ANALYSES AND MONITORING OF WATER RESOURCES (QUANTITY AND QUALITY) OF THE ZERAFSHAN RIVER BASIN

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Abstract. In article are considered water and environmental problems of a river basin of Zeravshan. Results of monitoring of a condition of glaciers, waterways and meteorological characteristics of a river basin of Zeravshan are presented. It is estimated process of degradation of glaciers and socially economic consequences of flooding and other emergency situations connected with water.
Water relations between Central Asia republics during the Soviet Union time were regulated by "Complex Used and Protection of Water Resources Schemes". It should be noticed that the number of important aspects such as ecologic and sanitarian acquirements were not considered and included in "Schemes" for the situation has greatly changed after 1980 (years of the last "Schemes" specification). Overusing basin water in irrigational lands planned as maximum use by "Scheme" resulted in exhausting water resources and appearing new problems. They are deterioration of ecological condition, great pollution of river water with pesticides, herbicides, other harmful elements and increasing of water mineralization. In the present work the monitoring of influence of the Anzob mountain-concentrating industrial complex wastewaters on quality of water of the river Zeravshan were carried out . For this purpose were made the physical and chemical analysis of tests of water selected from points located above and low from an industrial complex wastewaters dam. Results of comparison of the analysis of waters have shown about absence of essential pollution of waters of the river by wastewaters of the Anzob Mountain-concentrating Industrial Complex (AMCIC)

Key words: Zeravshan River, glacier, quality of water, pollution, flood

INTRODUCTION

In the Aral Sea Basin on the territory which is located five states water resources are used basically for irrigation and water-power engineering. These waterusers demand different modes of regulation of a river drain. In interests of water-power engineering – the greatest development of the electric power and accordingly use larges parts of an annual drain of the rivers in winter the cold period of year. For irrigation the greatest volume of water is required in the summer during the vegetative period. Regulation of a river drain is thus carried out by the large reservoirs. Thus all largest hydroelectric power stations are constructed in the countries of a zone of the drain formation - in upstream the rivers Amu Darya and Syr-Darya – in Kyrgyzstan and Tajikistan and the main areas of the irrigated lands are located in states of the down stream of the rivers – Kazakhstan, Turkmenistan and Uzbekistan (Petrov & Normatov, 2010).
Zeravshan River is the Transboundary Rivers (in Uzbekistan and Tajikistan) by length and basin area of 877 km and 17700 km^2, accordingly. The average expense of the river waters of 162 m^3/sec and originates from the Zeravshansk glacier in mountain knot between Turkestan and Zeravshansk with ridges the River is fed basically with glaciers and snow. Therefore the greatest drain in it is necessary for the summer (July, August) and during the cold period of year Zeravshan bears not enough water. In the summer water in the river muddy, gray-steel color, in the winter pure and transparent. On territories of Republic Uzbekistan near to the Samarkand city the Zeravshan river is divided into two sleeves – Akdarja and Karadarjua. Earlier Zeravshan ran into Amu Darya but now loses the waters in desert Kyzyl Kum, forming two deltas – Karakulsk and Bukhara.The total drain of the Zeravshan River Basin on the periods 1932-1962 and 1962-1991 make is accordingly 146.26 and 145.03 km^3 (Konovalov & Williams, 2005).
The water of the Zeravshan river on the Republic Uzbekistan territory is distributed basically on following areas: Samarkand-70.2 % (at irrigated area of 67 %), Navoinsky-13.1 % (at irrigated area of 16 %), Dzhizak-7.4 % (at irrigated area of 8.6 %), Kashkadarinskaja-9.3 of % (at irrigated area of 7.8 %) (Abduraimov, 2007).
From total water intake of the Zeravshan river make is 4834 to the Republic of Tajikistan to come only 253 mln. m^3 (5.23 %) (Nurmakhmadov, 2005). Actual mean of the water volume for irrigation and productivity of agricultural crops in the Zeravshan valley on the period 1980 - 2004 years presented accordingly in Tables 1 and 2.

Table 1. Average values of the sown and irrigated lands area (Th. ha) and volume of water for irrigation of the Zeravshan valley(Mln.m^3)

Periods	Sown area	Irrigated lands	Volume of the water for irrigation
1980-1984	29.92	21.28	187.52
1985-1989	34.30	24.52	185.36
1990-1994	36.58	26.12	188.36
1995-1999	38.30	27.40	209.94
2000-2004	38.28	27.34	181.64

Table 2. Average value of the agriculture crops productivity(centner/ha) in Zeravshan valley

Periods	grains	potatoes	rice	gardens	maize	vegetables	grapes
1980-1984	1.78	11.52	3.10	4.02	4.04	14.20	8.22
1985-1989	2.16	12.14	3.72	3.72	3.88	16.10	8.12
1990-1994	1.62	11.06	3.20	3.24	3.08	14.70	7.40
1995-1999	1.54	11.90	3.90	3.36	3.40	14.44	8.38
2000- 2004	2.12	13.92	4.30	3.60	4.26	18.50	8.72

Tables 1and 2 are shows that the area of the irrigated lands in the Zeravshan valley though not so big (about 20000 ha) but a tendency of its expansion by the assimilation of foothill territories is observed.
It is necessary to notice that for the Republic of Tajikistan is perspective the energy potential of waterways of the Zeravshan river basin which according to Nurmakhmadov(2007) makes – 11.8 Bln. kWt·h. Potential hydropower resources of some inflows of the Zeravshan River present on the table 3.

