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# INTEGRATED WATER RESOURCES MANAGEMENT IN FERGANA VALLEY (IWRM-FV) PROJECT PHASE V

# COMPREHENSIVE HYDROGRAPHIC STUDY OF THE FERGANA VALLEY

## Vision of the Integrated Water Resources Management (IWRM) based on the IWRM-FV Project experience in Uzbekistan

International Water Management Institute

SIC ICWC

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## EXECUTIVE SUMMARY

This Vision has been prepared in strict compliance with the Terms of Reference for the National Team of the Republic of Uzbekistan composed of leading experts of the Chief Water Management Department of the Ministry of Agriculture and Water Resources of the Republic of Uzbekistan with the involvement of high-skilled experts experienced in analytical work.

Also experts of the working groups from the Andijan, Namangan, and Fergana provinces as well as experts from the Fergana Valley Main Canal Administration with Unified Dispatch Center (MCA UDC) and BISAs the Fergana Valley.

General management was carried out by Professor V.A. Dukhovny, Director of SIC ICWC.

When drawing up the Vision, the National Report of the Republic of Uzbekistan "Assessment of the state of land and water resources management and rational use" and the IWRM-FV Project implementation results were used.

At the same time, recommendations of other relevant ministries and institutions involved in the project implementation were taken into consideration.

This Vision represents the Conclusions about the state of Integrated Water Resources Management in the Republic of Uzbekistan and recommendations on further development and deepening of the IWRM implementation.

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## ABBREVIATIONS

| | |
|---|---|
| **AAC** | Aravan Akbura Canal |
| **AADIS** | Administration of Amudarya Delta Irrigation Systems |
| **ABMC** | Amu-Bukhara Main Canal |
| **AC** | Agrotechnical Complex |
| **ADB** | Asian Development Bank |
| **AFC** | Additional feed canal |
| **AICA** | Amudarya Irrigation Canals Administration |
| **AMC** | Akhunbabaev Main Canal |
| **ASDP NAU** | Agency for Support Development Process NAU |
| **BAC** | Big Andijan Canal |
| **BAMC WC** | Big Andijan Main Canal Water Committee |
| **BFC** | Big Fergana Canal |
| **BFMS MO** | Big Fergana Main System Management Organization |
| **BFMS UWU** | Big Fergana Main System Union of Water Users |
| **BFMC WC** | Big Fergana Main Canal Water Committee |
| **BISA** | Basin Irrigation System Administration |
| **BNC** | Big Namangan Canal |
| **BWO** | Basin Water Organization (of the Syrdarya River) |
| **CAREWIB** | Central Asia Regional Water Information Base |
| **CDN** | Collector and drainage network |
| **CDW** | Collector and drainage water |
| **CHD** | Closed horizontal drainage |
| **CMO** | Canal Management Organization |
| **CROPWAT** | A computer program (practical tool allowing agrarian meteorologists, agronomists, and irrigation specialists making standard calculations of total water evaporation, carrying out investigations of water resources and use of those, designing irrigation systems, and managing those) |
| **CWC** | Canal Water Committee |
| **CWM** | Commission for Water Management |
| **CWMD** | Chief Water Management Department |
| **DB** | Database |
| **DF** | Dekhkan Farm |
| **DFA** | District Farms' Association |
| **DOISA** | District Office of Irrigation Systems Administrations |
| **DWA** | District Water Administration |
| **DWI** | District Water Inspectorate |
| **ES** | Extension service |
| **FAO** | The Food and Agricultural Organization of the United Nations |
| **FV** | Fergana Valley |
| **FV MCSMO** | Fergana Valley Main Canals System Management Organization |
| **FV SBA** | Fergana Valley Sub-Basin Administration |
| **FV SBWC** | Fergana Valley Sub-Basin Water Committee |
| **GIS** | Geographic Information System |
| **GRP** | Gross Regional Product |
| **GS** | Gauging station |
| **HGRE** | Hydrogeological Reclamation Expedition |
| **HMZ** | Hydromodule zone/zoning |

| | |
|---|---|
| **HS** | Hydrographic Study |
| **ICWC** | Interstate Commission for Water Coordination |
| **IDCA** | Inter-District Canals Administration |
| **IF** | Farm/Individual Farm |
| **ISA** | Irrigation Systems Administration |
| **ISF** | Irrigation service fee |
| **ISFP** | Payment of irrigation service fees |
| **IWMI** | International Water Management Institute |
| **IWRM** | Integrated Water Resources Management |
| **KBC/KBMC** | Khodja-Bakirgan (Main) Canal |
| **LF** | Legal Framework |
| **MAWR** | Ministry of Agriculture and Water Resources |
| **MC** | Main canal |
| **MCMO** | Main Canal Management Organization |
| **MCSMO** | Main Canals System Management Organization |
| **MIS** | Management Information System |
| **MS** | Master Station |
| **MUWR** | Multipurpose use of water resources |
| **NFC** | North Fergana canal |
| **NGNPO** | Non-Governmental & Non-Profit Organization |
| **NIDC** | National Irrigation and Drainage Committee |
| **NWC** | National Water Council |
| **NWG** | National Working Group |
| **PHGRE** | Provincial Hydrogeological Reclamation Expedition |
| **PSMO** | Pumping System Management Organization |
| **PSOECA/PSA** | Pumping Station Operations, Energy and Communication Administration |
| **PS UWU** | Pumping System Union of Water Users |
| **PS WC** | Pumping System Water Committee |
| **PWA** | Provincial Water Administration |
| **PWI** | Provincial Water Inspectorate |
| **RBMC** | Right Bank Main Canal |
| **RWG** | Regional Working Group |
| **SAC** | Small-Scale Agricultural Cooperative |
| **SCADA** | Supervisory Control and Data Acquisition |
| **SDC** | Swiss Agency for Development and Cooperation |
| **SFC/SFMC** | South Fergana (Main) Canal |
| **SFMC UWU** | South Fergana Main Canal Union of Water Users |
| **SFMC WC** | South Fergana Main Canal Water Committee |
| **SIC ICWC** | Scientific Information Center of the Interstate Commission for Water Coordination |
| **SJSC** | State Joint-Stock Company |
| **SNWMO** | Supreme National Water Management Organization |
| **SRUWU** | Small River Union of Water Users |
| **SRMO** | Small River Management Organization |
| **SR WC** | Small River Water Committee |
| **STO** | Scientific-Technical Organization |
| **STR** | Small Transboundary Rivers |
| **ToR** | Terms of Reference |
| **UBWU** | Union of Basin Water Users |
| **UCWU** | Union of Canal Water Users |

| | |
|---|---|
| **UDC** | Unified Dispatch Center |
| **UNDP** | United Nations Development Program |
| **USAID** | United States International Development Cooperation Agency |
| **VDW** | Vertical drainage well |
| **WB** | World Bank |
| **WLC** | Water & Land Commission |
| **WMC** | Water Management Council |
| **WMO** | Water Management Organization |
| **WB** | World Bank |
| **WPI-PL** | Project “Water Productivity Initiative at Plot Level” |
| **WUA** | Water Users’ Association |
| **WUA SD** | WUA Support Department |
| **WUG** | Water Users’ Group |

**CONTENTS**

# Section 1. Current situation in the water resources management in the country in the course of IWRM implementation

## 1.1. Overall condition of the water sector in the Republic

The water sector of the Republic is a quite complex system composed of water supply and sewerage systems, hydropower, recreation, conservation of water resources, water infrastructure management, fishery, etc.

Because of climatic peculiarities of the Republic, about 98 % of all the crop production is gained on irrigated lands. In view of this, special attention is given to the state of irrigated agriculture the effectiveness of which is subject to rational water management.

To date, the total area of irrigated lands is 4.2 mln ha, which comes to less than 9 % of the national territory. Development of irrigated areas is limited due to lack of fresh water. As estimated by specialists, about 14 million hectares of lands, or 30 % of the country's territory, are good for irrigation.

To provide all the sectors of the national economy with water, 185455.2 km of irrigation network has been constructed and used in the Republic, particularly 5337.5 km of main canals, 21967.5 km of inter-farm canals, and 158150.2 km of on-farm canals (that are on the balance sheet of former kolkhozes and sovkhozes and are at present inter-farm and used by WUAs).

Of the total length, only 20123.6 km of canals have been lined (11 %) and 21295.6 km of the canals are represented by flume network. 56 reservoirs with the total storage capacity of 17 bln. $m^3$ and usable storage of 13.5 bln. $m^3$ have been built in order to regulate the river flow. The network is equipped with a number of hydraulic structures (headworks, control and regulating structures, siphons, and aqueducts).

Total number of pumping stations is 1614 with 5025 installations that supply water to an area of 2278.5 ths. ha. To ensure water supply to water users, there are 2584 water delivery points in the inter-farm network and 142436 ones in the on-farm network. There are 4124 wells with the total flow of 298.7 $m^3/s$ for using groundwater for irrigation.

The irrigation and drainage network of the project zone (three Fergana Valley provinces) is the most complex in within the Republic and represent an intertwined network with numerous canals, collectors, pumping stations, and wells. Along with main water withdrawal, there is mixed water supply from many inflows (in total over 20 ones), sais, wells, and other local sources.

Table 1.1.1. Average figures of the irrigation infrastructure on the irrigated lands of the Fergana Valley provinces, Uzbekistan part.

| **Average figures for the period of 2001-2010** | PROVINCES | | |
|---|---|---|---|
| | FERGANA | ANDIJAN | NAMANGAN |
| Length of the inter-farm canals, ths. km | 2.4 | 2.2 | 2.6 |

| Average figures for the period of 2001-2010 | PROVINCES | | |
|---|---|---|---|
| | FERGANA | ANDIJAN | NAMANGAN |
| in particular: | | | |
| unlined, % | 47 | 53 | 61 |
| lined, % | 53 | 47 | 39 |
| Specific length of the inter-farm network (m/ha) | 7.1 | 8.4 | 9.3 |
| Length of the on-farm canals (WUA), ths. Km | 18.4 | 12.0 | 8.2 |
| in particular: | | | |
| unlined, % | 89 | 79 | 81 |
| lined, % | 11 | 21 | 19 |
| Specific length of the on-farm network (m/ha) | 52.9 | 44.4 | 34.1 |

By virtue of natural causes, more than half of the total irrigated lands of the Republic are hard in terms of reclamation and are subject to the rise of mineralized groundwater level and subsequent salinization. To maintain normal reclamation state of those lands, there is sufficiently developed network with the total length of 140406 km, of which 31751 km of main and inter-farm collectors and 70977 km on-farm drainage network. On an area of 959.8 ths. ha, there is utilities network with advanced drainage systems; horizontal subsurface drainage (37678 km with a serviced area of 571.4 ths. ha) and 3422 vertical drainage wells on an area of 288.46 ths. ha.

Table 1.1.2. Average figures of the collector-drainage infrastructure on the irrigated lands of the Fergana Valley provinces, Uzbekistan part.

| Average figures for the period of 2001-2010 | PROVINCES | | |
|---|---|---|---|
| | FERGANA | ANDIJAN | NAMANGAN |
| Total length of the collector-drainage network (CDN), ths. km | 14.6 | 8.2 | 5.4 |
| in particular: | | | |
| main canals, ths. km | 0.7 | 0.6 | 0.3 |
| inter-farm canals, ths. km | 2.8 | 2.9 | 1.8 |

| | | | |
|---|---|---|---|
| open on-farm canals, ths. km | 9.8 | 4.0 | 3.2 |
| closed on-farm drains drainы, ths. km | 1.1 | 0.7 | 0.03 |
| vertical drainage wells, units | 1 173 | 423 | 230 |

Since during the autumn-winter period water supply for the irrigation of winter wheat is carried through the system of canals, the time for possible repair works and reconstruction of irrigation system is limited to 2-3 months.

At the same time, the lifetime of the majority of the irrigation system components has expired. The problems of the former inter-farm irrigation network that is currently within the WUA contour are especially burning. When reorganizing shirkats, virtually nowhere documented inventory and transfer (at depreciated cost) of those to the WUA balance sheet was performed.

In recent years, scheduled works aimed to ensure drainage water outflow are carried out in collector and drainage systems at the expense of the Reclamation Fund. However, here, too, like in the on-farm irrigation network there is a similar problem of uncertainty of the belonging of collector and drainage networks. At the same time, WUAs do not have required mechanisms for cleaning open collector and drainage network (CDN) from silt, while the network has to be cleaned every five years. The closed horizontal drainage (CHD) is partly on the balance sheet of Provincial Hydrogeological Reclamation Expedition (PHGRE). The CHD sediment cleaning related situation has become complicated because at present there is no required drain cleaning equipment. Vertical drainage wells (VDW) are on the balance sheet of provincial pumping station administration and are operated at the expense of the national budget.

Uzbekistan water resources are made up of renewable surface and underground waters of a natural origin as well as return water formed in the territory in the result of business activities. It should be especially highlighted that only slightly more than 10 % of the river flow is formed within the country and the prevailing part inflows from outside.

The Basin Schemes of “Multipurpose use and protection of water resources” (1983-1984) carried out assessment of all available water resources in the Syrdarya river and Amudarya river basins with allocation of those to the riparian countries depending on demographic characteristics, areas of irrigated lands, and development of productive forces in the long term. In accordance with these Schemes, the following design limits of water resources use are determined for the level of complete depletion of water resources:

Table 1.1.3. Design quantity of available water resources in the Republic of Uzbekistan, bln. $m^3$ [1]

| Measures | Water withdrawal from rivers | | | Use of groundwater | Use of collector and drainage water | TOTAL of available water resources |
|---|---|---|---|---|---|---|
| | total | in particular | | | | |
| | | from stem stream | from small rivers | | | |
| Total in Uzbekistan | 53.59 | 37.41 | 16.18 | 2.59 | 6.84 | 63.02 |
| in particular:<br>Amudarya river basin | 33.90 | 26.92 | 6.98 | 1.00 | 2.63 | 37.53 |
| Syrdarya river basin | 19.69 | 10.49 | 9.20 | 1.59 | 4.21 | 25.49 |
| In particular in provinces:<br>Andijan | 2.53 | 0.95 | 1.58 | 0.17 | 0.45 | 3.15 |
| Namangan | 2.71 | 2.26 | 0.45 | 0.12 | 0.97 | 3.80 |
| Fergana | 3.65 | 1.20 | 2.45 | 0.44 | 0.86 | 4.95 |

At the same time, these design quantities are allocated by the sectors of the national economy in the following order:

Table 1.1.4 (bln. $m^3$)[2]

| Measures | Total water use | In particular | |
|---|---|---|---|
| | | for irrigation | Industrial and technical needs and public consumption |
| Total in Uzbekistan:<br>in particular in basins | 63022 | 53981 | 9041 |
| Amudarya river | 37532 | 32621 | 4911 |

[1] For a water year with 90 % water probability, according to the Schemes of "Multipurpose use and protection of water resources" (1983-1984).

[2] For a water year with a 90 % water probability, according to the Schemes of "Multipurpose use and protection of water resources" (1983-1984)

| Measures | Total water use | In particular | |
|---|---|---|---|
| | | for irrigation | Industrial and technical needs and public consumption |
| Syrdarya river | 25490 | 21360 | 4130 |
| In particular in the following provinces: Andijan | 3150 | 2860 | 290 |
| Namangan | 3800 | 3330 | 470 |
| Fergana | 4950 | 4250 | 700 |

To ensure equitable water supply under the conditions of increasing water deficit, the limited water use condition has been adopted in the Republic in accordance with the Resolution of the Cabinet of Ministers of the Republic of Uzbekistan # 383 dated August 3, 1993, and the following water use priority was established:

1. Public utilities
2. Hydropower
3. Industry
4. Fishery
5. Agriculture
6. Others

For the last 10 years, the volume of total water withdrawal during the year varies from 43869 mln. $m^3$ in the low-water year 2008 to 59476 mln. $m^3$ in the high-water year 2005. During the period of 2000-2010, 52700 mln. $m^3$ of water a year was withdrawn on the average. Of which the following water volume was used broken down by the sectors:

- Public utilities: from 2150 to 2409 mln $m^3$ – 4.3%;
- Hydropower (irrevocably): from 190.8 to 273 mln $m^3$ – 0.4%;
- Industry: from 697 до 1529 mln $m^3$ – 4.2%;
- Fishery: from 369 до 765 mln $m^3$ – 2.2%;
- For irrigation: from 35589 to 53265 mln $m^3$ – 88.9%;

Owing to natural growth the population the volume of total water consumption per capita (for all types of needs) is reducing from year to year. In 2000, the actual water consumption across the republic was 1813 $m^3$, while in 2009 it came to 1621 $m^3$.
At that, the total volume of water use in the public utilities sector has risen from 2163 mln $m^3$ in 2002 up to 2557 mln $m^3$ in 2009. That was due to the consistent work by the Government of the Republic of Uzbekistan aimed at the improvement of drinking water supply to the population. A special executive order concerning this issue was adopted. Public utilities are basically on the balance sheets of provincial and local bodies financed due to the payment by water users and from local budget. Some large waterways, especially in rural areas, that transport water to long distances are maintained at the expense of the state budget. The general activity in this area of water sector is coordinated by the Republican Association “Uzbeksuvhizmat” (Uzbekistan water service). In public utilities and industry, mainly groundwater is used, the production of which is carried out at the expense of these sectors. All the expenditures of the water sector related to

water withdrawal and delivery to water users (to the gate of the on-farm network – at present to WUAs) are made at the expense of the state budget.

All water users of all the sectors only pay (tax) for water resources and the size of the payment if annually fixed by the government separately for surface and ground waters.
Water resources protection is carried out by relevant units of the State Committee for Nature Protection. At that, water management bodies are also responsible for the execution of the requirements of the Resolution of the Cabinet of Ministers № 174 dd. 07.04.1992 "Statute of water protection zones of reservoirs and other water bodies, rivers, main canals, collectors, sources of drinking and domestic water supply, as well as therapeutic and recreational purposes in the Republic of Uzbekistan".

