensome – 130 thousand US dollars a year.

Based on this the scope of ICWC TC activities had been enhanced – its branches had been set up in Osh (Kyrgyzstan), Urgench (the Amudarya downstream), Andidjan and Ferghana (the Ferghana Valley), which proceeded

training activities putting emphasis on water mangers of middle and lower levels as well water users. (Fig 11). However, when steady funding from CIDA ceased, starting from 2006 have been obliged to organize training activity in conditions of constant search for financial resources since even bringing together representative of various countries, their accommodation and catering require currency allocation (these are actually unavailable for ICWC).

Some support along these lines has been provided by the Asian Development Bank. With its assistance we managed to conduct 7 training session during the period of 2005-2007 dedicated to issues of management and water law for employees of ministries and basin organizations, this has significantly facilitated improvement of functioning performed by ICWC organizations and promoted interstate Agreements.

Two special programs are noteworthy which are funded by ADB and OSCE. They are: - "Water and Gender" serving as a basis for Central Asian network of Global Water Alliance that has been established with wide-scope involvement of women and spread of focal points in regional countries; - and "Water and education" promoting introduction of special knowledge on water in educational programs of secondary schools.

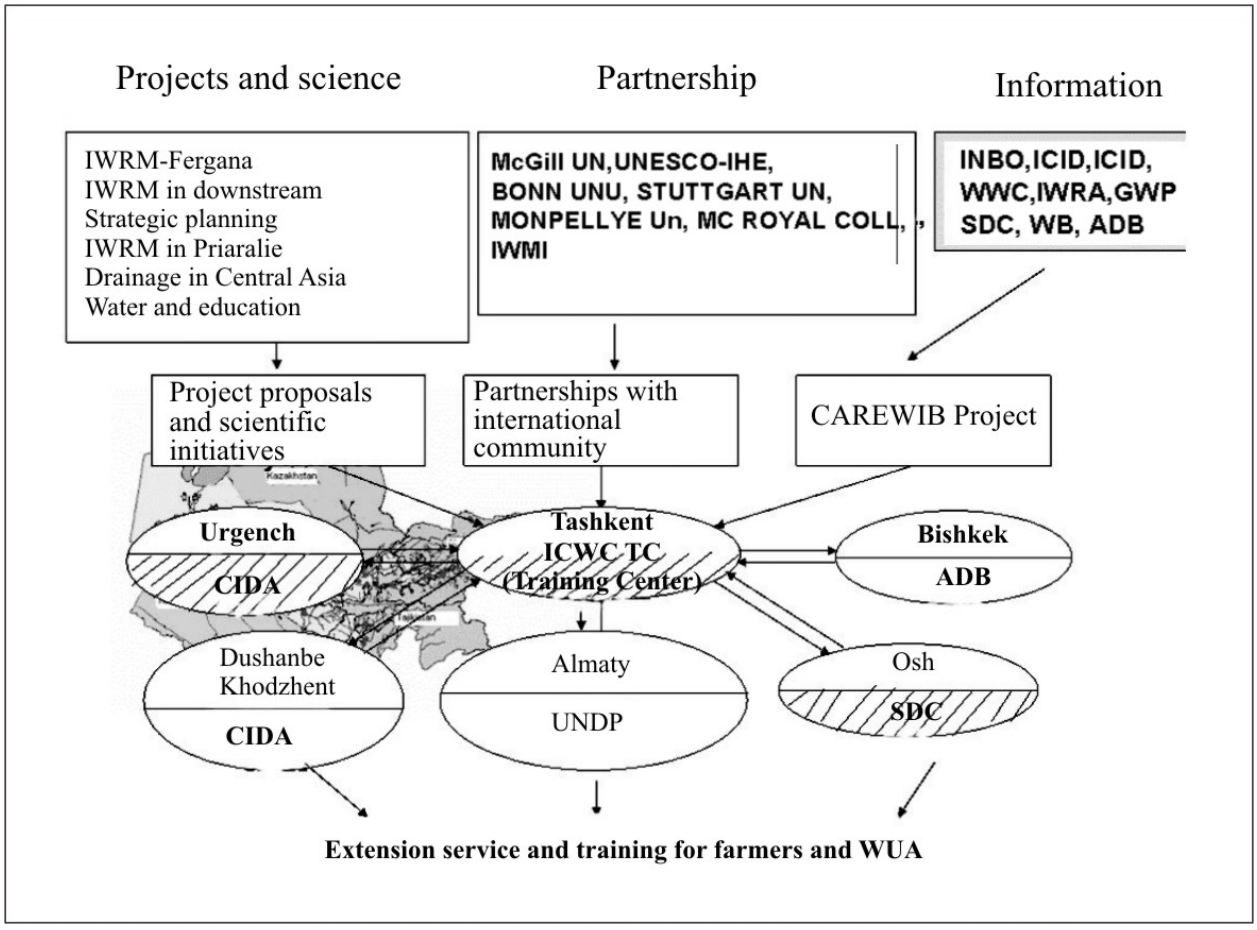


Fig. 11

Development of gender movement in water sector has already produced certain results with the advent of women among WUA leaders and even as heads of CWC. In this connection effective organizational work is noteworthy conducted in CWC SFC chaired by Mastura Saifutdinova. Women - senior managers often enjoy more go-ahead character features than men, especially taking into account local

mentality. It is because of this that special training programs should be organized with the purpose of educating women-farmers, women-water users and involving them in WUA.

An interactive instruction method has been adopted in ICWC training activity. It enables trainees concurrently with obtaining knowledge from lecturers and provided training materials to exchange their experience. Such an approach turns out to be exceptionally useful for generating the unifying "spirit of water implication and cooperation" in the basin, comprehension of peculiarities and specific approaches on the part of other countries as well as reaching consensus with regard to future water resources use. In our opinion, development of training activity is the most beneficial and efficient kind of investment in improving professional knowledge of water specialists and strengthening cooperation between the countries and promoting feelings of comradeship in relations between adjacent states, provinces and sub-basins.