Table 3. Potential hydropower resources of some inflows of the Zerafshan River (Koshlakov and et.al., 1988)

Name	Length, m	Average annual discharge, m^3/sec	Average annual power, th. kWt	Average annual production, Mln.kWt.h
Sarmad	22.6	1.52	9.15	80.2
Artuchdarya	17.14	1.26	8.65	75.8
Magiandarya	68.4	10.3	76.5	670.0
Shing	14.2	5.89	20.0	176.0
Fondarya	24.5	61.1	396.0	3470.0
Tagobikul	19.8	2.83	17.1	150.0
Hasorchashma	12.4	1.70	10.8	94.2
Pindar	12.3	1.64	12.8	112.0
Dzijikurut	17.4	1.59	14.9	130.0
Gaberut	10.1	0.84	4.14	36.3
Iskandardarya	20.4	21.1	106	927.0
Saritag	34.0	13.5	68.5	560.0
Pasrud	28.4	4.68	13.8	121.0
Turo	12.7	2.07	10.1	94.0
Yarm	11.1	1.48	11.1	97.2
Demunora	19.6	3.0	24.1	210.0
Jindon	18.8	1.61	12.1	105.0

In the presence of such rich energy potential suspended to the Zeravshan river Basin in Sugd area huge deficiency of the electric power is observed - 3-4 Bln. kWt·h /year which is covered by import of the electric power from the Republic ofUzbekistan.
The intensive grows of the Tajikistan population , presence of the large file of the fertile but not mastered lands suspended to upstream of the Zeravshan river demands principal processing of economic use of the Zeravshan rivers scheme. The mutual combination of interests of upstream and downstream countries of the Zeravshan River is quite achievable by building of the cascade of Hydropower station (HPS) with regulation of the river drain.

It causes some discontent of Republic Uzbekistan connected by that realization of programs on development of a hydropower potential of the river by building a number of the water reservoirs leads to deficiency of water in vegetation period of agricultural crops.

The cardinal solution of the conflict situation between an irrigation and water-power engineering is the greatest their joint development by building of new HPS with reservoirs. For water-power engineering it means increase in production of cheap and ecological pure energy and for an irrigation – increase of depth of long-term regulation of a drain and water security of already mastered lands, and also possibility of development new. At presence of several HPS with reservoir the to reservoir can work only in power mode, the bottom reservoir of the same volume can regulated a drain up to restoration of its natural regime. Especially it can provide drain regulation in interests of an irrigation. At presence not two but many quantities of HPS with reservoirs the situation even more will improve (Petrov& Normatov, 2010).

Thus the analysis of the above-stated material is demonstrated that the solution of a problem of balanced use of two aspects, namely use of a hydroenergy potential of the river Zeravshan with full satisfaction of requirements of agriculture on water demands the deep feasibility report leaves on a plane of bilaterial negotiations of the adjoining countries. It seems that at the present stage in Global climate change by the most important monitoring and a behavior estimation hydro- and meteorological parameters of a river basin of Zeravshan to climate changes which allows to plan and adapt development and water-power engineering and agriculture taking into account forthcoming values of volume of the river water on immediate prospects is.

One is actual problems of modernity is Global Climate Change and adequate behavior of the each component of ecosystems to this change for the Tajikistan 93% territory which is occupied by mountains and which characterized by availability more 8500 glaciers by the total area of 8476.2 km^2, or about 6% of all territory of the Republic of Tajikistan is very important.

GLACIERS OF THE ZERAVSHAN RIVER BASIN

Zeravshan glacier. The glacier is located on the Zeravshan and Turkestan ridges joints and gives rise to one of the main rivers of the Central Asia – Zeravshan River. It is dendrite glacier by length of 27.8 km, the area 38.7 км^2 and with inflows 132.6 км^2.The tongue of the glacier take place on f 2810 m above sea level. Moraines of the Zeravshan glaciers occupy 10 км^2 and with inflows 24 км^2 areas. Observation of theZeravshan river water discharge are begun from the end of a 19th Century on the Dupuli Hydropost and since 1927 years are begun detailed observation of the Zeravshan glaciers.