Construction and operation of large hydropower systems is carried out by the State Joint-Stock Company Uzbekenergo. Also the cascade of Chirchik-Bozsu hydropower plants and the system of Zarafshan hydropower plants are under its jurisdiction. The following hydropower plants are on the balance sheet of the Ministry of Agriculture and Water Resources (MAWR): Tuya-Muyun, Andijan, Akhangaran, Gissarak, and Tupolang. In recent years, MAWR deals with the development of small hydropower plants.

### 1.2 Existing legal framework of the water management sector

Certain legal framework for the regulation of water management relations has been built in the Republic by adopting a number of directive documents during the independence years. The Law on Water and Water Use of the Republic of Uzbekistan (put in force in 1993) is the principal directive document for the regulation of water relations; rational use of water resources for the needs of the population and economy; water protection from pollution, clogging, and depletion; prevention and liquidation of damage effect of water; improvement of the condition of water bodies; financing of water management activities; protection of water users' rights; and regulation of international water relations.

Taking into account substantial changes in the composition of water users (establishment of farms) that caused dramatic increase of their number as well as taking into account the reforms carried out in the agricultural sector, additions and amendments were introduced in the Law on Water and Water Use in 2009.

These changes have allowed strengthening the rights of water users represented by farms, fixing contractual relations between water users and water suppliers with appropriate obligations, toughening the requirements for rational water use and widespread implementation of the IWRM principles which are the basic tools for good water resources management under the conditions of increasing water deficit.

Since 1993, the limited water use system has been in effect in the country. In accordance with the Resolution of the Cabinet of Ministers of the Republic of Uzbekistan # 383 dated August 3, 1993, every year water withdrawal volume limits with indicated feed sources are fixed for all water users from all the sectors of the national economy.

The water management activity of the Ministry of Agriculture and Water Resources and its field units (BISAs, ISAs, PHGREs, PSOECAs, and MCMOs, large reservoir management organizations) are to be carried out in accordance with the Resolution of the Cabinet of Ministers of the Republic of Uzbekistan # PK-320 dated July 21, 2003, "On the improvement of the organization of water industry management" and associated approved regulations.

State control and supervision of the technical condition and operating safety of large and especially important water management facilities is performed by the State Inspectorate "Gosvodkhoznadzor" (State Water Management Supervision) specially established in accordance with the Resolution of the Cabinet of Ministers of the Republic of Uzbekistan # PKM-186 dated April 20, 2004, and these works are regulated by the Law "On safety of hydraulic structures" adopted on August 20, 1999, and enforced on September 4, 1999.

The issues related to water withdrawal and water use, water reception and delivery, as well as accounting and reporting are regulated by the relevant time-based procedure approved by the Ministry of Agriculture and Water Resources (Order # 165 dd. September 16, 2003, and Order # 210 dd. November 24, 2003).

To improve the protection of rivers, reservoirs, water bodies and other water supply sources from detrimental effect of industrial, building, transport, agricultural, etc. facilities, the works related to the establishment of water protection zones and riversides is being carried out along with the identification of the boundaries of fresh groundwater deposits that are granted with the protected area status. Thus, based on the recommendations of the State Committee for Nature Protection, 11 natural object related resolutions have been adopted since 2001, three of which were concerning the identification of the boundaries of fresh groundwater deposit formation zones and eight ones concerning the identification of the boundaries of water protection zones and riversides. In accordance with the existing laws, the following are to be obligatorily installed around the coastal zones of reservoirs and water bodies as well as along river, canal, and collector banks:

- coastal strip, where any economic activity (except for planting of greenery and beautification) is prohibited and all existing buildings and facilities are to be carried out from there;
- water protection zone, where limited economic activity can be carried out in line with certain requirements.

According to the legislation, special economic activity regime has been established within the authorized boundaries and the activity that will cause damage or is potentially dangerous for a water body is prohibited.

Nevertheless, the improvement of the practical water supply and water use management system is outpacing before the development of the legal basis and especially as it pertains both to the linkage of a great number of by-laws with basic laws and resolutions, and development of the mechanism of the control over the performance of statutory provisions.

### 1.3 Organizational structure of the water management system.

The existing organizational structure of water resources management in Uzbekistan at the national level is shown in Fig. 1.1A. At present, the Chief Water Management Department (CWMD) under the Ministry of Agriculture and Water Resources is the Chief Water Administration (CWA) of Uzbekistan. The existing organizational structure of CWMD was formed in 2003 (Fig. 1.1B) as a result of substantial reorganization of the Uzbekistan water industry. The present day's diagram of the water resources management structure in the Republic of Uzbekistan is given in Fig. 1.2 (the IWRM-FV Project zone is an exception).

Since 2003 in the Uzbekistan transition to the hydrographic principle as one of basic lines of IWRM has been accomplished. In accordance with the Resolution of the Cabinet of Ministers of

the Republic of Uzbekistan # 320 dated July 21, 2003, the administrative-territorial system of water resources management has been liquidated and new facility operation and water resources management system has been built on the bases of water management unit of provincial and district agricultural and water management administrations as well as inter-district canal administration. At that, all irrigated territory of the Republic was divided into unified basin management areas allowing for the feed source and servicing the territories along the full length of main and inter-farm canals. Basin Irrigation System Administrations (BISAs) have been established with an independent balance sheet and direct subordination to the Ministry of Agriculture and Water Resources of the Republic of Uzbekistan; each of those includes several Irrigation System Administrations (ISAs) for servicing territories of two or three districts taking into consideration coincidence with the zone of coverage of particular large and inter-farm canals. Furthermore, main canal management organizations that are subordinate to BISA have been founded on order to improve the management efficiency.

In particular, three Basin Irrigation System Administrations (BISAs) have been established in the Uzbekistan part of the Fergana Valley where there is quite complex irrigation system: Naryn-Karadarya, Syrdarya-Sokh, and Naryn-Syrdarya; also, with the view of improving the management efficiency, the Big Fergana, Big Andijan, and South-Fergana main canal management organizations with the unified dispatch center have been established. Irrigation System Administrations (ISAs) have been established under each Basin Administration allowing for the hydrographic characteristics of the basin. To ensure the collective nature of the decisions taken and control over their execution as well as ensure broad involvement of stakeholders in the water resources management process, public councils and commissions were set up at different levels (in accordance with the resolution of the Cabinet of Ministers # 320 dd. 21.07.2003).

Significant changes have taken place in the political and economic life of the country for the past 10 years; those changes have led to the acceleration of the reforms in the management and rational use of land and water resources.

The reorganization of all shirkat farms to individual farms was accomplished by 2005 in accordance with the Law of the Republic of Uzbekistan on Individual Farms (1998). As a result, 260’000 independent individual farms were founded across the Republic; they work on the basis of contracts with different governmental and joint-stock organizations.

By adopting a series of directive documents, the Government has ensured the operation of contract systems in agricultural production along with the establishment of developed infrastructure of service organizations. For the last 10 years alone, 17 directive documents (President’s resolutions and decrees, resolutions of the Cabinet of Ministers) have been adopted as well as additions and amendments to a number of Republic’s laws aiming at strengthening the status of individual farms, protection of their rights and granting various exemptions.

Optimization of farms’ areas along with their enlargement was carried out during the years 2008-2010 for the purpose of rational use of agricultural equipment and machinery and raising the profitability of individual farms. As a result, to date the minimum area of farm’s lands (within the state-order zone) comes to 50-60 ha and the areas of most farmers’ lands have come, on average, to 80-100 ha.

In the consequence of the optimization process, the number of water users has reduced from 80’714 in 2008 to 66’184 in 2011, which also allowed enhancing the efficiency of water resources management.

In view of the establishment of water user sin completely different form, in the form of individual farms, the problem of reformation of the Republic’s water sector too became pressing. It was necessary to radically change the existing water management framework and set up new structures that take into consideration the interests of all water users and that are adapted to new

conditions where the number of water users increased a few hundred times. Significant changes in the on-farm (intra-farmer) water resources management and generally in the regulation of water relations took place in the result of the establishment of Water Users' Associations.

As is obvious from the above-stated, significant changes have taken place in the agricultural and water sectors of the country for the past 10 years; however, these changes practically had little to do with the organizational structure of the water sector management at the level of irrigation systems and higher (exception is the IWRM0FV Project zone), by virtue of which the drawbacks remained, and those can be removed through the implementation of the IWRM principles.

The main drawback of the current management structure is the existence of dual hierarchy of the water supply management system: on the one hand it seems hydrographic, on the other hand it keeps the administrative attachment. In the presence of direct contracts for water supply between WUAs and canal management organizations, the role of ISAs will reduce only to the registration of the performance of the commitments between the contracting parties. This role can be played by BISAs which are charged with water supply to all the water users of a certain hydrographic unit and which together with the Master Station of the Fergana Valley can secure the water supply linkage between the main canal management organizations and small rivers, collector & drainage flow and other sources, particularly allowing for the variability of the flow of small rivers.

This does not imply that the management in general cannot combine the hydrographic and territorial principles; however, these approaches should be specialized: water supply – according to the hydrographic principle, water demand management – according to the territorial principle. Moreover, improvement and rationalization of water management should follow the same lines: decrease of water losses at water supply owing to the improvement of efficiency and improvement of the accuracy of the water delivery to water users must be carried out according to the hydrographic principle, while the improvement of water productivity, irrigation method efficiency and achieving high water user effectiveness according to the territorial principle.

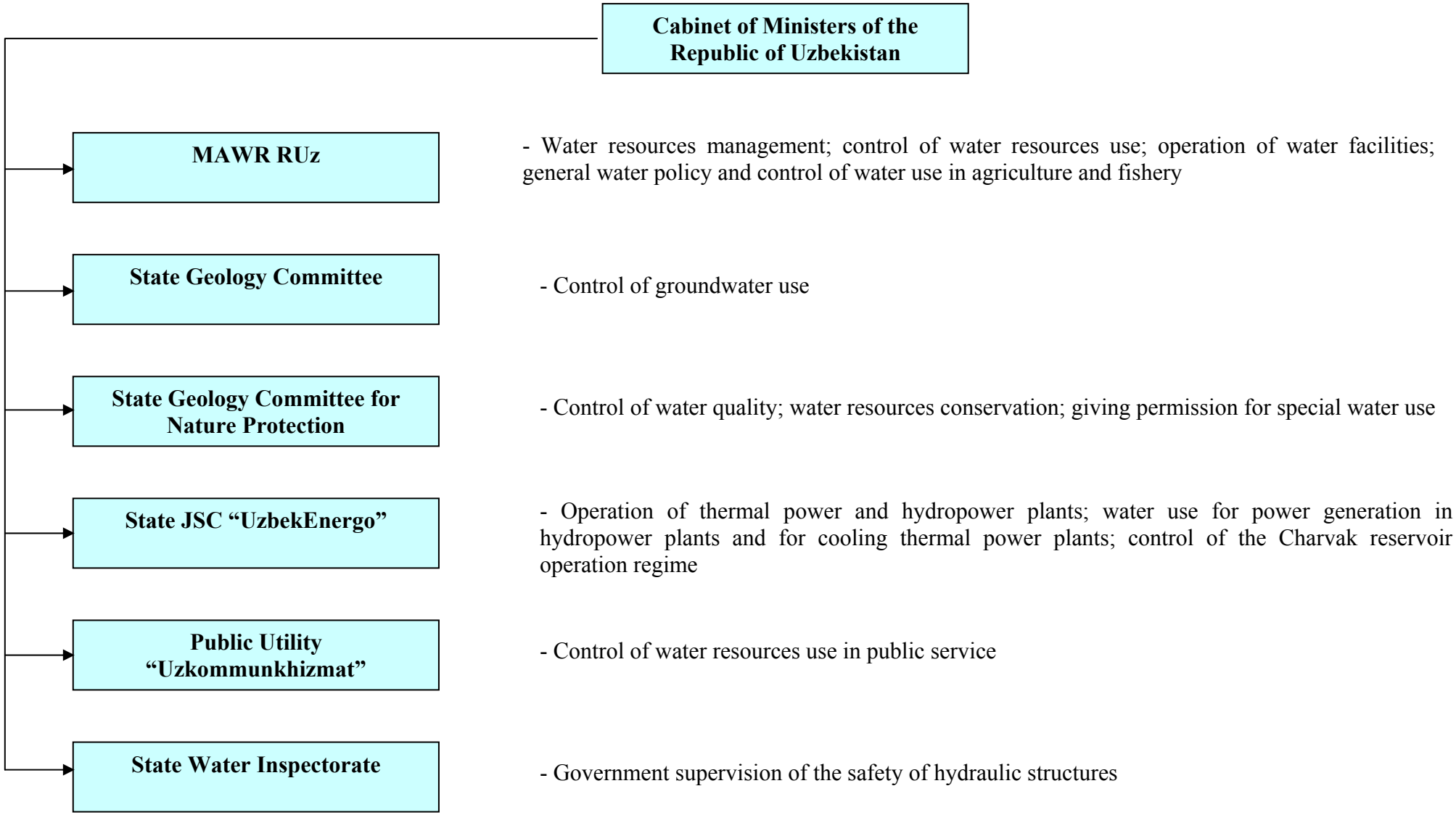



Figure 1A. Main republican organizations for the control of water resources use.

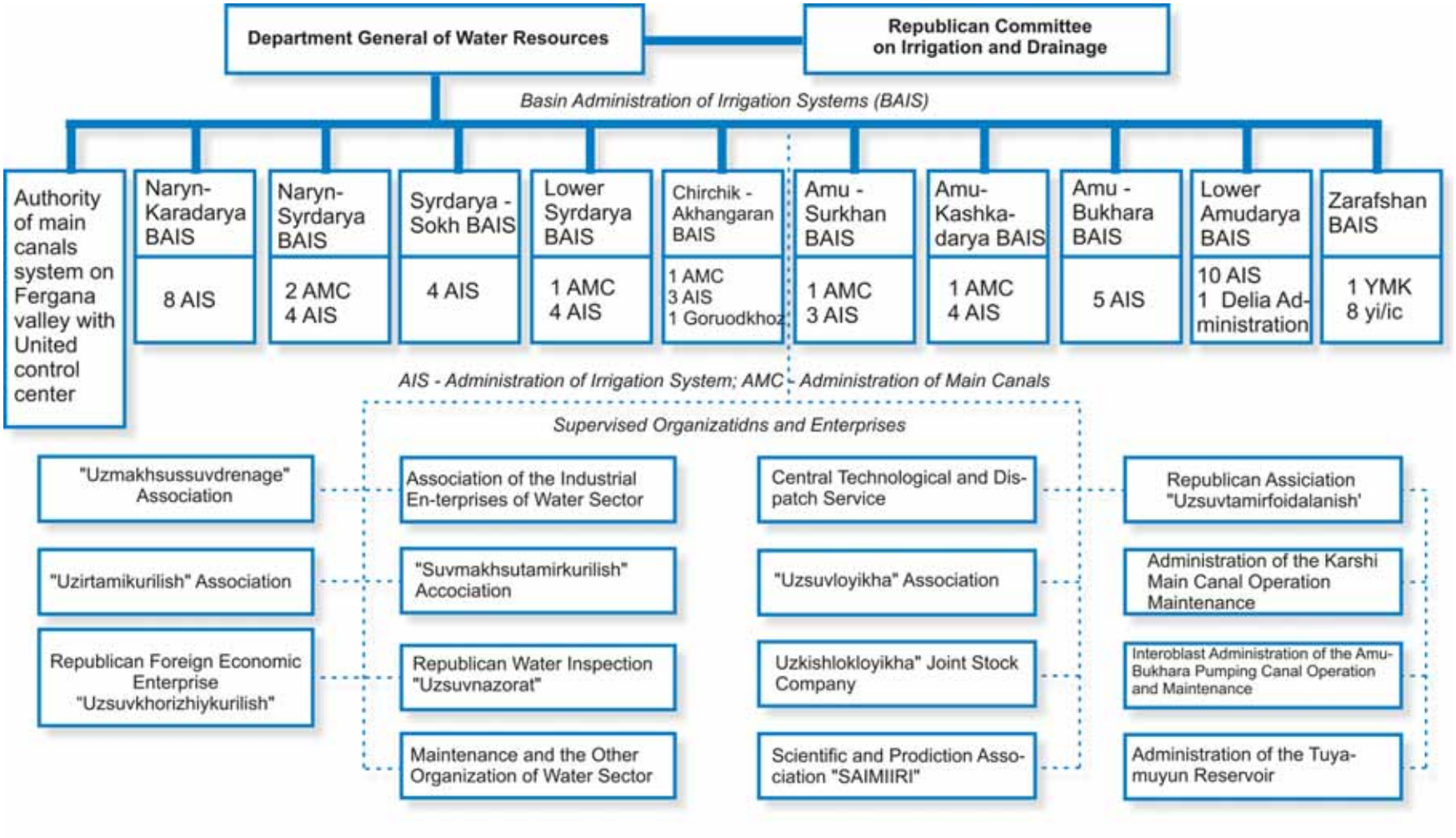



**Figure 1.1B Existing Institutional structure by basin irrigation systems**

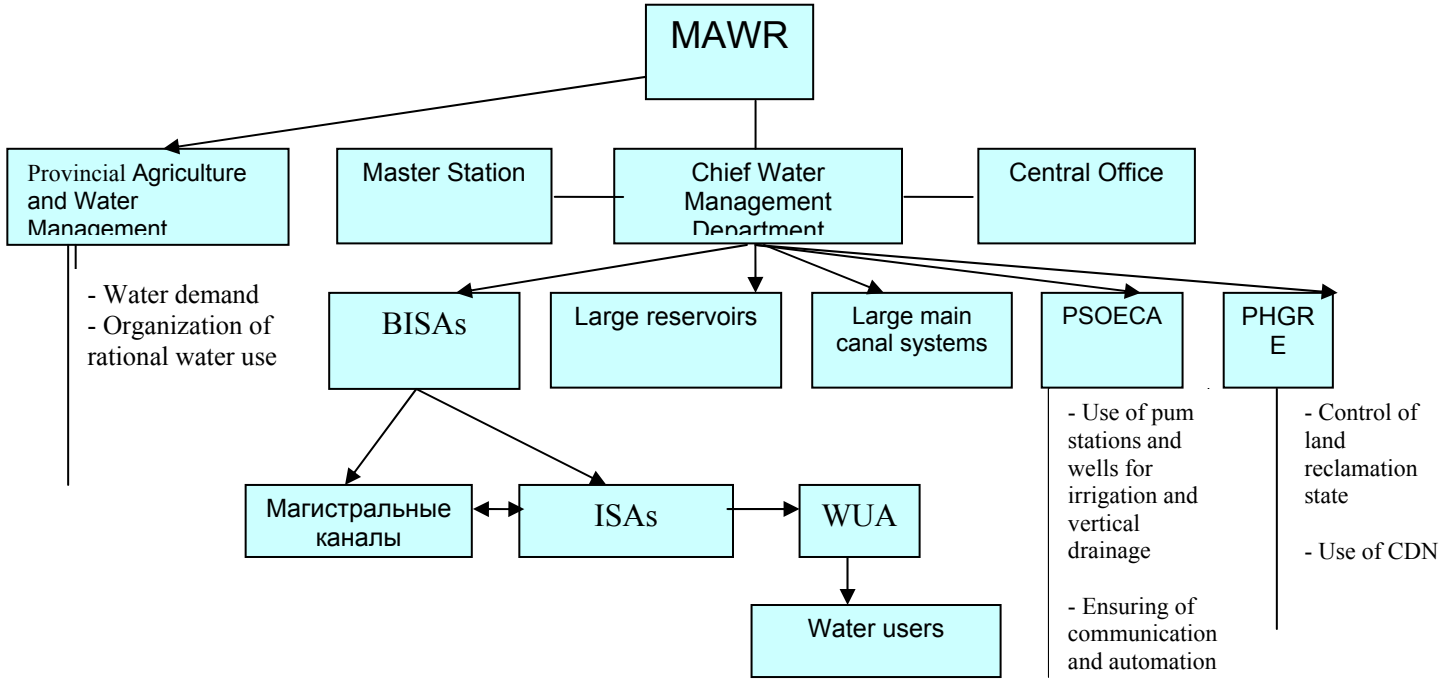



Figure 1.2. Structure of water resources management in the Republic of Uzbekistan