To our satisfaction we have got to know that the European Union in its strategy of strengthening cooperation between Central Asian countries has put forward augmentation of training activity at the interstate level and wide scope promotion of these works in the region as one of its priorities. We together with IHE UNESCO have prepared and submitted to the embassies of all Europian states – members of EEC proposals on development of training activity, and we give voice to hope that international organizations, in the first place EC, assist in providing financial support – both at the level of the central office and at the level of local branches.

Technical mechanisms designed to improve water resources management at the interstate level regard - first of all - perfection of technical methods of control, accounting and information transmission. Some accomplishments have been made in this direction. So, works on installation of SCADA equipment were started in 1996 on the head works of Kirov canal with assistance rendered by USAID. Lately, support on the part of SDC has made it possible to install automated control devices at a dozen of schemes in the Syrdarya river basin. Remote control systems secure stable water delivery (despite all fluctuations of water horizons and discharges at the approaches to the scheme) to diversion canals in specified volumes and concurrently ensures constant monitoring and control over water levels and discharges. Previously all fluctuations of water flow at the approach to the Uchkurgan hydroscheme (sometimes they reached 100 m^3/sec. for one day) immediately affected water delivery all through the Ferghana Valley through head works of Norhtern Ferghana Canal, Large Ferghana Canal and other water delivery ways. Nowadays, despite excistence of such fluctuations, deviations in water discharges at hydro schemes do not exceed ± 2 %.

SCADA

Fig. 12

International experts who had been supervising installation of automated control systems at the construction sites highly appreciated implemented work and devoted to it a special presentation at the last meeting of International Commission on Irrigation and Drainage held in Sacramento.

It should be noted that employment of local technicians and equipment formerly applied in state enterprises of the USSR ("SIGMA") reduced the price of these works as compared to foreign analogs by 5-6 times at high quality of mounting. Introduction of SCADA systems is the most inexpensive method of reducing non-productive organizational water losses. The proposals worked out by us together with two BVOs on completing these works in the Syrdarya river basin and launching similar works in the Amudarya river basin will require 16 mln.$ in all, but at that, judging by results achieved in the process of operating structures installed in the Syrdarya river basin non-productive water losses under interstate management will be reduced by 7-8 % at the minimum.