Rama glacier. The glacier is located on a southern slope of the Turkestan ridge in upstream of the Zeravshan River in narrow rocky gorge. It is a valley's glacier by length of 8.9 km and the area 22.3 км^2. The end of the tongue of the glacier take place on 3500 m a. s. l. and is covered by the moraine 3 км^2. As well as all other glaciers of the Zeravshan river basin the Rama glacier recedes.

Tro Glacier . The glacier is located on the southern slope of the Turkestan ridge in sources of Zeravshan river. A glacier is valley's by length of 3.0 km and the area 2.2 км^2. The tongue of the glacier take place on 3920 m a. s. l. and buries in a final moraine. Observation of the glacier are begun in 1959.

Dihadang glacier. The glacier is located in the Zeravshan River Basin on northern slope of the Zeravshan ridge. The glacier is valley's by length of 2.2 km and the area 2.0 км2. Dihadang glacier is covered by a moraine 0,3 км^2. The tongue of the glacier is located on 3600 m a. s. l. Observation of the glacier are begun in 1959.

HGP (Hydrographic party) glacier. The glacier is located on northern slope of Hissar mountains in the Saritag River Basin running to lake Iskandarkul. Length of a glacier of 1.16 km, the area 0.54 км^2, average width of 0.47 km. The glacier end lies at height of 3320 m a. s. l. The first observation on a glacier are spent in 1968 and in 1971-1974 periods on a glacier every summer worked complex glacional expedition. For last 16 years (1990 - 2006 years) a glacier has receded on 35-55 m annually the average its speed has made about 3 m per year though in the eightieth years of the last century it has made about 8 m annually. Shooting of a cross-section structure has shown that the glacier has not changed almost, and recedes only from a final part. Thus, the nearest decade's disappearance does not threaten glacier HGP.

Table 4 Dynamics of change of the Zeravshan River Basin glaciers

No	Name	Periods	Deviation (m)	Deviation velocity (m/yr)	Note
1	Zarafshan	1927-1961	280		In the period 1927-1976 years from ice set free the area 1.19 km^2
		1961-1976	980	65	
		1976-1991	1092	73	In the period 1961-1976 years from ice set free the area 0.93 km^2
2	Rama	1929-1948		4	
		1948-1975		9	
		1976-1989		15	
		1989-1991		60	
		1929-1975	320		From ice set free the area 0.12 km^2
		1976-1991	356		From ice set free the area 30.0 km^2
3	Tro	1976-1988	18	1-2	
		1988-1990	60	30	
		1990-1991	23	23	
4	Dykhadang	1977-1991	180	13	
		1990-1991	60	60	
5	HGP	1968-1976	18	2.2	
		1982-1990	63	7.9	
		1989-1990	12	12	

Table 5 Possible changes of the Zeravshan River Basin glaciers for the period to 2050

Name of Glacier	Reduction		
	Length (km)	Area (km^2)	Volume (%)
Zeravshan	4.0-5.0	25-30	30-35
Rama	1.5-2.0	3.0-3.5	25-30
Tro	0.5-1.0	1.0-1.2	30-35
Dikhadang	1.2-1.5	1.0-1.5	Moree 50
HGP	Completly will thaw to 2030 years		

Source: Tajik Hydrometeorology Agency

RIVERS OF THE ZERAVSHAN RIVER BASIN (MINISTRY OF ENVIRONMENT OF THE TAJIKISTAN**)**

Fondarya River. The Fondarya River is inflow of the left party of the Zerafshan rivers its length it is equal 24.5 km, and the pool of a reservoir is equal to 3230 km^2. Source Fondarya considers district where incorporate the rivers Yagnob and Iskanderdarya. The glaciations area of the Fondarya River concerning to the glaciations of the Matcha river basin is less on six times. Therefore glacial feed of the Fondarya River makes 3 mid-annual feeds and on 8 times less than on the Matcha river. Average long-term discharge of Fondarya river waters of 62.2 m^3/sec and in same years up to of 85.4 m^3/sec.

The monthly average charge of weighed deposits of the Fondarya River reaches to 25.8 kg/sec and turbidity to 0.396 kg/m^3. This river comes to a year 815 thousand tons of the weighed deposits, i.e. from each square kilometer of the basin of 252 tons of various products washes away in the river Zerafshan.

Matcha River. The length of the Matcha River is 200 km and the basin area of 4650 km^2. This river begins from Zeravshan glacier at height of 2775 m a. s. l. and flows in a direction of the West. The width of the river Matches reaches from 6 m up to 20 m and 70 small rivers run into it and streams which absorb the river.
Initial flood the Matcha Rivers comes the first decade of May. In July alltongues of the Zerafshon glacier are released from seasonal snows and the river passes basically to a glacial feed. The discharhe of water of the Matcha River 14.9 м^3/sec and the module of a drain (from each square kilometer) is equal to 49.2 l/sec . An

average turbidity of the Matcha Rivers in each cubic meter it is equal to 1640 g and yearly from each square kilometer of a river basin 894 tons of the weighed deposits are washed out. Matcha River is hydrocarbonatly. In riverheads HCO^{-}_{3} ions reaches 50- 80 mg/l.