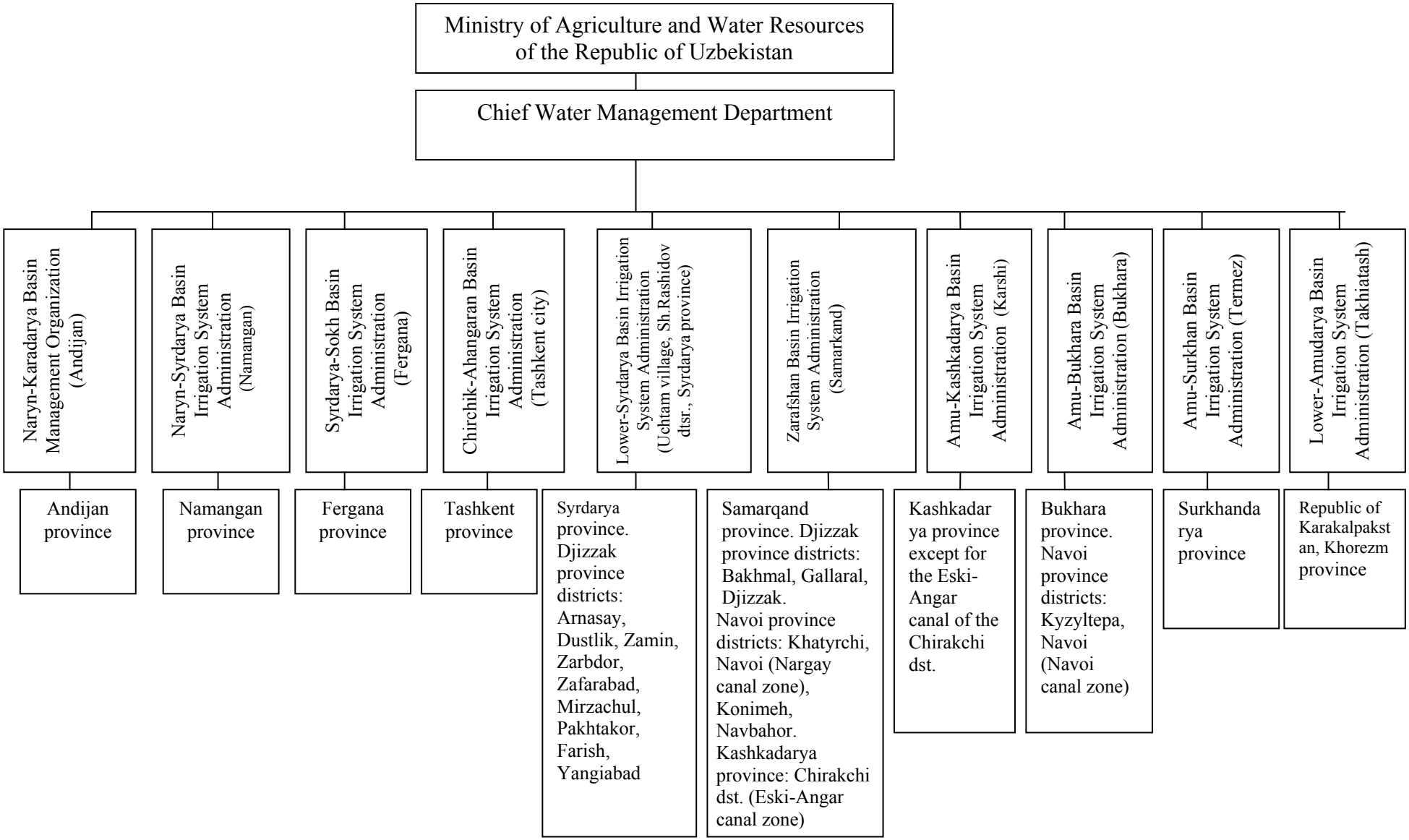



Figure 1.3. Existing institutional structure of the Ministry with BISAs.

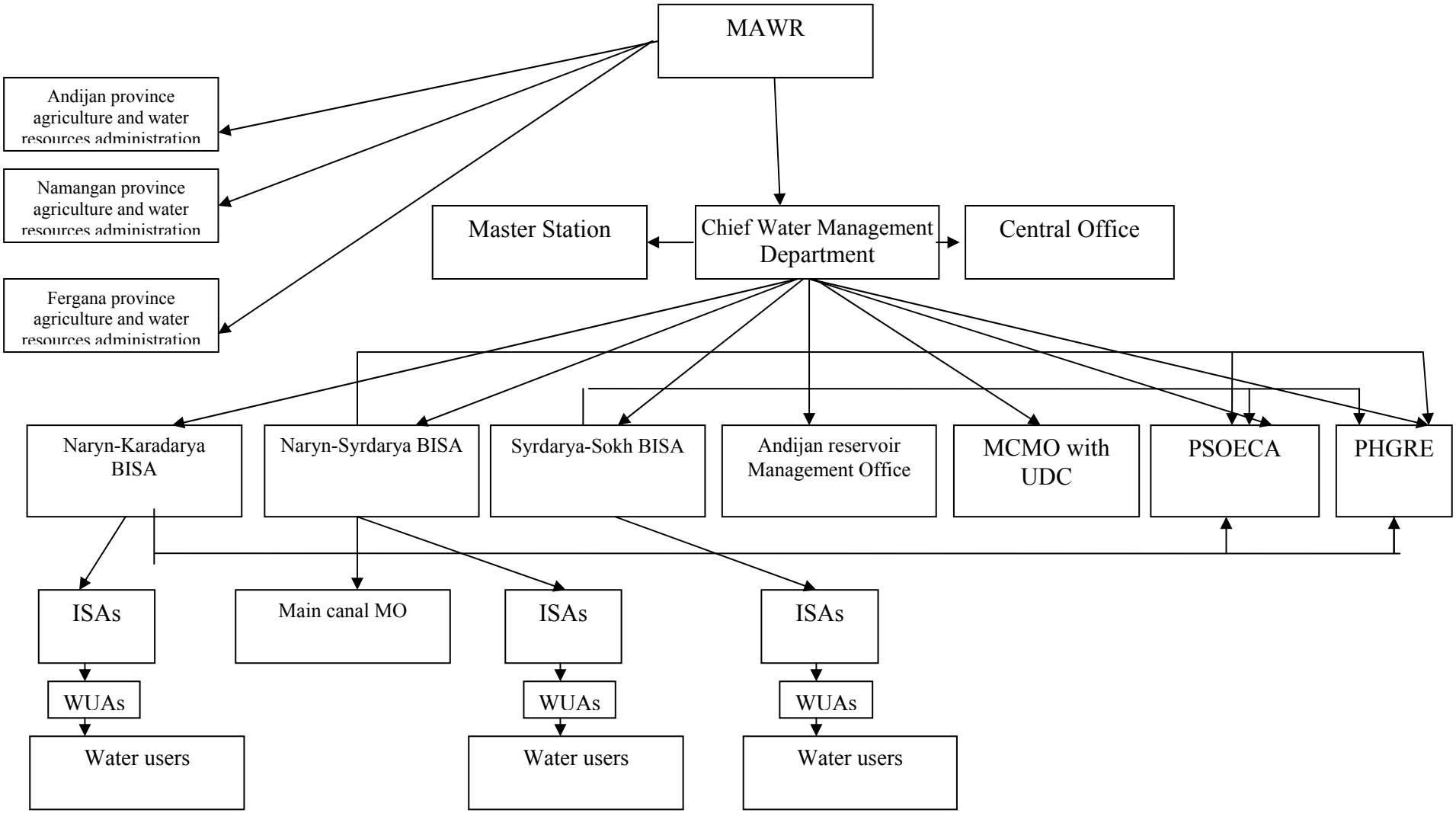



Figure 1.4. Current water resources management structure in the Fergana Valley

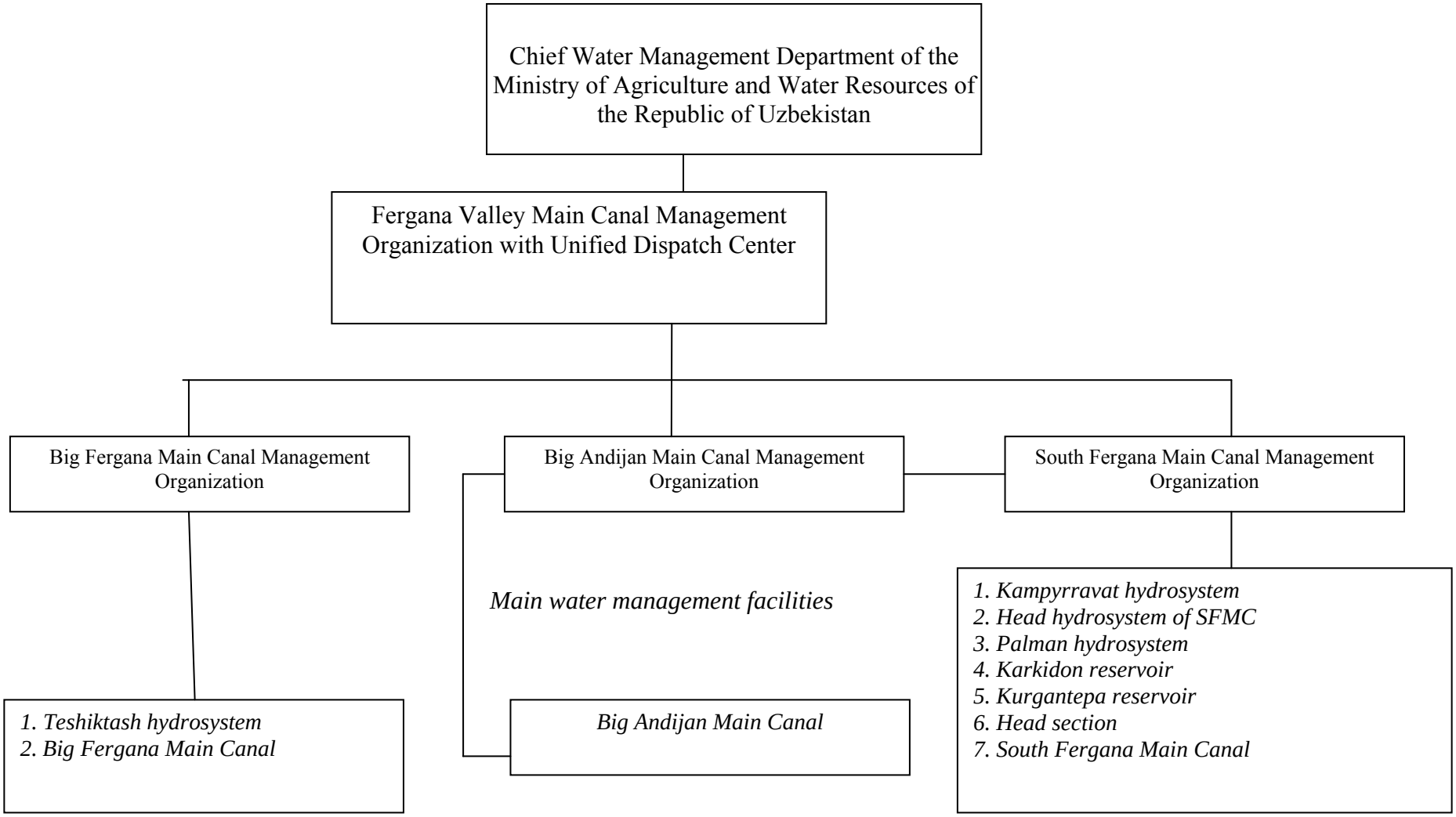



Figure 1.5. Current organizational structure in the Fergana Valley Main Canal Management Organization with Unified Dispatch Center (MCMO with UDC)

# Section 2. Vision of the IWRM principles implementation

## 2.1 Vision of the IWRM principles implementation

In the course of the water resources management reforms carried out in the Republic, including Fergana Valley, in accordance with the Resolution of the Cabinet of Ministers of the Republic of Uzbekistan # 320 dated July 21, 2003, hydrographization has been made to some extent. However, for some reasons complete hydrographization within boundaries in the Republic as a whole and in the Fergana Valley have not completed yet. Completion of this process at all levels will allow streamlining, as mush as possible, the process of water delivery from sources to the end user.

Top, interstate level

In spite of the fact that ICWC is established and its executive bodies are set up for the regulation of water relations (BWO "Syrdarya" and BWO "Amudarya"), there exist certain problems because all headworks were not transferred to their balance sheet, which evidently lowers the quality and efficiency of the interstate water resources management.

Besides, the zone of transboundary small rivers (Zarafshan river and small rivers of the Fergana Valley) remained out of sight of interstate bodies. Also, the authority of the BWO "Syrdarya" for the management of all water intakes on the Syrdarya and Chirchik rivers have not been carried to their logical completion. Required measures at this level are given in Section 3 (Vision).

Republican level (includes three sub-levels)

A) Basin level

In accordance with the Resolution of the Cabinet of Ministers of the Republic of Uzbekistan # 320 dated July 21, 2003, ten BISAs and one Fergana Valley Main Canal Management Administration with the unified dispatch center have been founded in the Republic. Of the ten BISAs, the Chirchik-Akhangaran, Nizhne-Syrdarya, Nizhne-Amudarya, and Zarafshan administrations as well as Amu-Bukhara Main Canal (ABMC) can (conventionally) be considered completed within hydrographic boundaries. The other five BISAs (that were formed during the reforms for some reason or other) are set up mainly within provincial boundaries. Supposing the BISAs set up within the Kashkadarya and Surkhandarya provinces are to some extent comply with the hydrographization principles, since the whole network is located within one or several basins located in the province's territory. The most difficult situation is associated with BISAs set up in the three Fergana Valley provinces which obviously fail to comply with the hydrographization requirements. They mainly are fed from the system of inter-province and even inter-state level main canals. At that, the above-mentioned reform did not take into account the zone of impact of small rivers that play significant role in the water supply to the Fergana Valley lands. It seems reasonable to carry out gradual transition to the management of the whole Fergana Valley water supply system by a single inter-province body, keeping BISAs charged with planning and coordination of the water supply to the province territory in linkage with the systems of main supply, small rivers, and local sources as well as with water demand management and improvement of water use at the WUA (technical assistance) and direct water users levels.

At that, it should be taken into account that hydrographization, as some researchers (e.g. Mr. Kai Wegerich) think, does not imply the securing of water supply according to the principle "one area (one sub-basin) – one source". Hydrographization involves selection of the MAIN SOURCE of water supply, but feed allowing for possible inflow from other, more economical or

compensating sources, especially in the case of water deficit. In this respect, the Fergana Valley provides wide field of different combinations. For example, the Sokh river sub-basin orients mainly to the water supply from the stem of this natural flow source. But at the same time it is fed from the BFC canal, and during water shortage the lower part of the basin provides for the possibility of additional water supply by pumping stations from the Syrdarya river. The Master Station of the Fergana Valley together with the Syrdarya-Sokh (Fergana) BISA will determine both the share of planning water supply from these different sources and possible adjustment in the case of unforeseen change of water content (or water availability) in the Sokh river.