Box 6

Principle advantages of the automated control and management system SCADA

- **Upgrading accuracy of measurements of levels, discharges and water mineralization, as well as performing control of water-gates in hydro schemes due to application of up-to-date**
- **technical means of measurement and accounting of water resources (reduction of inaccuracy measurements and calculation regarding discharge from 5-10% up to 2-3%);**
- **Improvement of informational support due to continuous collection, storage and processing measurement values of levels and discharges in computers;**
- **Improvement of responsiveness and accuracy in water resources management due to speeding-up rate of collecting and processing information on the technological process and decision making;**
- **Improvement of responsiveness in detecting and eliminating malfunctions of the management system and hydro schemes.**

We hope that donors and financial agencies of Central Asian states would be able to raise necessary means in order to implement these works along two main rivers in the nearest 2-3 years.

Introduction of SCADA system is followed by two additional significant technical improvements – they enable water managers not only to constantly control water volume and level at hydro schemes of interstate significance but also to continually register indicators of water flow and water quality. This kind of steady monitoring with concurrent data transmission over long distances to dispatcher stations of territorial water departments and central office of BVO will enable managers to avoid discharges fluctuations that used to take place when in the past only four measurements a day were made. And what is more, this system generates trust and transparency in basin management.

Next in turn there is the objective of including the whole hydrological observation network into this system with regard to information collected by stations of Hydrometeorology Services on the rivers and in the flow formation zones. These activities should of priority for achieving accuracy in water accounting and forecasting.

Technical management tools should include risk management (Fig. 13). Climate fluctuation has already led to significant frequency of extremal phenomena within our rivers – for the last 15 years we have had as many low-water years (2000, 2001, 2007) and floods as for the last 35 years. Taking this into account the

order and the procedure for water management and use should be developed under these conditions based on risk management and be functioning by approving it at interstate level.