B) Middle level (sub-basin)

To solve many administrative and organizational issues, 4-5 Irrigation System Administrations (ISAs) has been founded in every BISA instead of district water administrations and inter-district canals administrations (IDCA); those deal with water resources management through inter-farm canals. The past eight-year period has shown that most ISAs have been set up without allowing for hydrographization and are an "unnecessary" unit in the water resources management hierarchy, and, dealing mainly with administrative and organizational issues, they defend the territorial interests of the district serviced by them lowering the efficiency and, at the same time, quality of water management. Moreover, each of those has district water administration (rayvodkhoz) features remained in the hidden form, having no independent financing, but at the same time having certain number and responsibility to district authorities. This all calls to revise the ISA functions or redistribution of water supply and water use functions between other structures (or even levels). At that it makes sense to legitimate the giving ISAs the water demand management functions (i.e. the official functions of territorial bodies) or use their financing for official restoration of district water administrations.
The established particular main canal management organizations, as well as possibly particular small basins, directly subordinate to BISAs (if the basin is located in the territory of the same BISA), deal only with water delivery to inter-farm canals. Such a situation exists in the territory of the Kashkadarya and Bukhara provinces, in the RESP-2 Project zone, where, respectively, the Karshi (and its Mirishkor branch) and Amu-Bukhara main canal systems are subordinate to the respective BISAs and where it is now impossible to supply water by the "BISA-MCMO-WUA" scheme, but it is done by the "BISA-MCMO-ISA-WUA" scheme. The SDC's statement, given in the conclusion on the first version of the Uzbekistan Vision, about the successful development of this link is ate least untimely, since it would be necessary to analyze the total water consumption at the head section of the canals according to the organizational structure proposed by us and being used by the RESP-2 Project. At least, today there is no accounting of water on main canals and particularly losses at the joints of these canals-ISAs-WUAs, which would allow judging the effectiveness of this option which we are not going to ignore giving at the same time a priority to clear separation of the functions of water delivery according to the hydrographic principle and water use according to the territorial principle. Time will show the acceptability and showings of both approaches.

C) WUA level

Along with the reforms in the main and interfarm canals management, since 2001 Water Users' Associations (WUAs) began to be established step by step from in accordance with governmental directives to ensure the regulation of water resources use among farms and other water users. They were set up mainly proceeding from the recommendations of donors as well as based on foreign experience. Since 2002, the IWRM-FV Project started intensively working out basic provisions for the formation of WUA and their development. Based on that, since 2005 the WUA establishment process proceeded at a sufficiently fast pace and covered almost the whole

territory of the Fergana Valley's irrigated lands in the territory of Uzbekistan. Dynamics of WUA establishment in the Fergana Valley is shown in Figure 1.3. However, when establishing WUAs, they did not take into account the each site's hydrographic peculiarities everywhere, which lowered the water supply effectiveness. Furthermore, it turned out that the restructuring of the agrarian production seriously affects the necessity to account for its peculiarities in the WUA activity. Therefore, to enhance the efficiency of the WUA activity they had to carry out much amount of work in several directions:

- ensuring of the sustainability of the organizational structure and principles of the WUA activity through maximum involvement of water users and making most of them have the sense of the ownership of these bodies;
- development of the economic planning model aimed at making their activities financially viable with proper accounting system;
- introduction of the system of contractual relations between CMOs and WUAs, between hydroreclamation organizations and WUAs, and between water users and WUAs;
- development of water supply planning and its daily monitoring and reporting.

That all took place under the conditions of practical absence of the legal basis for WUA existence and availability of great many by-laws that impede the implementation of recommended innovations. Regular exchange of views between the project management and employees and MAWR representatives within the NCSG activity with the participation of the representatives of other ministries and institutions (ministries of justice, finance, economy, nature protection committee) along with periodically contacting directly the Government allowed gradual development of the mechanism of state control of the WUA activity. In particular, the preparation of the law "On the amendment and addition to the Water and Water Use Law" in 2009, in the course of which many legal issues related to the WUA existence and development, was of great importance. The further processing of a series of the documents on WUAs which was carried out by the project implementers together with MAWR in accordance with he order of the Government played a great role in making those decisions being practically implemented (standard contracts between WUAs and WMOs, between WUAs and water users, standard WUA Charter, regulation on crediting the WUAs that deal with the farmers on the state-order crop fields, order of the Government on the payment for the services by other water users, etc.).

That all contributed to the improvement of the WUA viability and, in the final analysis, has formed the situation when all the showings of the project zone WUAs are much better than those of WUAs across the country and even of much-praised RESP-2 project zone.

### 2.1.2 Conclusions

Analysis of the current hydrographization state allows drawing the following conclusions:

1. Implementation of the hydrographization principle is an important instrument for improving the quality of management of water supply to water users and overcoming "administrative interference".
2. In practice, it is very difficult to obtain maximum hydrographization at all water hierarchy levels for both objective and subjective reasons. For instance, a main canal can cross the territories of a few countries; locations of irrigation and reclamation systems on the map often do not match; there are irrigation systems that often are interrelated (cross-manifold) and inter-dependant, mutually complementary as was shown depending on the water availability in sources. In such complex cases, it is important to determine the main source of water supply and interrelation conditions, including, as appropriate, transfer of water from one system to another.

3. The hydrographization process, given the abovementioned, can go in several stages as suitable conditions have matured (political, technical, social, ethnic, etc.)

2.1.3 Vision of hydrographization principle dissemination

1. The experience of the hydrographization implementation within the IWRM-FV Project is reasonable to disseminate over the Fergana Valley both vertically and horizontally.
2. Dissemination horizontally supposes, mainly, the WUA hydrographization activity in the zones of BFMC, BAMC, and other main canals.
3. It follows from the IWRM-FV Project that the hydrographization is advisable to be implemented in the following order and based on the following general rules:

- Conducting a hydrologic survey of the existing boundaries and water sources of all water users within main canal's command area.
- Collection, analysis, and generalization of main canal (MC) water distribution monitoring results (discharge and water supply stability on MC monitoring sites, stability and uniformity of water supply to water users from MC, etc.).
- Collection, analysis, and generalization of conflict situation monitoring results (conflicts places, causes, types, participants, and frequency) in the MC zone.
- Based on the above preparing a draft plan/map for realigning the hydrologic boundaries (of WUAs) within main canal's command area including assessment of hydrographization work reasonability and possibility of carrying out of such works (subject to support by major stakeholders).
- Discussion, coordination, and approval of the hydrographization plan by stakeholders (representatives of water users, water management organizations, power structures, nature protection organizations, etc.).
- Implementation of the hydrographization plan with the involvement of stakeholders.
- Organization of monitoring and assessment of the real effect from the hydrographization plan implementation.

In perspective, in the Fergana Valley the approach with which ISAs must be either reorganized into the bodies of water demand and land and water productivity management at the district level or dissolved and their water supply functions and infrastructure be transferred to CMOs (large secondary canals) or WUAs with appropriate transfer of financing.
In other zones, it is necessary to consider, as was shown above, two options: similar to the recommended for the Fergana Valley and the BISA-CMO-WUA option with which ISA is to coordinate the work related to the improvement of the performance of WUAs and water users.

## 2.2 Vision of the improvement of legal framework of IWRM

Analysis of the assessment of legislative acts and directive documents from the standpoint of securing the IWRM implementation principles shows the following:

- The Law on Water and Water Use (with the amendments introduced in 2009) clearly supports the hydrographization principle at all levels (sub-basin, irrigation system, and WUA). At that, two more principles are supported at the WUA level: integration of water users and public participation.

However, absence of prohibition does not mean the commitment of the Government to apply these principles especially at two upper levels. Here more efficient regulation of these principles is required, particularly acknowledgement of these two IWRM branches directions, territorial and hydrographic, as well as fixation of the separation of management and governance functions.

For a start, securing of the legal status of UCWU and CWC is required to integrate water users and strengthen the role of public participation in the control over water resources management and financial support to WUAs. Validation of the order of obligatory water users' (in particular makhalla committees) participation in financing the WUA activity as well as governmental commitment to build up the system of support to WUAs, including in terms of long-term investment, is a must. In addition, to create conditions for the implementation of the Law on Water and Water Use (with the amendments and changes introduced in 2009) it is needed to speed up adoption of appropriate legislative acts and subordinate regulatory acts, instructions, and departmental rules.

At that, it is very important to specify the limiting of water use through linking it to irrigation area and number of water users preventing voluntarism in the setting and adjustment of limits. In particular, every water user, taking into account its biological and technical needs, shall be assigned with minimum water volume per unit area (agriculture), product (industry, power industry), and per capita (domestic). This water volume shall not be allowed to be reduced. With forced reduction of biologically minimum water volume in agriculture, the agricultural producer shall be compensated for the losses of income because of reduced fixed water volume in accordance with legal procedure.

Implementation of water saving technology that allows reducing the volume of limited water use shall be carried out by the government.

- Given the special role of irrigated farming in ensuring of food security, employment and well-being of rural population, the following water supply priority should be set in the Republic of Uzbekistan:
  1. Public service
  2. Medical and treatment
  3. Agriculture
  4. Environment and recreation
  5. Fishery
  6. Energy sector (thermal plants)
  7. Industry
  8. Hydropower industry

2. Adoption of the following governmental regulations in order to provide conditions for the execution of the Law on Water and Water Use:

- On immediate measures for widespread implementation of water saving technologies in all branches of the national economy.

*The organizations responsible for the preparation of the following: Ministry of Agriculture and Water Resources, Ministry of Justice, Ministry of Finance, Ministry of Economy, State Committee for Nature Protection, Uzbekenergo State Joint-Stock Company, State Agency for Public Utilities Uzkommunhizmat, Association of Farms.*

- On step-by-step introduction of the principles of payment for water supply and land reclamation state maintenance services.

*The organizations responsible for the preparation of the following: Ministry of Agriculture and Water Resources, Ministry of Justice, Ministry of Finance, Ministry of Economy, Association of Farms.*

- On enhancement of the water users' responsibilities for accounting and reporting using of all types of water.

*The organizations responsible for the preparation of the following: Ministry of Agriculture and Water Resources, Ministry of Justice, State Committee for Nature Protection, State Geology*

*Committee, Hydrometeorological Service, Uzbekenergo State Joint-Stock Company, State Agency for Public Utilities Uzkommunhizmat, Association of Farms.*

- On the improvement of the water specialists training and retraining methods.

*The organizations responsible for the preparation of the following: Ministry of Agriculture and Water Resources, Ministry of Justice, Ministry of Higher and Secondary Special Education, Ministry of Finance, Ministry of Economy.*

- Introduce additions to the "Regulation of the water use and water consumption procedure in the Republic of Uzbekistan".

*The organizations responsible for the preparation of the following: State Committee for Nature Protection, Ministry of Agriculture and Water Resources, Hydrometeorological Service, Ministry of Justice, and Khokimiats (administrations) of the provinces.*

3. Adoption of the following executive directives in the Ministry of Agriculture and Water Resources:

- "On the enhancement of the responsibilities of the parties involved in water resources management";
- Joint order of the Ministry of Agriculture and Water Resources, Ministry of Finance, and Ministry of Economy "Enforcement of water facility operation cost measurement standards"

*The organizations responsible for the preparation of the following: Ministry of Agriculture and Water Resources, Ministry of Finance, Ministry of Economy, Ministry of Justice.*

4. Organization of the system of control and checking with the involvement of relevant ministries and institutions, on-site execution of the requirements of the Decree of the Cabinet of Ministers # 174 dd. April 7, 1992 "Regulation of water protection zones of reservoirs and other water bodies, rivers, main canals and collectors, as well as the sources of drinking and domestic water supply, therapeutic and recreational purposes in the Republic of Uzbekistan".

### 2.3 Vision of the implementation of the public participation principle

2.3.1 Public participation in water supply management

Survey and opinion poll has shown that public participation in the water resources management process in the region is still in nascent state, and the public participation at the canal and WUA levels is limited by the project impact area. The founded public organizations represented by councils, committees, and commissions exist on paper only and have no influence on the management process. This can be exemplified by ***Water Management Councils and Commissions*** established in accordance with the Model Regulations on the Basin Irrigation System Administration (Supplement № 5a to the Resolution № 320 of the Cabinet of Ministers dated 21 July 2003). In this case their membership is composed of the leaders of provincial water management organizations headed BISA Chief. Administrative governance is practically fixed, which is rendered as if social character.

The established various Councils and Commissions (including the Republican Water Management Council) deal mainly with organizational and technical issues and only without public participation.

A joint water supply governance body (SFMC WC), which includes the representatives from all key stakeholders inclusive of water users, has been established only in the project zone at the irrigation system level. The organizational sustainability of SFMC WC needs to be strengthened and its role be acknowledged to ensure its full-fledged activity.

***CWC***

*CWC is an agency for joint (governmental and public) governance, which is founded based on the agreement between the WMO and public body (UCWU) concerning the joint governance of the CMO activity (Fig. 2.1).*

*<u>CWC functions</u>*

- *Initiation, consideration, and approval of the long-range development plan as well as annual and seasonal plans for water distribution and water use improvement in the canal zone;*
- *Development of equitable ten-day limits for water distribution on the pilot canal based on coordination of water supply and water demand and control over the compliance with those.*

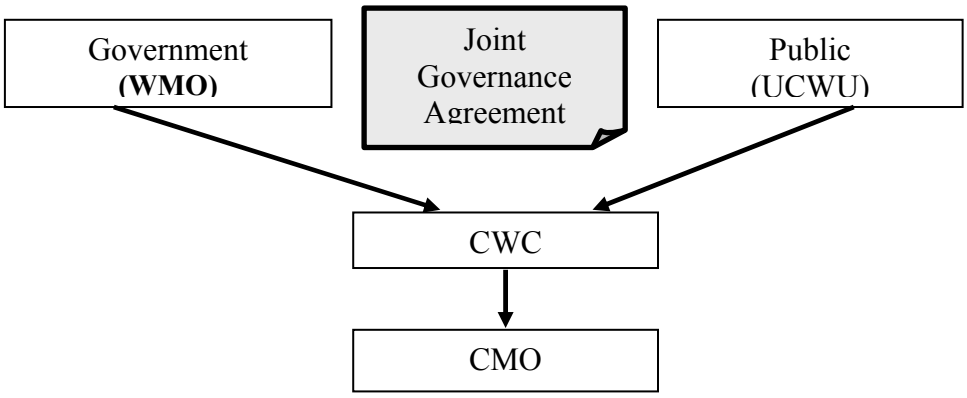



*Figure 2.1. Joint water governance scheme.*

- *Increase of water supply service fees collection from water users.*
- *Participation in solving the issues of environment (WPZ), drinking water supply, etc.*
- *Monitoring and assessment of the CMO activity.*
- *Participation in the prevention and settlement of conflict situations and controversial issues arisen between water users and between water management organizations and water users; etc.*

*At first, CWC is to be composed of the members of the Board which is formed from WMO and UCWU representatives, i.e. representatives of water management organizations and water users. At that, from UCWU the CWC Board is represented chiefly by the representatives of agricultural water users. Further, as its capacities and capabilities increase, the CWC Board can (must) be extended by other stakeholders.*

*Approximate composition percentage of the stakeholders in the CWC Council can be as follows (Figure 2.2).*
*Here, LA – local authorities; WS – water suppliers; WU – water users; OT – others.*

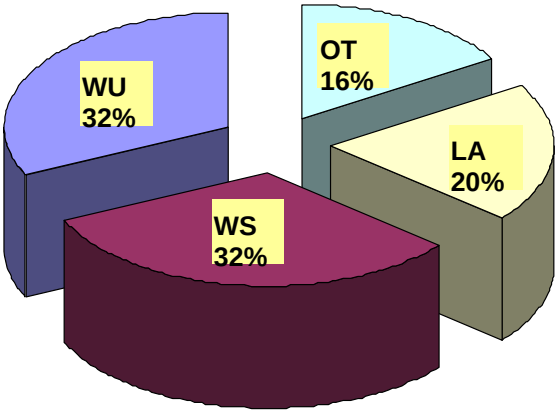



*Figure 2.2. Percentage composition of the stakeholders in the CWC Council (approximate). Here, LA – local authorities; WS – water suppliers; WU – water users; OT – others.*

*Also involvement of the representatives of environmental and drinking water supply institutions (even if they are not direct water consumers) in the CWC Council activity is very important, since the water protection zone state and drinking water deficit in the canal zone exercise a significant influence on the canal operation conditions and life of water users.*

*When forming the CWC Council composition, it is necessary to consider the share of water use (for example, agricultural water users are the major consumers), share of the contribution from the government and water users to the financing of CMO, etc.*

2.3.2. Public participation in water use governance

Moreover, a water and land commission (WLC) has been set up in the project zone at the district level (only one district – Kuva district) in the last year of the project activity in order to implement the joint water demand governance concept. Land productivity is the main objective of local authorities. They possess all levers for cropping: fertilizers; machine and tractor fleet; financing banks. In addition, this structure is the extension of the Government's decision on the establishment of commissions for the coor5dianbtion of the agrarian activity at the province level. The first results obtained are already positive. Below, recommendations on the development of such structures are given.

2.3.3. Public participation in the WUA activity

Establishment of WUA per se indicates great progress in the implementation of the public participation principle in the Republic, since farmers are given the rights for water governance. Currently, WUA carries out the activity associated with the water relations mainly between agriculture (irrigation) objects with poor involvement of other water users. Therefore, in the course of the project works, great attention was paid to the social mobilization of makhalla committees and dekhkan farms in the activities of WUAs and their Councils as governance bodies. The inquiries of the specialists carried out during the hydrographic study clearly evidence that the activity level of WUA members and level of understanding the necessity to strengthen the role of WUA Councils in the project zone is much higher than in the non-project zone.

Taking into account that WUA is a public organization, the following measures are proposed to strengthen and extend its activity with improving WUA Council performance:

- Moral and, most importantly, material encouragement of WUA Council Chairs at the transition stage.
- Combine, in the transition stage, the WUA Council Chair and WUA Director positions (such a WUA model already occurs, but it has not yet become popular enough).
- Inclusion of the representatives of local authorities and governmental water organizations (ISA) in the WUA Council.

The Government represented by local authorities and governmental water organizations is per se a WUA cofounder because it gives the latter a part of the state irrigation and reclamation network and therefore has the right to influence on the WUA activity through its representatives in the WUA Council. Such civilized (legitimate) form of the Government's influence on the WUA activity would more facilitate strengthening the WUA Council as a democratic governance body.

### 2.4 Vision of the integration of all types of water principle

There is no doubt that multipurpose use of all types of water resources will allow maintaining the level of water supply to irrigated lands at proper level. However, for various reasons when planning water use the major load falls on surface sources: rivers, streams, and main canals. Thus, when planning, collector & drainage water and water pumped from vertical drainage wells (VDW) with salinity permissible for irrigation are very often only indirectly allowed for, being left a kind of the internal reserve.

The experience of water distribution and water sue planning in the SFC zone has indicated the possibility to involve all of these sources and necessity to account those especially under water deficit conditions. For example, the number of other water sources accounted in the SFC plans comes to 18%. Accordingly, in the WUA plans, for example, in the WUA "Akbarabad", these waters account for 16 %.

To increase the integration of all types of waters, it is necessary, according to this experience, to develop special measures for reuse of collector and drainage water the bulk of which is composed of the surface water from the irrigated fields within the contours where they formed. According to the recommendations by a relevant research institute, these waters, if necessary, must be mixed with irrigation water from surface water sources. To this effect, it is reasonable to improve the prediction of groundwater and collector & drainage water volumes for possible reuse allowing for year's dryness.

At the same time, it is necessary to toughen the requirements and cooperative actions by the State Geology Committee, State Committee for Nature Protection, and Ministry of Agriculture and Water Resources in respect of accounting and reporting on the withdrawal and use of underground and collector & drainage waters.

To enhance the employment of all types of waters, the following organizational and technical measures are recommended:

1. BWO Syrdarya together with hydrometeorological services and water agencies of the countries should carry out appropriate works that provide accurate accounting of all water returned to the river stem.
2. Establish a joint Commission by the State Geology Committee, Ministry of Agriculture and Water Resources, and State Committee for Nature Protection for the inventory of all existing wells and improvement of accounting the volume of withdrawn and used groundwater.

3. Establish a joint Commission by the Ministry of Agriculture and Water Resources, State Committee for Nature Protection and Hydrometeorological Service for the specification of the available collector-drainage water volume and development of appropriate measures aimed at improving accounting of the used collector-drainage water volume.
4. By involving relevant research institutes and design and survey organizations it is necessary to perform zoning of the region's territory with the preparation of recommendations on the volume of collector-drainage waters possible to be used in the branches of the national economy along with the recommendations on their usage.
5. Ministry of Agriculture and Water Resources together with WUAs should carry out inventory of the availability and technical condition of the facilities and method of accounting collector-drainage waters along with the development of measures aimed at radical improvement of land reclamation condition.. Equipment of key sites for the identification of collector and drainage flow must be completed within 1-2 years. At that, governmental assistance in the equipment of the on-farm network is required.
6. Such a mechanism where every BISA, ISA, CMO, and WUA will bear corresponding responsibility for the employment of all types of water within permissible volumes (limits) and proper accounting and reporting of those.

### 2.5 Vision of the priority of environmental requirements principle

In accordance with the Law on Water and Water Use of the Republic of Uzbekistan, the purpose of the state control over water use and protection shall be to ensure that all ministries, state committees, agencies, businesses, institutions, organizations, individual and dekhkan farms, and citizens observe the established procedure of water use, carry out obligations related to water protection, prevention and liquidation of their damage effect, as well as water accounting rules.
The Resolution of the Cabinet of Ministers # 111 dd. 3 April 2002 "On approval of the regulations on state monitoring of environment in the Republic of Uzbekistan" specifies concrete distribution of objects to be controlled between ministries, institutions, and organizations of different ownership nature.
At that, it should be mentioned that the Protected Natural Territories Law of the Republic of Uzbekistan and relevant executive orders clearly specify the conditions of the use of riparian areas and water protection zones and, in accordance with these orders, about 188 potentially hazardous facilities have been taken outside the water protection zones and riparian areas of eight large rivers. However, allocation of lands of water protection zones and riparian areas for various purposes uncoordinated with relevant bodies as well as unauthorized occupation would cause violation of water protection regime and affect the operating regime of engineering structures (canals, hydraulic systems, etc.), which will result in the pollution of water bodies.
To secure the priorities of environmental requirements, the Project from the very beginning of the works outlined the program of environmental measures, including inventory of the state of water protection zones, registration of those and observance of the regime; assessment of land reclamation state; establishment of the interaction between public organizations and reclamation services, including the contracts between WQUAs and HGREs. During the training of WMO and WUA workers, great attention was paid to the environmental protection of watercourses and irrigated lands. Involvement of the representative of nature protection organizations in CWC contributed to the coordination of the nature protection activities of CMO, UCWU, WUA with local authorities.
It is also necessary to take over the special control of UCWU and WUA the performance by village people the works related to the cleaning of canals on their territory and keeping water bodies clean. At that, involvement of school students is of primary importance for not only

improving the current state of watercourses but also developing respectful attitude of the future generation towards water.

### 2.6 Vision of the linkage of all water users principle

The main type of water users in the Republic are represented by:

- Agriculture…….. ..88.9 %
- Domestic and drinking water supply……4.3 %
- Industry ……4.2 %
- Energy industry ……0.4 %
- Fishery……..2.2 %

At that, the Law on Water and Water Use of the Republic of Uzbekistan has fixed the following priority in water supply:

1. For domestic and drinking purposes;
2. Energy industry;
3. Industry;
4. Fishery;
5. Agriculture.

Traditionally, agriculture accounts for the major volume of water consumption, while when apportioning water the priority is given to such sectors as domestic and drinking water supply and industry, etc., except for environment. In fact, water is allocated to environment based on the leftover principle (maintenance and restoration of ecosystems, sanitary releases), which causes damage to nature (Aral Sea tragedy). Everybody knows the consequences of such an approach.
One of key principles of IWRM is the principle of linking the demands of all water users. much is spoken about it, but little is done in this respect. In order that the demands of all water users should be taken into consideration, these demands by justified and imposed upon the organizations in charge of water supply. In order that these demands should get a hearing, these water users must act in a body by coordinating their actions and represent a force able to hold their own.
There are the problems related to the consideration of all types of water users at all hierarchy levels. For example, at the lowest level the problem of consideration of the demands of homestead land owners, fishery owners, etc. is pressing. At the main canal level, drinking water supply and water protection zones associated problems are very topical. At higher levels, the relevant environmental problem is particularly urgent: the higher level, the more urgent this issue is.
Basically, WUA brings together agricultural water users-farms etc. The process of the involvement of homestead land owners and other water users (summer cottage partnership associations, sanatorium, school, college, small-scale industrial enterprises, etc.) in WUAs through setting up water users' groups (WUG) is in progress under the Project. This process is going on, but it is still far from being accomplished. Recently, such a tendency is taking shape when local self-government bodies (kishlak and makhalla committees)) get involved. Involvement is not just the participation in decision making and defending but also certain contribution to the process of fund raising for the operation and maintenance of WUA canals and structures.
Although the priority of agriculture is the lowest, the Ministry of Agriculture and Water Resources is the state body authorized to control water resources. In this regard, to ensure equal rights for all water users within the relevant laws, it is necessary to consider the issue of the

participation of all sectors' representatives in the process of limit setting at all water hierarchy levels, control over their observance, and, accordingly, improvement of water productivity.

### 2.7 Vision of the water saving implementation principle

It is obvious that the principal measure to alleviate the increasing water deficit is every kind of water saving and minimization of unproductive water losses. Unfortunately, despite tightening the requirements for rational water use and performed different one-time campaigns in not only the Fergana Valley but also across the Republic, water saving stimulation mechanism has not been created yet.

Farms and other water users are not interested in carrying out water saving measures. Neither the method to encourage (or stimulate) the WUA and CMO personnel for proper and efficient water resources management, which would allow both observing set limits and equal supply to all water users irrespective of their location, has not been developed.

Extremely inadequate equipping of the on-farm network with gauging stations, insufficient provision of inter-farm canals with gauging stations as well as their poor technical state do not facilitate adequate assessment of the results of water resources management and thrifty water use. Data related to these issues are not systematized and analyzed, the job of BISA and ISA reduces, chiefly, to water regulation in canals depending on water content in the sources.

Under these conditions, the Project carried out a series of organizational and technical measures which within the existing executive directives allowed streamlining water use and reducing specific consumption of water for irrigation as well as total water withdrawal by over 20%. This included involvement of the community in water distribution planning and monitoring, specification of the amount of the losses in main canals, specification of water consumption rates in accordance with the updated hydromodule zoning, water reception and transfer from WUA to water users according to acts, etc.

These and other actions for overcoming increasing water deficit aimed at strict saving of water consumed has to become a part of the national program on the widespread implementation of water saving which is recommended below proceeding from the analysis of the other countries' experience in this area.

#### 2.7.1 Organizational measures

a) Adoption of a special governmental program along with assigning each province with the tasks of step-by-step reduction of the total and specific water withdrawal; tightening control over rational and thrifty use of water, raising penalty size and number of punishments along with the amendments in relevant legislative acts; extending rights and powers of water management authorities in the suppression of unthrifty and irrational water use;

b) Incentives for rational and thrifty water use based on clear criteria for relevant assessment of water use. Rational and thrifty water use assessment criteria must be developed and validated for different natural and economic zones and for different crops in agriculture and separately for other branches of the national economy, and on their basis stimulation principles and their implementation mechanism must be developed and validated. At the first stage, the amount of tax on land and water use can be reduced for the water user become interested in water saving.

c) Revision of cropping pattern with using less water-consuming crops and drought-resistant varieties, and raising new crop varieties.

d) Introduction of water supply charging.

Probably, many people clearly understand that the introduction of paid water use, so-called irrigation water supply service fee, is one of effective methods that make water users take actions towards saving consumed water, especially since in other branches paid water use practice already exists since long ago and they have got used to this fact.

Various actions were taken to introduce paid water use. In particular, in Uzbekistan until the 1960s agricultural producers used to pay for water delivery or took part in keeping irrigation network operational.

Chargeable water use introduction related unsuccessful experiment was carried out in order to "lull" the society's vigilance in the mid-80s of the last century because of water consumption growth, increased water deficit and the consequent Aral Sea problem. One district from each province was selected, and using a hastily developed mechanism they carried out an experiment the essence of which was to transfer all operational funds from the district water administrations (rayvodkhoz) to the accounts of kokkhozes and sovkhozes (water users) and proceeding from actual water withdrawal (at a set tariff) the funds were transferred back to the district water administrations. Today the absurdity of that experiment is obvious, but then many officials and leaders set to executing that work with enthusiasm. They forgot about that little by little.

Nowadays, certain payment for water delivery is practiced in Tajikistan and Kyrgyzstan; in Uzbekistan, they pay only for WUA services.

In addition, the reforms carried out in agriculture provide required conditions for step-by-step introduction of paid water use in Uzbekistan too. To the effect, taking into account the economic position of water users, presence of state order for crops, and soil and climatic conditions of the regions, the following system is proposed:

- By involving research and design institutions, determine the economic value of different types of water use (water supply and sewerage of urban and rural settlements separately; industry; irrigated farming; energy sector; recreation; fishery) and determine the appropriate sector-specific specialized value and price of water in the crop production, while in irrigation according to every type of a particular crop for different soil and climatic conditions.
- Determine for each sector appropriate standards of self-financing of water supply and government's participation (or possibility of cross-subsidy of water supply);
- Determine the design cost of irrigation and reclamation network maintenance separately for the state-owned network and water users' associations.
- Carry out zoning of the territory to define introduction stages and set the size of water use charge taking into account soil crop-producing power, climatic conditions, and water availability.
- Maximum volume of the cost recovery by water users in the state-owned network zone will come to 50 %, while in the zone of water users' associations it will come to 100 % including 10 % from the stabilization fund (if water resources are saved, service fee if reduced; under such conditions, the stabilization fund is required to keep financial stability).
- The first year of the cost recovery in the state-owned network zone will come to 5 % of the design expenditure with even increase within 10 years (currently, the process of establishment of farmers is in progress, which requires step-by-step introduction and raising the cost recovery amount).
- To introduce changes in the procedure of setting purchasing prices for state-order products allowing for the introduction of the fee for water supply.
- In general, charged water use system must be introduced within 10 years.

- At the first stage, paid water use system will cover farmers engaged in growing fruits, vegetables, cucurbit crops, and rice (with the exception of former virgin unproductive lands). State-order cropped lands will be covered by paid water use system after three-year period since the introduction expires. At that, maximum cost recovery volume in the state-order zone will be set at a rate of 30 %.
- To introduce paid water use system it is necessary that appropriate regulations and guidelines should be developed as well as government decisions should be taken.

2.7.2 Technical measures

a) Improvement of furrow irrigation by applying different attachments (pipes, hoses, siphons, films, etc.) that allow saving certain volume of during the furrow irrigation;

b) Transition to widespread good land leveling using laser levelers.

c) Complete equipping all waterworks facilities, water delivery points of irrigation network, and sites of small rivers with gauging stations.

Hence, it is necessary to carry out inventory of the availability and technical state in terms of equipping important points with gauging stations. Based on inventory results, measures aimed at completing these works will be worked out. The measures should take into consideration improvement and modernization of the gauging stations at waterworks facilities allowing for introduced automatic data accounting.

Given higher level of equipping waterworks facilities and water delivery points with gauging stations in the state-owned networks in comparison with the network within farms, it is suggested to complete these works in the state-owned network as soon as possible at the expense of the national budget. Equipment with gauging stations in the on-farm network is possible within 2-3 years depending on the amount of works. At that, it is considered advisable that on low-productive lands (areas of former "planned unprofitable farms") these works should also be financed from the national budget and by means of grants. In other areas, with this view targeted interest-free credits should be allocated to farms.

Designing of gauging stations should be performed in an organized way by making several standard designs (the options were earlier worked out by the Scientific Production Association of the Central Asian Institute of Irrigation SANIIRI and other design and research institutes).

To ensure quality construction of gauging stations it is necessary, in our opinion, to set up specialized teams within operating state unitary enterprises of water engineering. To reduce the cost it is necessary to allocate cement and metal at reduced prices.

Special attention should be paid to the equipment key sites of small transboundary rivers with additional gauging stations and modernization of the existing hydrometric network on those. The share of small transboundary rivers (STR) in the overall water balance of the Valley, according to HS, ranges from 34 to 60 % depending on year's dryness; in some cases the flow of small rivers is the only life support source for some areas. In order to radically improve the quality of hydrometric observations on small transboundary rivers it is suggested to carry out the following special measures:

Long-term measures

Establishment of a joint inter-state working group which includes specialists from the water sector, hydrometeorological service, Emergencies Ministry, and nature protection organizations

for the purpose of making systems study of the actual state of small transboundary rivers to specify the following issues:

- technical condition of existing gauging stations and measures to improve those;
- identification of key sites to install new gauging stations;
- develop a hydrometric observation method allowing for the condition of each river.

Urgent measures

- reconstruction of the existing gauging stations along with the modernization of the facilities that allow keeping automatic observations;
- organization of simple gauging stations at the mount of all lateral inflowing sais and offtakes;
- organization of regular hydrometric observations and monthly hydrochemical (in case of positive results, it is possible to change the time of sampling for seasonal: flood, low water);
- organization of hydrometric observation training for hydrometer specialists.

### 2.7.3 Application of advanced irrigation methods

Because of strengthened adverse effect of growing water deficit, the issue of extensive saving of water resources is becoming even urgent. As well known, furrow irrigation, which entails much water losses, remains the main and only method of crop irrigation in the region. Both theoretical and practical searches aimed at improving furrow irrigation are being carried out in the Central Asian countries. However, the international practice shows that the capabilities of furrow irrigation in terms of water resources saving are limited and, therefore, in spite of certain expenditures in the countries where water deficit is becoming more and more critical they begin widespread application of advanced irrigation methods such as drip irrigation and sprinkling irrigation.

In particular, in the U.S.A. in the regions with arid climate (Arizona, Texas, etc. states) to irrigate crops, including cotton, they broadly use technologically new sprinkler installations that allow irrigating by literally each furrow with water saving of about 40-50 % compared to the traditional furrow irrigation.

In Israel, where there is acute water shortage, furrow irrigation is virtually absent and everywhere irrigation is made by the drip or fine-dispersed irrigation through closed irrigation network that allows reducing losses as much as possible.

In Uzbekistan, for more than 30 years they have worked at advanced irrigation method introduction. By involving research and design institutes, advanced irrigation ways introduction concept was developed, and the Scientific Production Association of the Central Asian Institute of Irrigation (SANIIRI) has executed preliminary zoning of the Republic's territory according to the type of introduction.

Practical steps were made towards the introduction of drip irrigation on small areas of orchards and vineyards. Being concerned about the increasing water deficit, the Government of the Republic of Uzbekistan initiated drip irrigation introduction works. At present, first steps are taken towards the developing new orchards and vineyards with drip irrigation system.

Because of the absence of methodological and technical basis, these works arte in slow progress and are not always effective.

In view of the aforesaid, to create the bases for widespread application of advanced irrigation ways in the region, the following actions are proposed to be taken:

a) Organizational

- By involving appropriate research and design institutes, carry out the work of detailed zoning of the region territory with a view to identify areas and select the option of one or another method of advanced irrigation taking into account the technical characteristics of the new irrigation technique;
- Establishment of a specialized research, design, and engineering unit for studying progressive foreign experience in this field, adaptation of that for our conditions, development of machines, mechanisms, and fittings of drip and sprinkling irrigation that are suitable for our specific conditions, and designing facilities with field supervision during the construction;
- Organization of the manufacture of components for drip and sprinkling irrigation systems;
- Establishment of a specialized (possibly a few, taking into consideration the scope of works) organization for mounting and adjustment of drip and sprinkling irrigation systems;
- Establishment of a specialized operating organization equipped with appropriate specialized machinery and spare parts.

b) Financial provision

In light of certain costliness of building and operation of advanced irrigation ways, the following scheme of financing these works is proposed:

- in the state-order cropping (cotton, wheat) zone, designing, building, and three-year operation of systems will be carried out through government funding and interest-free loans will be allocated for further operation;
- in the zone with no state order (orchards, vineyards, vegetables, cucurbit crops, etc.), priority-based construction of the mentioned systems at the own expense of water users. Interest-free loan will be allocated for construction and three-year operation;
- exemption from land and water resources taxes.

c) Methodological and technical

The following guidelines are supposed to be developed:

- zoning of territories to determine areas broken down by the application of advanced irrigation methods;
- rules for the construction of drip and sprinkling irrigation systems;
- drip and sprinkling irrigation systems operational manual;
- agricultural technology of growing crops (individually by varieties) by employing drip and sprinkling irrigation systems.