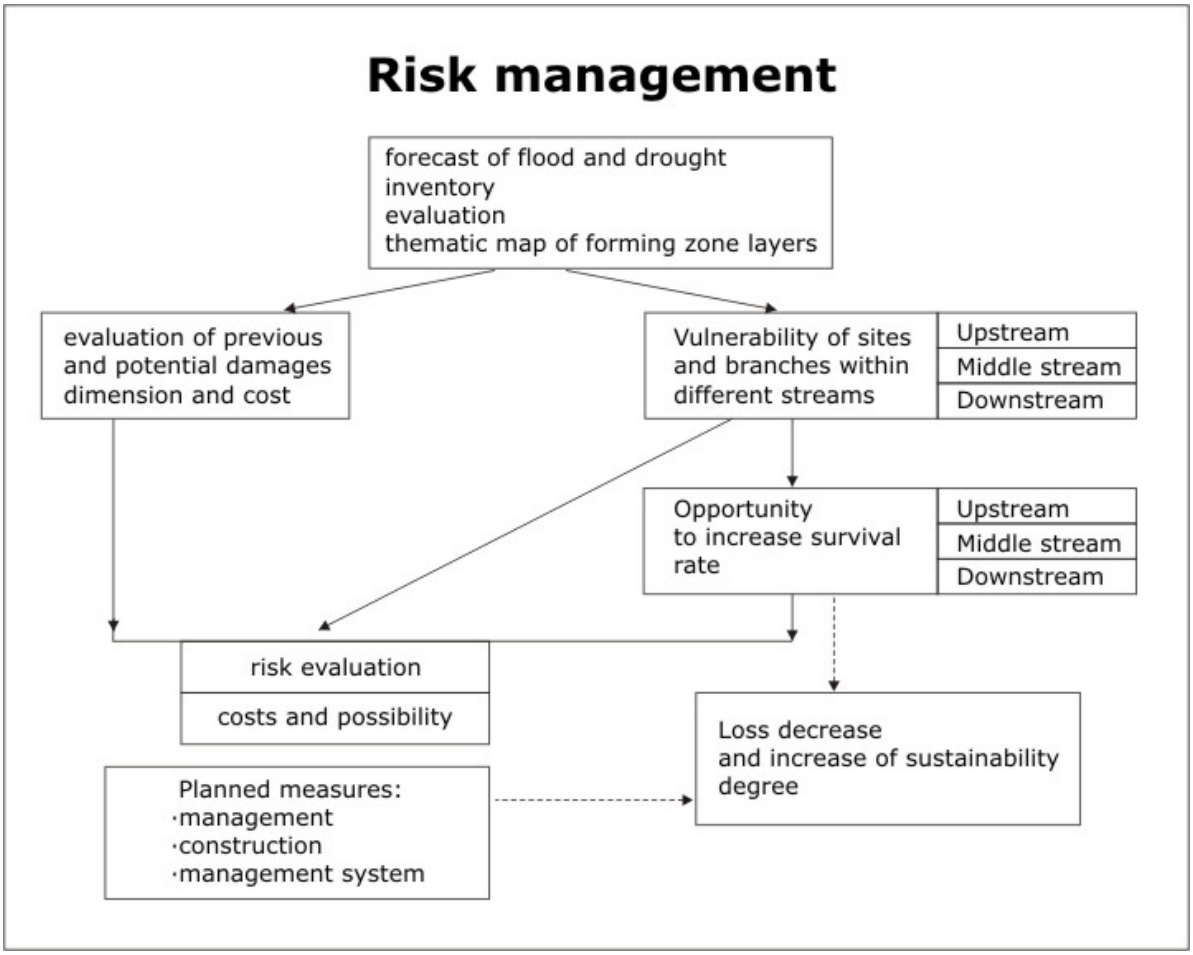


Fig. 13

The Aral Sea and Priaralie.

There is no doubt that one of the important aspects for water complex sustainability in the basin is the Aral Sea and Priaralie problem. It is defined by scenarios for future development and their implementation, which should be determined by the Strategic Region Plan on water development, water conservation and use parameters. Schemes for creating sustainable environmental profile of the Aral Sea and Priaralie were developed for each of Amudarya and Syrdarya deltas – Fig. 14 and Fig. 15. At the same time such complex is implemented more rapidly in Kazakhstan due to the World Bank loan, but Uzbekistan also has positive results, for example, delta watering (Sudoche lake) as well as foresting deserting lands. Nevertheless, these activities should be permanently supported by ecological releases and investments. Confidence was emerged in possibility to resolve Priaralie problem. As for the Aral Sea itself at the present time there are two long-term forecasts of SIC ICWC and the Russian Institute (P. Stanova). These forecasts show that among many future forecasts (18 variants composed of 3 development scenarios, 2 water availability scenarios and 3 scenarios for Amudarya delta development) only 8 variants allow keeping the Large Sea within current points 29,5 … 31,5 even when there is some point increase up to 32,0 … 32,7 in two variants in both water bodies, which continue to maintain interrelation between each others.