### 2.8 Vision of building of financial and human capacities

It is apparent that to ensure full-fledged activity under current conditions, water management organizations must without fail have the following:

- stable financial position that allows ensuring required operational and ca[ital works related to the maintenance of the network and personnel;
- availability of sufficient vehicles, specialized machinery, stock, and office equipment;
- staffing with experienced personnel adapted to the conditions required for IWRM; method of training and retraining of specialists and their further training;

- informational support and dissemination of the results of successes achieved in IWRM implementation.

In recent years, financing of the water sector has enhanced to some extent. At the same time, because of regular rise in the prices of electric power, fuels and lubricants, metal, cement, machinery and mechanisms, equipment, etc., the funds allocated to maintain irrigation and drainage systems in operating conditions even at the level of main and inter-farm networks that belong to BISAs become insufficient.

The situation of financing governmental water management organizations is similar at all levels. As for the zone commanded by the IWRM-FV Project (SFMC), the situation here has not changed much either in terms of staff salary; as to the operation costs, the Project has succeeded obtaining additional funds for the maintenance of technical facilities with allowance for the introduction of SCADA system and remote control of hydraulic structures.

The situation of financing WUAs in whole remains extremely serious. Despite there are certain methods for estimating costs and their recovery, in practice 30-40 % of those are implemented because of difficult economic position of water users and absence of an efficient service fees collection mechanism. The situation in the project commanded zone is quite different and here owing to the actions taken within the IWRM-FV Project the fees collection rate comes to 82.6 % on average in WUAs as against 59-69 % beyond the project impact zone owing to the package of the measures that include setting rates subject to the crop profitability, regular control over the fulfillment of financial plans and certain dialogue with governmental bodies. At present, the Government is planning a series of cardinal measures aimed at increasing crediting of WUAs and strengthening of the measures related to the state control over the securing of sustainable financing of WUAs.

The actual amount of earnings from provided services in 2011 is also much different coming to UZS 11,012 per hectare in the commanded zone as against UZS 5071 per hectare across Uzbekistan on average.

Although governmental water management organizations have some transport equipment, it is not enough. The same holds true for the availability of specialized machinery, mechanisms, and stocks. There are standards for the calculation of specialized machinery (excavators, bulldozers, cranes, etc.) requirements, but there is no precise rule for the provision of personnel with vehicles.

Only central offices of BISAs, ISAs, and other governmental water management organizations have computers the prevalent part of which is of old-pattern. At lower, canal management organization level availability of computers remain insufficient or those are absent at all.

Owing to the IWRM-FV Project, only the SFMC MO is equipped with office equipment to sufficient degree. While software for drawing up water use plans and their adjustment are introduced in all large canal management organizations and majority of WUAs in the commanded zone, these works are in the nascent state beyond the commanded zone.

2.8.1 In accordance with the Law on Education and National Manpower Development Program, large-scale reforms aimed to update the education system have been realized in the Republic since 1997; at present manpower development is carried out based on two-stage higher-education system as it is practiced in all developed countries of the world.

One should highlight the importance and opportuneness of the Regulations by the Cabinet of Ministers of the Republic of Uzbekistan (№ 150 dd. 30 March 2004 «On the establishment of the Tashkent Institute of Irrigation and Melioration» and № 415 dd. 3 September 2004 «On the improvement of the system of training skilled personnel for agriculture and water sector») signed by the President of the Republic. Those specify basic directions for the training of skilled personnel. At the same time, staffing in the water sector of the Fergana Valley, as well as of the Republic in whole, causes concerns due to the following factors:

- decline in the "prestige" of the profession of water specialists who once were very respectable persons;
- low salary; insufficient financing; toughening the requirements that are not typical of the work status; absence of incentive mechanisms; and sharp rise of incomes in other spheres;
- absence of any mechanism for staffing WUA with specialists;
- management of many WUAs are staffed by specialists in other majors;
- in the manpower development they focus on enough on the issues of integrated water resources management ;
- low level of organizational management for retraining and advanced training of specialists.

The work of the provision of various structures with information is still inadequate. Required information is not available at all water hierarchy levels because of the absence of modem communication and skilled personnel. The overwhelming majority of WUAs have not water resources use data banks.

At the same time, the experience of the IWRM-FV Project is poorly covered in mass media for broader implementation of its successful results.

To eliminate the existing gap in the capacity of the workforce involved in the water resources management process in the context of carried out land and water reforms and taking into consideration the experience of the IWRM-FV Project, the following measures aimed at radical changing the water specialists training and retraining approaches adapted to the basin-wide and integrated water resources management taking into account increasing water deficit.

a) Revision of the method (principle) of operating staffing to introduce the system of employment of specialists to any position only on a competition basis. At that, a mechanism for competitive selection of specialists and quality selection of the competition committee composition has to be developed. The competitive selection process must be open and public with wide coverage in mass media. At the competitive selection, in addition to technical qualification requirements also requirements for humanity (kindness, fairness, and love for one's profession) and the history of the region's water economy as well as traditions should be placed.

b) Improvement of the method of teaching specialists in higher and specialized secondary educational institutions. In addition, taking into account increasing water resources deficit it is advisable to give more and deeper attention to integrated water resources management issues when training water specialists personnel

   A separate faculty must be established to educate water specialists who can manage water resources under new conditions of basin-wide and integrated management approaches. In this respect, retraining and development of qualified teachers who have both theoretical and practical knowledge in water resources management is urgent; it can be implemented probably by means of two-moth courses to train higher and specialized secondary educational institutions' teachers themselves by involving MAWR, SIC ICWC, SANIIRI experts as well as individual practitioners who are experienced in IWRM. In future, these specialists may also be involved in the training process itself. At the same time, some specialists should be sent to other countries to get familiar with good professional practice in this field.

c) Organization of water specialists retraining and advanced training activities.

To retrain water specialists engaged in water resources management temporary training courses will be established with the following breakdown (temporary – until at University level appropriate courses will be developed and implemented):

- Training courses for the mid-level workers in the office of every BISA. For experienced workers, training will be organized on a yearly basis. Newcomers will be delivered one-month training (retraining) at the beginning of their employment as a group of 10-15 persons is formed.
  Executives of BISAs and main canals who were trained at relevant courses as well as IWRM-FV Project experts will be involved in training of mid-level workers. Further, all water sector specialists must be retrained every three years and the results of that retraining should be taken into account when selecting them to new positions on a competitive basis.

d) Farmers and WUA specialists training activities. Training of farmers and WUA specialists in on-farm water resources management and rational use is a very serious issue. During kolkhozes, sovkhozes, and shirkats there were specialized services (mirab, irrigation specialist) in every farm which were skillfully dealing with thee problems. When those farms were reformed, specialized services were liquidated and establishment of WUAs instead of those took too long time. Today, WUAs are mostly staffed with non-water specialists and many of them have no idea of the elementary rules of on-farm water resources management, and for crop irrigation farmers often involve children or women with no experience in irrigation.
   Farmers and WUA specialists training courses are advisable to be organized on the bases of the extension services in every WUA. Training will be delivered separately: farm workers (irrigation specialists) will be trained in the irrigation of different crops and rational use of land; WUA workers will be trained in on-farm water resources management, methods of rational water use control, and basics of contractual and financial relations with associated branches.
   WUA workers will be trained twice a year, for two weeks. Farm workers will be trained on a permanent basis in farming schools; their training (also for two weeks)is organized as seasonal irrigation specialists' teams are formed before starting large-scale crop irrigation.
   It is recommended to pay special attention to training female farmers in the view of enhancing their role as independent managers of farms.
   Experienced workers of BISAs, local universities and colleges, experienced practitioners, and extension services workers will be involved in the training of farmer workers and WUA specialists. SIC ICWC and SPA SANIIRI will develop the training programs for all three courses on commission from MAWR RUz.

2.8.2 The issue of financing water management organizations has been considered at two levels: a) governmental organizations; b) public organizations (WUAs).

As mentioned above, the amount of financing governmental organizations at present does not allow performing full-fledged work related to the operation of facilities and efficient water resources management.
The method for determining the amount of finances for operational needs is as follows up today: based on the facility evaluation report taking into account staff costs and electric power costs, operating organizations in the field draw up estimates of expenditures for the next financial on an annual basis.
The Ministry of Agriculture and Water Resources submits summary data to the Ministry of Finance and "defends" those there. At that, to determine the amount of financing of operating organizations the Ministry of Agriculture and Water Resources take the actual amount of financing for the past year as the "basic" amount and does not take the approved operating costs

method as a basis taking into account the actual state of affairs. The Ministry of Finance acts in the same way allocating funds for electric power consumption and maintenance of personnel as required allowing for possible indexation during the year and for the rest operating costs taking into account last year's actual amount of financing.
As a result, every year certain part of required maintenance works remains unaccomplished. Year-round operation of water facilities because of sharp expansion of areas under winter wheat even more worsens state of affairs related to the technical state of the system.
In order to improve the situation arisen in financing governmental water management organizations, it is necessary first to revise the existing method of determining amount of financing. It is required, with the involvement of research and design & survey institutes, to work out an absolutely new method of determining operating costs and its introduction mechanism and get those approved at the Government level. At that, based on foreign experience, one should proceed from the necessity of achieving sustainability and possibility to ensure long-term functioning by assessing those through financial and economic forecasting taking into account the actual worn state of water facilities. Full and quality inventory of the technical state of governmental water management organizations is required. In this context, government decision is needed, since this inventory should be carried out by special commissions that include Ministry of Finance and Ministry of Economy representatives.
Of no little importance is the issue of working out of an inventory method. To improve the financial support to public water management organizations represented by WUAs and state-run WMOs, to assess technical state and determine the amount of financing, total and quality inventory is needed, first, in respect of former on-farm as well as inter-farm irrigation and drainage networks with the involvement of relevant specialists according to the approved new method.
Differentiated approach is needed for the financing of the WUA activity, taking into account the overall actual state of the network and its technical complexity, water supply level, profitability of farms, and presence or absence of state order.
Technically complex irrigation and drainage systems (flume network, underdrainage, pumping stations, wells) as well as systems on low-fertility lands call the Government for taking actions about supporting water users. At that, one-time actions aimed at the restoration of irrigation and drainage network should be carried out at the expense of the national funds, and in future interest-free loans and preferential credits are advisable to be allocated for their maintenance.
WUA personnel maintenance on virgin low-fertility lands and state-order cropping lands should be performed with government support on a percentage basis depending on the profitability of farms.
The above-mentioned mechanism of financing support to the activity has to be approved at the government level.

2.8.2 To improve the level of equipment of water management organizations with vehicles, mechanisms, office equipment, and required stocks, it is necessary to carry out the following measures:

- Inventory of the availability and technical state of vehicles, mechanisms, office equipment, and stocks with determining the quantity of those required for adequate support of both governmental and public (represented by WUAs) water management organizations' operational activities;
- Development and getting approved a new method for the determination of required quantity of vehicles, mechanisms, office equipment, and stocks as well as mechanism of financing those. In this context, the experience of foreign countries with the situation similar to that of our Republic should be studied.

WUAs that operate on virgin, low-fertility, and low-water lands with technically complex systems and grow state-order crops will also need government support with the development of a certain implementation mechanism.

## Section 3. Vision of the improvement of the organizational structure pof water governance and management

### 3.1 Introduction

For the period from 2000 to 2010, certain steps towards the improvement of the organizational structure of the Fergana Valley water management were taken; however, it should be admitted that not all IWRM requirements were allowed for.

1. In spite of the reorganization carried out in 2003, the organizational structure of the Uzbekistan water sector remains complex enough with given:
   - multistage character and excessive centralization of water management;
   - intersecting water supply responsibility areas (hydrographic and territorial), which with absent clear rules for their coordination leads to duplication, contradictoriness of interests and directions, and even conflicts in water management;
   - instability of the composition and number of water users (farmers and other agrarian enterprises), as a result there is difficulty in raising their skills and implementation of advanced technologies.

2. The multistage character of water management is reflected as follows: along with ISAs, which are established according to the hydrographic principle and deliver water directly to water users, there are also CMOs that serve chiefly for transporting water for ISAs and do not take part in the water use planning and limiting process. In spite of the fact that most WUAs take water directly from main canals, water supply contracts are concluded by means of ISA.

   The multistage character will cause, in case of absent common goals and objectives, occurrence of great deal (and great volume) of losses and discrepancies in water supply, which eventually will increase the volume of unproductive losses of flow.

3. Because of the absence of a single basin management organization in the Fergana Valley, excessive centralization of water management lasts, since a number of territorial structures are in direct simultaneous subordination to CWMD, which brings to the reduction of the possibility for the linkage of water distribution among canals allowing for local conditions and joint immediate solution of emerging problems. Reasonable extent of decentralization with simultaneous coordination of operative decisions with main BISAs within a single center of the Fergana Valley would enable accounting the flow of small rivers and collector-drainage mains and freeing higher water management bodies for carrying out analytical assessment of the overall water management situation and concentrating their efforts on strategic tasks without getting distracted for operational tasks.

4. Agricultural agencies (Agrotechnical Complex units) managed based on territorial principle do not have their distinct water counterparts at the district level and as such they take part in facilitating the conditions for sustainable irrigated agriculture only indirectly through

administrative supervision of the WUA and BISA activities and through periodic interference by district administrations (khokimiats) in their activities.

5. Although Hydrogeological Reclamation Expeditions (PHGREs) essentially perform functions associated with both water supply management and water demand management, those have a propensity for the latter and this fact should be reflected in the organizational structure improvement process. Here it is necessary to combine enhancing the role of reclamation services in line with the improvement of reclamation work planning and organization carried out by the Reclamation Fund of the Ministry of Finance. Furthermore, this should go along with building contractual relations with WUAs and farmers for providing favorable reclamation conditions and water demand management with the employment of CDW as much as possible. As for the first part, it is advisable to work out the method of forecasting reclamation situation depending on budding tendency of its aggravation (improvement) for each HGRE and selection of optimum impartial decisions with respect to the scope and priority of planned works.

In the course of the reforms, certain positive steps (especially in the project zone) have been made, but still there is considerable potential for the improvement of the organizational structure. When using this potential, the following should be allowed for:

- Reorganization is a continuous process that has to be carried out proceeding from well a though, theoretically sound, forward-looking concept based on the principle of evolutionary improvements but not on the principle of revolutionary destructions.
- Water sector alone is unable to cope with water challenges without every kind of involvement of all stakeholders. This involvement (especially of the community) should take place in accordance with the integration and democracy principles.
- Depending on the set goals, integration of all stakeholders (in particular, water users) is possible and reasonable for all hierarchy levels by both the hydrographic principle (for water management, that is organization of equitable and timely water delivery to the end user, i.e. WUAs, farmers, and other water users) and territorial principle (for water demand management, that is for the organization of rational water and land resources use); the latter is required for water demand management, viz. for the organization of rational water and land resources use, purposeful work on the enhancement of water and land productivity along with employing extension services.
- Implementation of the approaches based on well-balanced combination of the hydrographic and territorial principles will allow creating organizational prerequisites, on the one hand, for enhancement of water supply quality (stability, uniformity, effectiveness) and, on the other hand, enhancement of water and land use quality (physical and economic productivity of land and water).

### 3.2 General organizational improvement principles

Organizational improvement (setting up of new and reorganization of existing) water structures at all water hierarchy levels should be executed step by step based on the following principles:

- Hydrographization;
- Integration;
- Public participation;
- Separation of water governance and water management powers (functions);
- Water saving (change of accent from water supply to water demand management);
- Separation of water governance functions and organizations into those dealing with water supply governance and those with water demand governance;
- Decentralization.

***Hydrographization***

Further rising level of hydrographization of governmental water organizations will create organizational bases for substantial improvement of water management efficiency and quality. Implementation of the created bases depends on institutional factors.

***Integration***

Integration of stakeholders, depending on the purpose of the integration, can be made based on both the hydrographic and territorial principles:

- Water supply organizations are advisable to be established on the basis of the hydrographic principle;
- Organizations of water use and water productivity enhancement are advisable to be established on canals on the basis of the territorial principles.

Integration of water supply and water use functions is expedient at the national level and WUA level.

***Public participation***

Participation of the community in the governance of land and water resources management and rational use is ensured through the establishment of appropriate structures at all water hierarchy levels:

- National Water Council under the Cabinet of Ministers of the Republic of Uzbekistan;
- Republican Water Users' Union. Similar unions are established at the irrigation system level (main canal, small river);
- Fergana Valley Sub-Basin Water Committee. Similar water committees are established at the irrigation system level (main canal, small river);
- Water and land commissions (WLC) for the usage of water and land resources are established at the district and province levels.

Two options of raising the level of public participation in water governance are considered:

- Option 1. Establishment of water governance body in one stage: according to the IWRM-FV Project's model (that is CWC is established in addition to WMC (CWM));
- Option 2. Establishment of water governance body in two stages:
  - At the first stage, water users (UCWUs) and other representatives of the community (stakeholders) get involved in the existing WMC (CWM). The stages of stakeholders involvement in WMC (WMC) can be as follows:
  - At the second stage, after the ratio of the public representation in WMC (CWM) has considerably risen, CWC is separately built up from the WMC (CWM) composition.

Item 2.3.1 includes explaining section.

***Sharing functions***

Water structures are reorganized allowing for the performance of the following main functions (Fig. 3.1):

- Water management;
- Water demand management;
- Water supply and water use control.