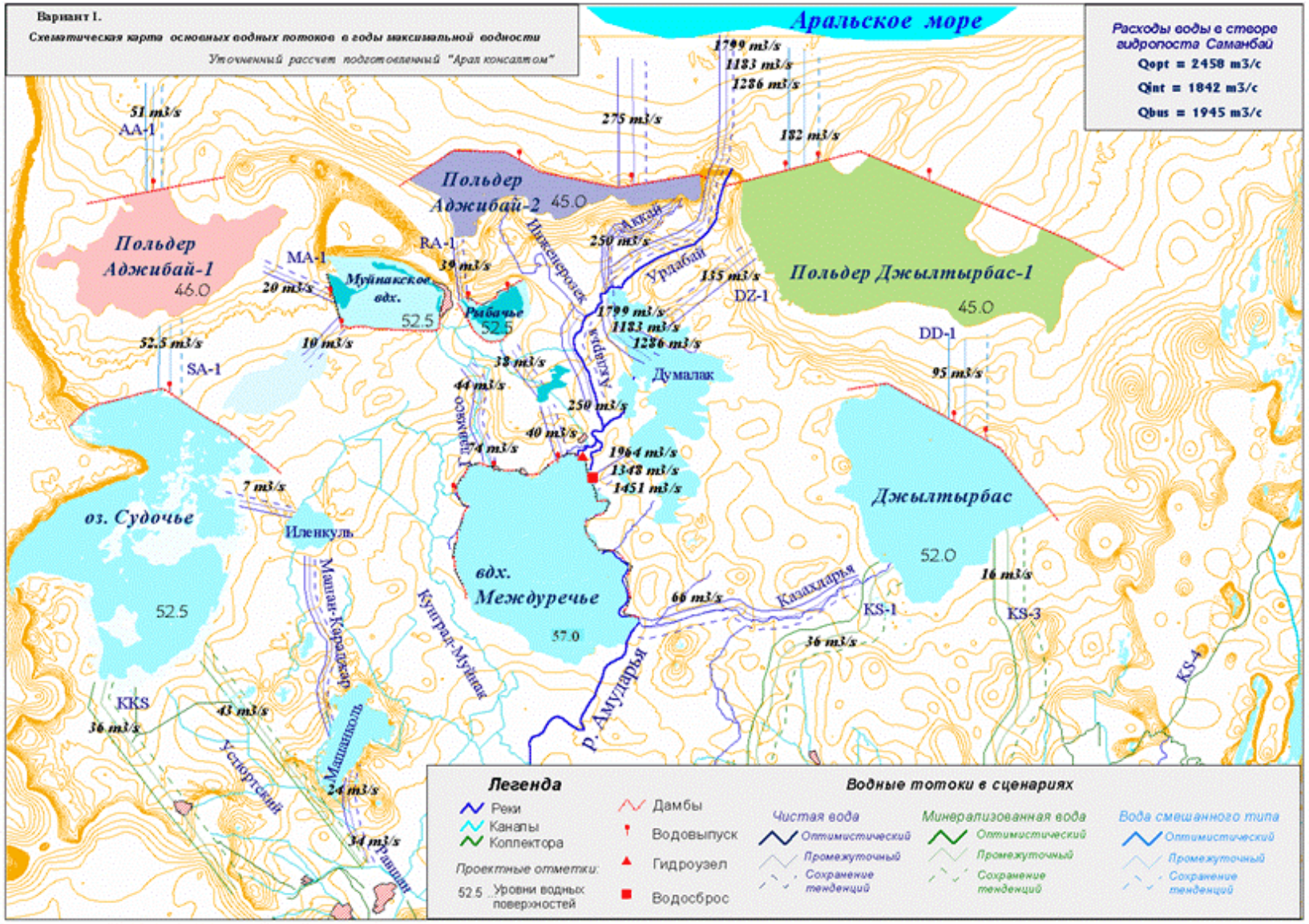


Fig. 14 Scheme of the South Priaralie

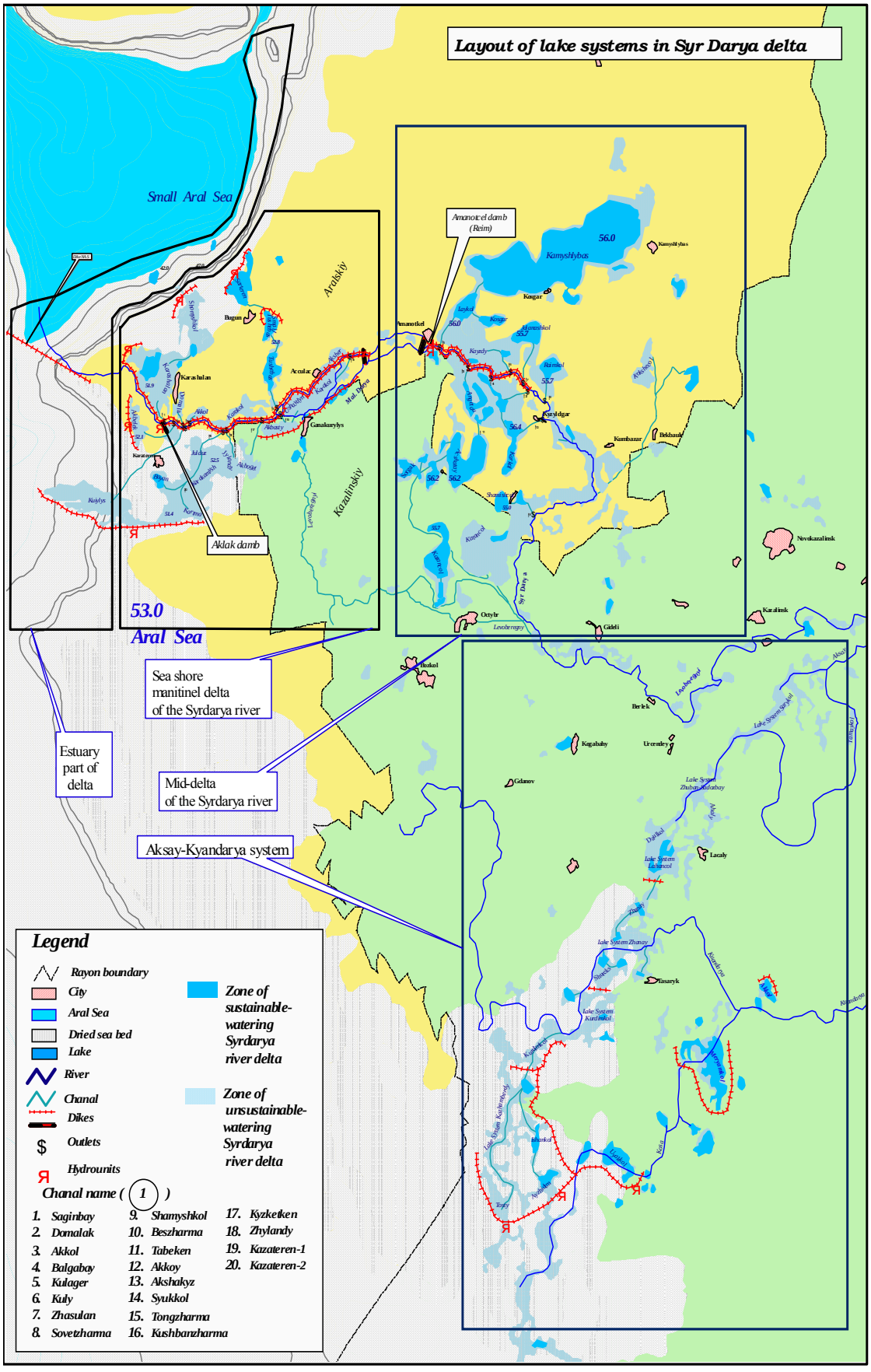


Fig. 15 Scheme of the Northern Priaralie

Table 4

Variants of the Aral Sea water area conservation under various approaches for the period till 2025

Варианты	Western sea		Eastern sea		Total water area
	Level mark	Size of water area	Level mark	Size of water area	
Existing delta infrastructure					
Nation. vision 2021	21.6	2439	31.0	10365	12804
2025	20.2	2245	29.6	6177.2	8422
BAU 2021	23.8	2865	31.3	11166.2	14031
2025	23.4	2732.5	30.3	7975.0	10707
Optimal 2021	31.5	5987.5	32.0	13267.8	20254
2025	32.0	6405.4	32.2	13621.8	20026
NATO infrastructure					
National 2021	26.0	3374.9	30.2	7866	11240
2025	24.0	2911.1	28.8	4940.1	7851
BAU 2021	27.3	3770.8	31.0	10419.1	14189
2025	25.9	3348.6	29.7	6818.4	10167
Optimal 2021	31.6	6156.6	31.8	12823.4	18980
2025	31.3	5844.3	31.4	11189.2	17033
Hypothetic delivery					
National 2021	31.6	6119.8	29.5	6934	13054
2025	29.6	4721	28.3	3797	8518
BAU 2021	21.7	6218.6	30.8	9872.7	16091
2025	30.5	5255.5	29.6	6257.4	11513
Optimal 2021	32.7	6979	32.5	14333.0	21312
2025	32.1	6484	32.0	13336.9	19813