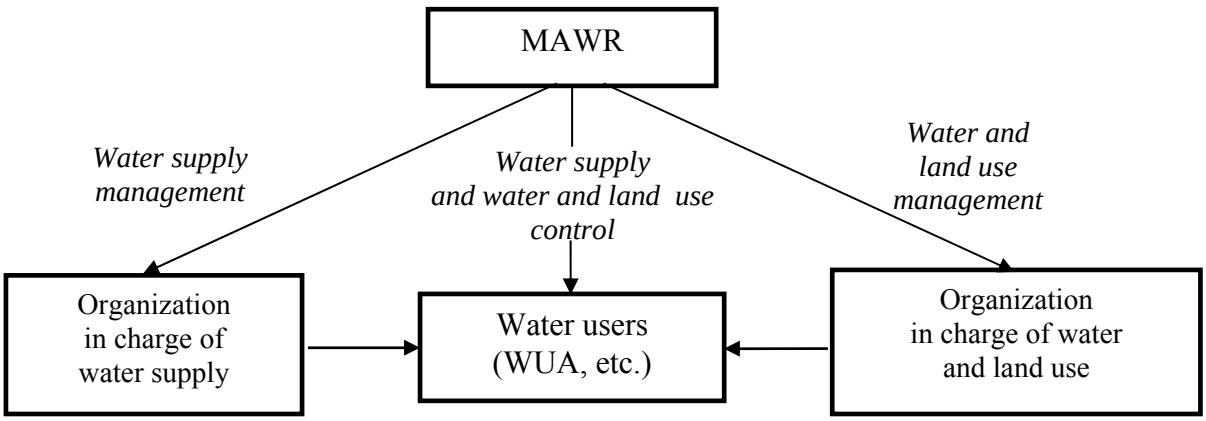



Figure 3.1. Recommended general water supply and water use control.

***Decentralization***

Transfer of the powers of the high water management body (CWMD) to territorial agencies. It concerns territorial structures that are now directly subordinate to CWMD and the management of which at the local level would be more effective. This requires establishment of appropriate sub-basin structures. This will allow focusing on the performance of regulation and control functions and development and implementation of the national water strategy.

## 3.3 Recommendations for organizational development

Proceeding from the results of the comparison between the water management conditions in the Fergana valley and the areas of other existing basin management organizations in Uzbekistan (Figs. 1.3, 1.4, and 1.5) one can draw the following conclusions:

- each basin management organization has individual specific conditions and, at her same time, identical conditions;
- in particular, the Amudarya, Lower-Amudarya, and Lower-Syrdarya BISAs have no the small rivers related problem;
- although in the Amu-Surkhandarya, Amu-Kashkadarya, Chirchik-Akhangaran and Zarafshan basin management organizations small rivers are essential to the formation of water resources, here there is no problem related to the border with certain states;
- in the territories of all the basin management organizations there are the problems of drawing up and adjustment of accurate requirements for water, organization of rational water use and introduction of advanced irrigation methods as well as effective control;
- also all the BISAs face the problem related to the regulation of pumping station regime allowing for water demand and limits.

In connection of the above-stated, it seems possible to spread some of the recommended changes to the Fergana Valley water resources management process to other BISAs of the republic.
In particular, in order that all BISAs can solve the problems of drawing up and adjustment of accurate requirements for water, organization of rational water use and introduction of advanced irrigation methods for enhancing the productivity of land and water resources it is advisable to create appropriate analytic structure in charge of addressing these issues. Two options are proposed to consider in this plan:

1. Establishment of these structures as a part of the existing district agriculture and water resources administrations along with the settlement of the issues of their financing.
2. Establishment of these structures as a part of the existing ISAs.

Also, to enhance the water resources management efficiency in the BISAs (Lower-Amudarya, Lower-Syrdarya, and Amu-Bukhara), where there are appropriate conditions (availability of isolated main canals), it seems possible to set up appropriate main canal management organizations with transferring them from ISAs the functions of water delivery to water users.
The Amu-Surkhandarya, Amu-Kashkadarya, and Chirchik-Akhangaran BISAs, where there is twisted irrigation network with internal small rivers, it seems reasonable to set up small river management organizations given the functions of water delivery to water users.
At that, in the Amu-Surkhan BISA, the cascade of Amu-Zang and Sherabad pumping stations may leave PSOECA and form appropriate organizations for water withdrawal, transport and delivery to water users.

As for the Amu-Kashkadarya and Zarafshan BISAs, it seems necessary to revise the zones of actions of the existing ISAs to improve the hydrographization conditions.

### 3.3.1. Water management bodies

***National level***

Option 1.
State Water Resources Committee is established (Figs. 3.3, 3.4); it is in charge of the preparation and implementation of the national policy on multipurpose use, conservation and management of water resources.
Appropriate basin or regional structures are set up as a part of the State Water Resources Committee for accounting the quantity and quality of all water resources and rational use of those.
In accordance with the existing regulatory legal acts, the State Water Resources Committee develops recommendations of water resources use in future and water consumption standards for the branches of economy as well as limits on water withdrawal from river stems, small rivers, CDNs, and underground sources with the fixation of priorities of water use.

Option 2.
CWDM is reorganized into the Ministry of Land Reclamation and Water Resources of the Republic of Uzbekistan (MLRWR RUz) and is fully in charge of the implementation of the national water policy.

Option 3.
CWMD remains as it is, but the form and content of its job is changed. CWMD does not intervene in the operational work of local bodies. CWMD assigns water limits; sets reservoir operation modem set financial limits, including electric power limits; plan repair and operation works; controls monthly performances; establishes information system at lower levels; etc.

Such order will allow relieving the CWMD personnel and help CWMD to pay more attention to strategic issues of the water policy, water demand issues, manpower development, etc.

***Sub-basin level***

Two options of the improvement of the organizational structure at the sub-basin level of Uzbekistan (Figs. 3.4 and 3.5) by way of example of the Fergana Valley sub-basin. Given the irrigation system of the Fergana Valley sub-basin is the most complex in the country, one can assume that the organizational improvement options for the rest sub-basins of the country are particular cases of the options offered for the Fergana Valley sub-basin.
These options consider the case when the status of the Chief Water Administration (CWA) of the country, i.e. CWMD, has not been changed.

Option 1.
The existing water organizations remain intact with changing their functions and setting up additional water resources management structures (Fig. 3.4). In this case, Irrigation Systems Administration will deal with the issues of the estimation of water needs and rational use of water resources. Several main canal management organizations and small river management organizations will be founded within each BISA for water transport with the delivery to WUAs. At the same time, in the Fergana Valley sub-basin FV MCSMO & UDC will also, within its coverage area, deal with water transport with the delivery to WUA gate. For this purpose, a relevant inter-farm offtake network will be transferred to FV MCSMO & UDC.

The advantage of this approach consists in that little structural changes will be made and a water management organization will be kept in each province.
Shortcomings: full hydrographization of the Fergana Valley sub-basins will not be brought to its logical end.

Option 2.
In this case, all ISAs are liquidated and district water management divisions (DWMD) are established in every district within BISAs.
Under the Fergana valley conditions, this option provides for the full accomplishment of hydrographization in the Fergana Valley sub-basin by setting up a single Fergana Valley Sub-Basin Administration (FV SBA) on the (basis of the existing MCMO with UDC (Fig. 3.5).

A few main canal management systems and small river management organizations will be founded within FV SBA. The functions will be clearly separated among them as follows:
- FV SBA deals with water delivery to WUA gates.
- BISAs with its organizations (DWMD, HGRE, and PSOECA) will deal with the issues related to the organization of water demand management, rational water use, development of water saving technologies, introduction of water supply services, and providing proper reclamation condition, measures to improve the reclamation state of lands, WUA‘s extension services for the enhancement of water and land resources use productivity, and ensuring required operation modes of pump stations and wells.

Advantage: completion of full hydrographization of the sub-basin with the liquidation of intermediate links, which will allow dramatically improving management efficiency and quality.
Risks: there might be difficulties with coordination with provincial administrations and selection of the FV SBA’s central office location.

### 3.3.2. Water governance bodies

***National level***

National Water Council (NWC) is established within the Cabinet of Ministers (Fig. 3.6); it has the authority to supervise the Uzbekistan water policy development and implementation and is responsible for the discussion, coordination and submission to Oliy Majlis (Parliament) for approval of the documents associated with the water policy issues. NWC is supposed to be a representative body that will determine the water policy of the country.
Its main function is the management of the Uzbekistan water policy development and implementation.
National Water Users' Union (NWUU) is established which unites on a voluntary basis all UCWUs in the Republic and is a Non-Governmental & Non-Profit Organization (NGNPO). The NWUU Leader is a member of NWC.

***Sub-basin level***

Stage 1. Representatives of the community (water users and other stakeholders) are included in the existing WMCs that carry out only technical guidance.
Stage 2. Sub-Basin Water Committee (SBWC) is set up (in particular, Fergana Valley Sub-Basin Water Committee – FV SBWC); it is composed of the representatives of SFMC WC, BFMC WC, BAMC WC, etc. FV SBWC is supposed to be a body for joint water supply governance with the involvement of key stakeholders.
Its main function consists in water supply governance.

***Province and district levels***

Province level
Province Water & Land Commissions (PWLC) (Fig. 3.7) are established in particular in the three provinces of the Fergana Valley: Fergana, Andijan, and Namangan. PWLC is supposed to be a body for joint province water and land resources use governance based on public participation.

Its main function is land and water use (water demand) governance.

District level
District Water & Land Commissions (DWLC) (Fig. 3.8) are established. In particular, district WLCs are set up in all the districts of the Fergana Valley sub-basin. DWLC is supposed to be a body responsible for the governance of the development and implementation of the water strategy on rational water use, land reclamation, support to WUAs, etc.

Its main function is governance of land and water use (water demand), organization of the works aimed at the improvement of water and land productivity.

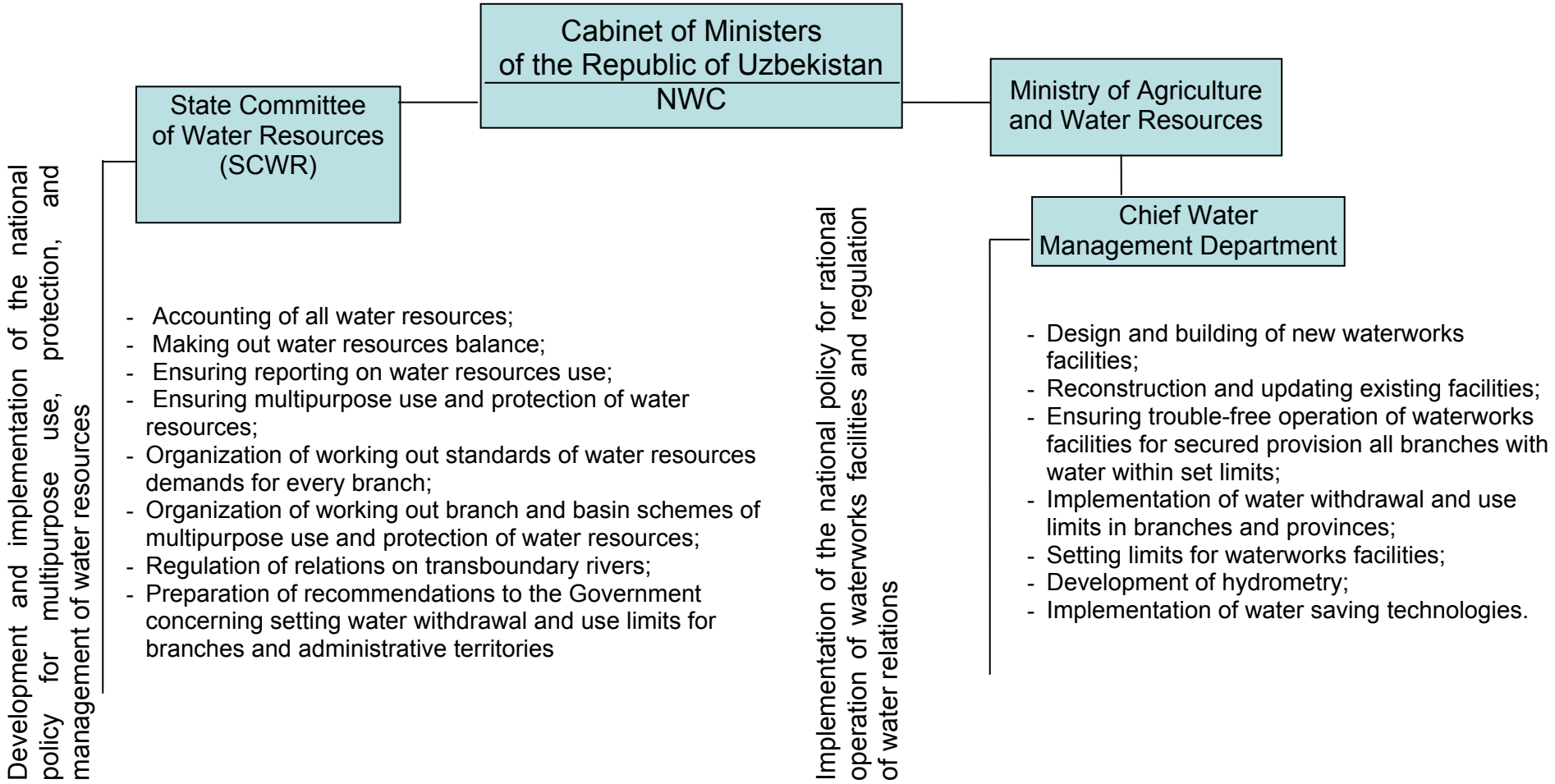
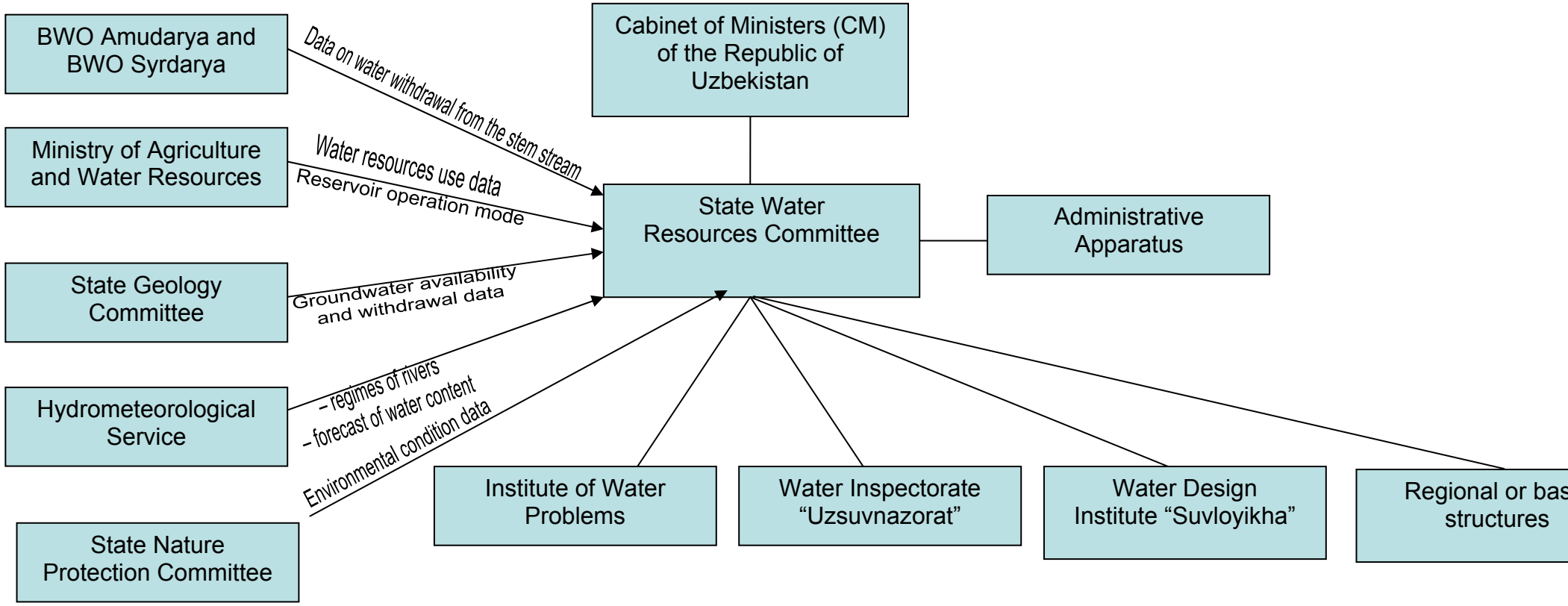



Figure 3.2. Structure of water resources management at the national level.




The following existing organizations are transferred to the State Water Resources Committee: Institute of Water Problems of the Academy of Sciences; Water Inspectorate "Uzsuvnazorat" with provincial subdivisions; Water Design Institute "Suvloyikha" of MAWR RUz; and the Water Resources Department from the central administrative office of MAWR. In addition, regional or basin-wise structures are set up in the field.

Figure 3.3. Structure of State Water Resources Committee.