However, water surface area will not diminish only in six variants, as to the others – sea bottom desiccation will take place – increasing the surface of desiccation up to 1.0 mln. ha in addition to the existing 4.7 mln. ha.

Field and remote studies of the dried up sea bottom (GTZ – Terra – SIC ICWC – Nukus University) made it possible to chart a Map of risks relevant to negative consequences of desiccation development and concurrently assess processes occurring here . The researches noted alongside with man-made afforestation - covering the area of 200 th. ha - the presence of natural self-induces growth of flora and stabilization of the landscape. As a result, area of stable landscapes on the dried up sea bottom enhanced from 24.2% in 1990 up to 42.9% in 2006. Areas referred to as "assigned risk" have also increased from 29.5% to 34.1%.

Studies conducted and forecasts made, overall attention should be attracted to the problem of the Aral Sea proper. The problems are in store to be tackled concerning both – how to outline the Sea related ideas in a future Regional water strategy and what is the way to organize detailed monitoring of the Sea bottom so that to assist the Nature in stabilizing itself and at the same time preventing development of harmful wind erosion processes. It is necessary to involve oil-production enterprises and geological oil prospecting companies, which at present

are strenuously advancing their projects at the Sea bottom, in funding activities relevant to the subject under discussion, carried out by those entities that damage growth of fauna plant cover, disrupting the stable landscapes by such activities as explosions and applications of heavy equipment machinery.

DEVELOPMENT OF PROGRAMES OF WATER RESOURCES EFFICIENT USE is one more important tool of water management not less important than strengthening of cooperation on the interstate level. It is very important that all states of the region would give consideration to the above mentioned jointly developed Strategy of efficient water resources use in the basin and managed to arrange united integrated advancement towards achieving the targets of frugal water use and increase in productivity that have been outlined in joint plans and prospects.

The region has been progressing The main condition ensuring progress along these lines is introduction of IWRM, meant to consolidate efforts undertaken by water management authorities and water users aimed at achieving potential water productivity. Central Asian region has been actively moving along these lines. Alongside with the "IWRM Ferghana" pilot project, which covers the issues of pilot introducing IWRM in Kyrgyzstan, Tajikistan and Uzbekistan (scientific and practical audience has been repeatedly informed about the results), there are significant changes for the better in further promoting IWRM principles. So, Kazakhstan has worked out the National Plan of implementing IWRM; Kyrgyzstan, Tajikistan and Uzbekistan have prepared IWRM "road-maps". But the main thing is that IWRM is enthusiastically accepted at the lower levels of water hierarchy, where involvement of stakeholders'initiative has been exerting immense effect in improvement of water resources use.

Of great importance for the expected outcome of all these efforts is the resumption of deep concern for water sector and support on the part of Central Asian states as it used to be in former times. It should be manifested first of all in establishing unified state organs designed to manage all water resources at the governmental level as it has been made in Tajikistan and Turkmenistan. All countries need establishment of National Water Councils headed by prime ministers to involve public at large in water management and attaching significance of state support and participation of other ministries in efficient water resources use.

The outlined program is not at all a comprehensive one. These are only some observations and considerations designed to assist in working out relevant plans and arrangements which can become a corner stone in the program of future water survival of Central Asia.

Box 7

Water as the core of unity, but the apple of discord

Water delivery stability;
Energy generation stability;
Sustainable production of food products
Sustainable environment

All these factors ensure Sustainable development of society

All these can be achieved at the account of:

Reduction of water use by 20-30%;
Increase in water productivity by 1.5-2 times;
Agreed allocation and regimes of TBW;
Wide introduction of IWRM