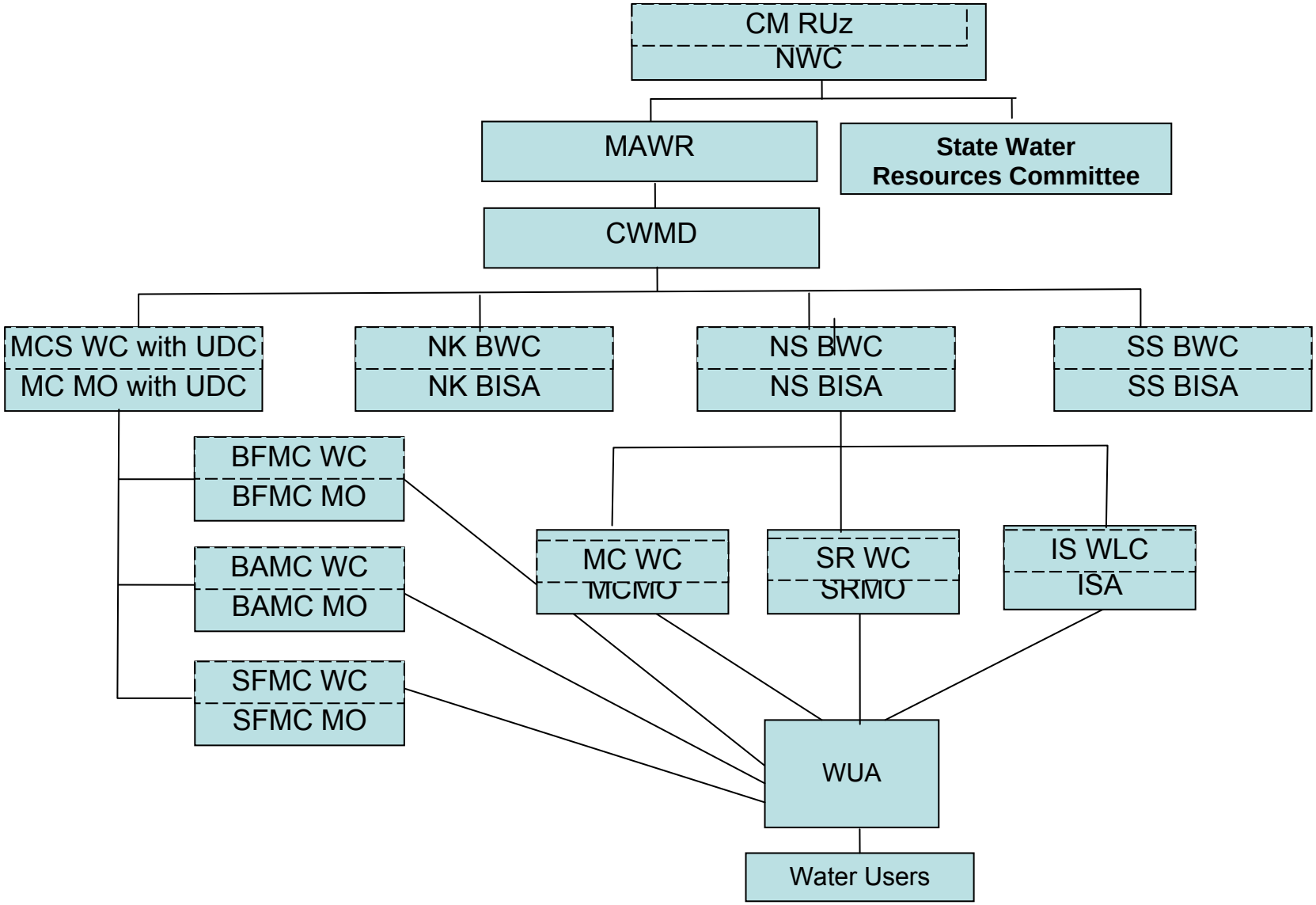
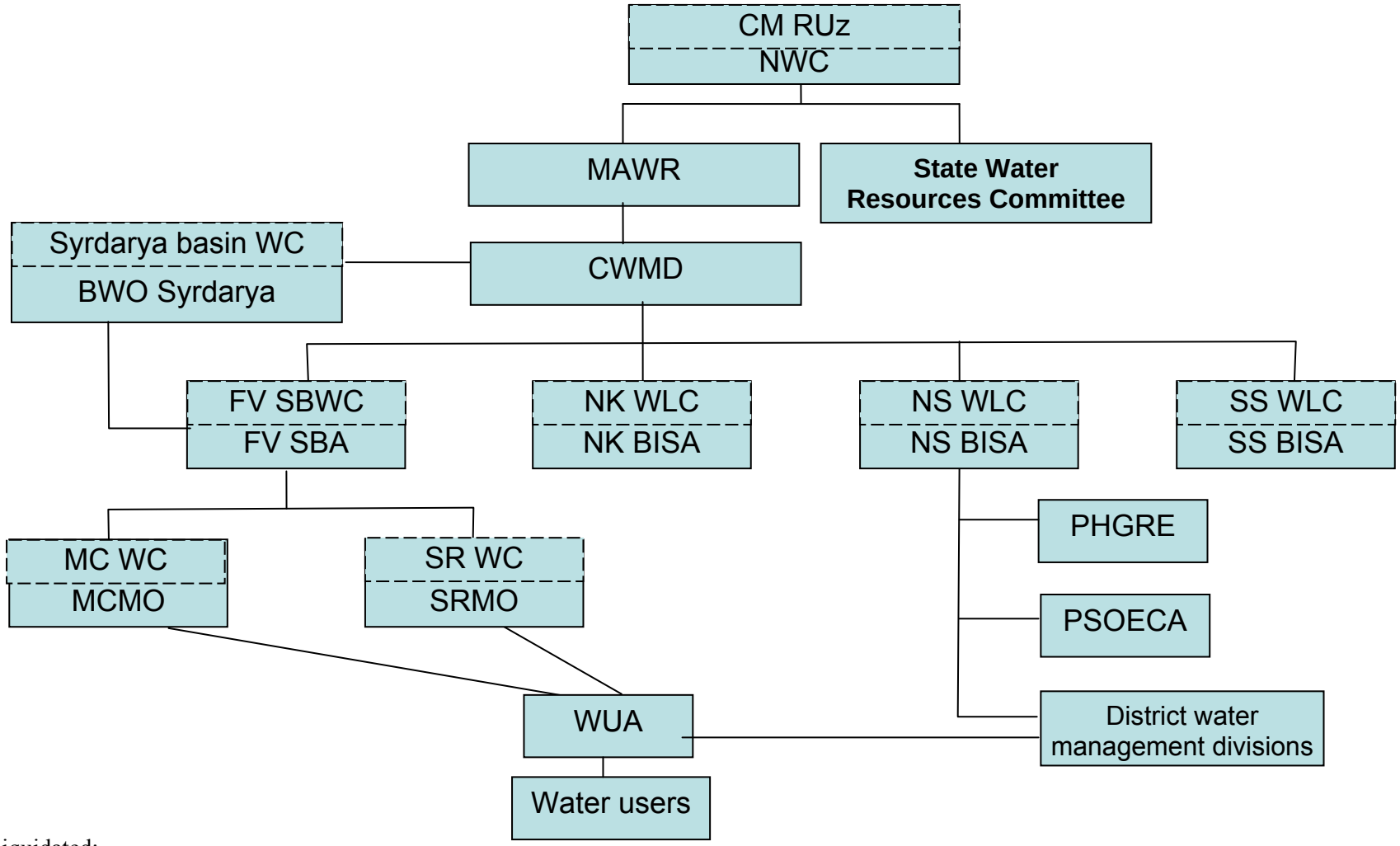



Figure 3.4. Recommended water resources management structure (Fergana Valley sub-basin level). Option 1.




-all ISAs are liquidated;
- common Fergana Valley Sub-Basin Administration (FV SBA) is established as part of MCMO & UDC;
- a few more main canal management organizations (MCMO) and small river management organizations (SRMO) are set up within FV SBA;
- District water management divisions are set up in every district within BISAs (NK – Naryn-Karadarya; NS – Naryn-Syrdarya; SS – Sokh-Syrdarya);
- the public water committee of the Fergana Valley sub-basin is set up (FV SBWC).



Figure 3.5. Recommended water resources management structure (Fergana Valley sub-basin level). Option 2.

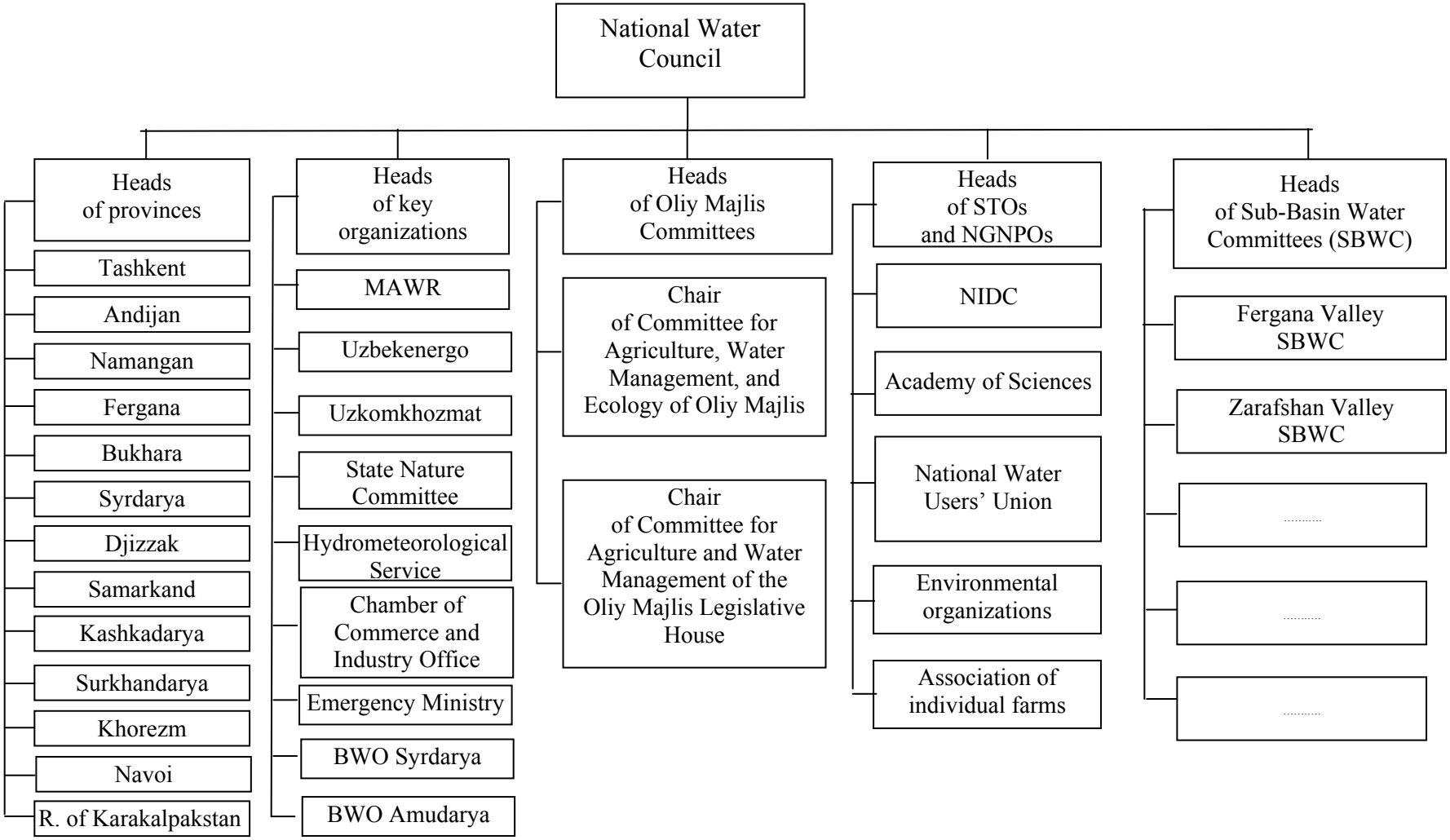



Figure 3.6. Recommended composition of the National Water Council under the Cabinet of Ministers of the Republic of Uzbekistan.

Note: participation of BWO Syrdarya and BWO Amudarya representatives in the NWC activity is regulated by ICWC.

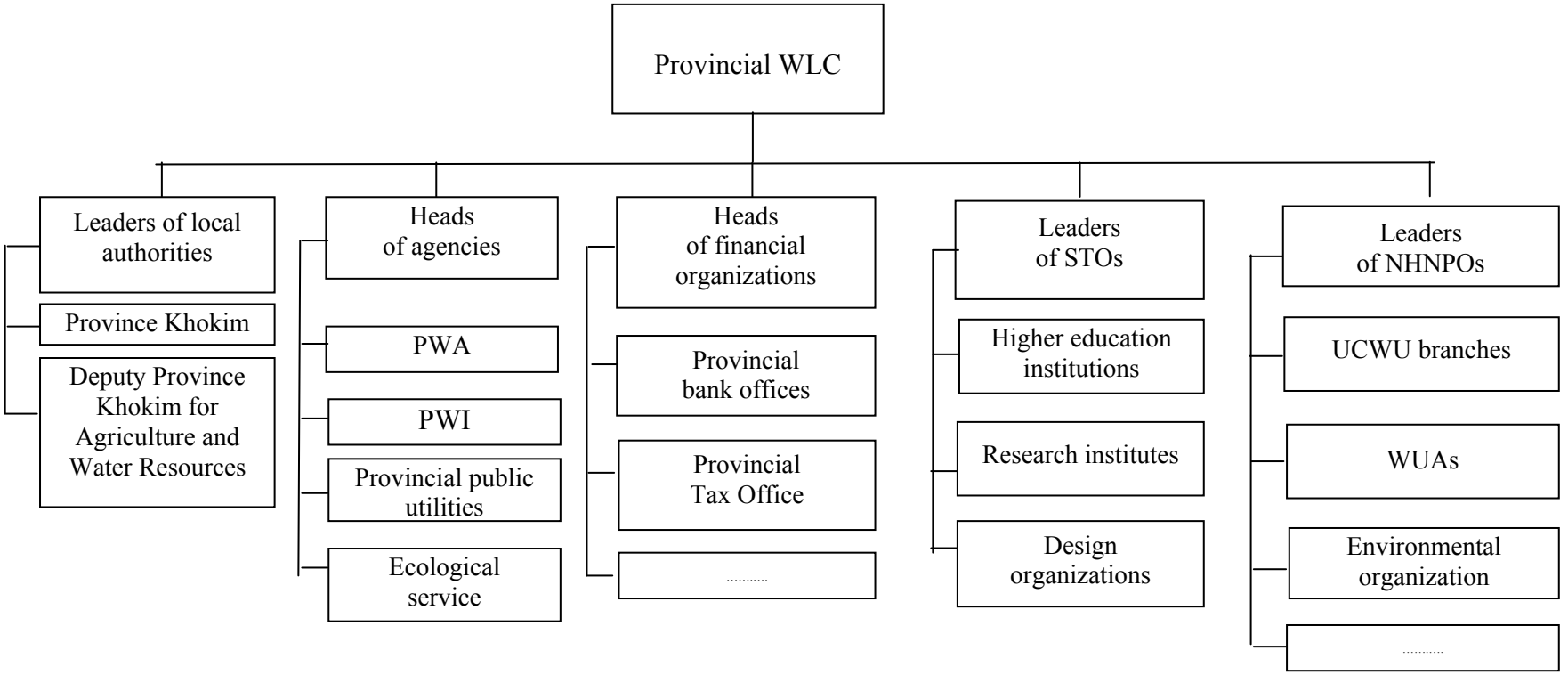



Figure 3.7. Recommended composition of provincial WLC.

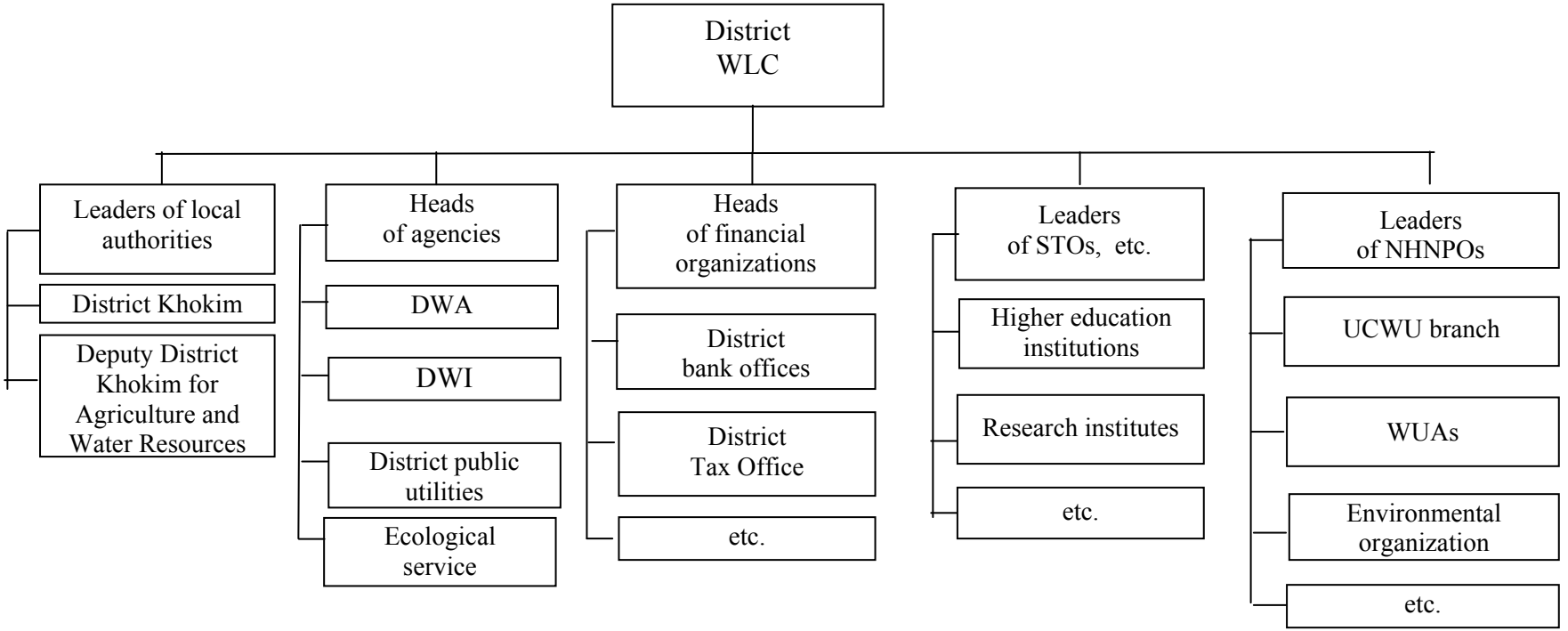



Figure 3.8. Recommended composition of district WLC.

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