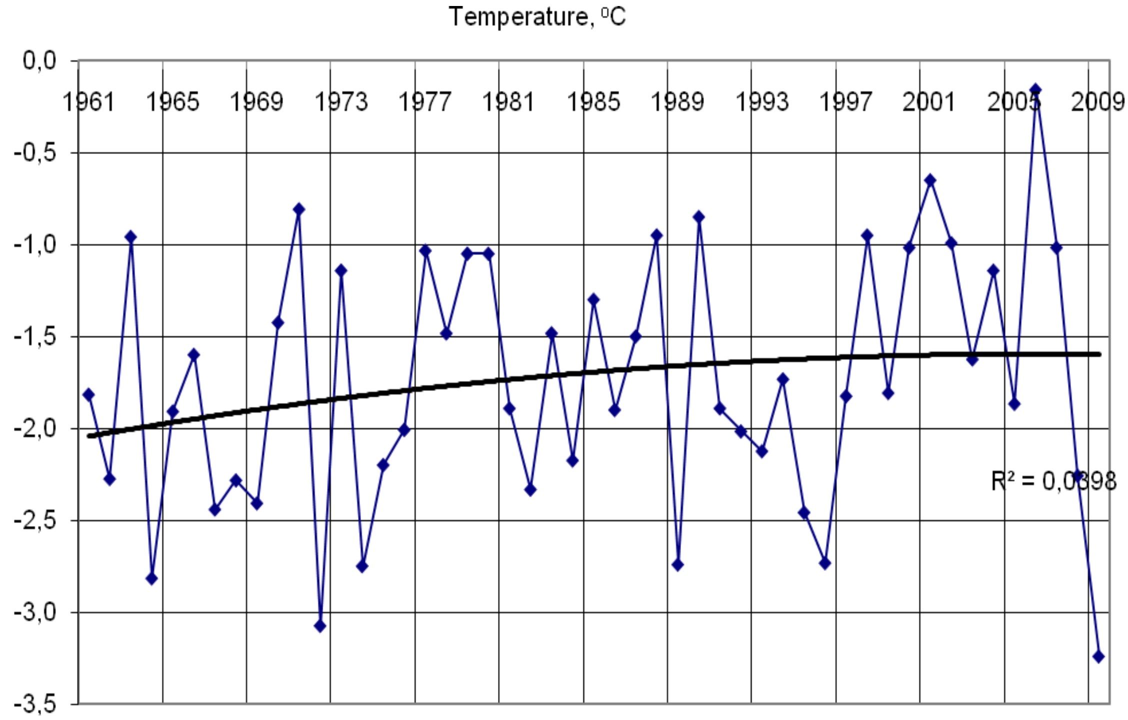
Yagnob River. The watersheds of the river Yagnob is at height of 3440 m and is formed by merge of two small rivulets which begin from northern slope of Gissar Mountains. These rivulets try from small glaciers. The reservoir of the river Yagnob makes 1650 km^2. The charge of water in June- July reaches up to 194.2 m^3/sec. The average long-term water discharges of the river Yagnob 31.8 m^3/sec and the minimal mid-annual charge of water in February- March and equal to 11.28 m^3/sec. The average module of the water charge of the Yagnob River is equal 21.2 l/sec. In Yagnob river basin there are 70.8 km^2 of glaciers. It is established that the river Yagnob takes 29% feeds from underground waters 58% from thawing snows and 13% from glaciers. In each cubic meter of the Yagnob river water have 265 g of the weighed deposit and from each square kilometer the river washes away 187 t of various materials and annual average which to make 308.5 th. t.

Pasrud River. The Pasrud River is one of large inflows of the Fondarya Rivers who joins from the left party near to small town Sarvoda. Length of the Pasrud River is 28.4 km by basins of 371 km^2. In the river basin there are 22 glaciers by the area 21.6 km^2. The average annual charge of water of the river makes 4.68 m^3/sec. The least charge of water is necessary for February-March (3.32 m^3/sec). After merge of the rivers of the Match and Fondarya the river Zerafshan by extent from a source up to border of Republic Uzbekistan on 116 km, but from glacier Zerafshan extent in 316 km is formed. After passage of 56 km, the river Zerafshan accepts from the left party the river Kishtud and after an interval of 94 km too from the left party other inflow Mogiyan. Other inflows with left and with right the parties incorporating the river Zerafshan is small rivulets which lengths reach 20 km..

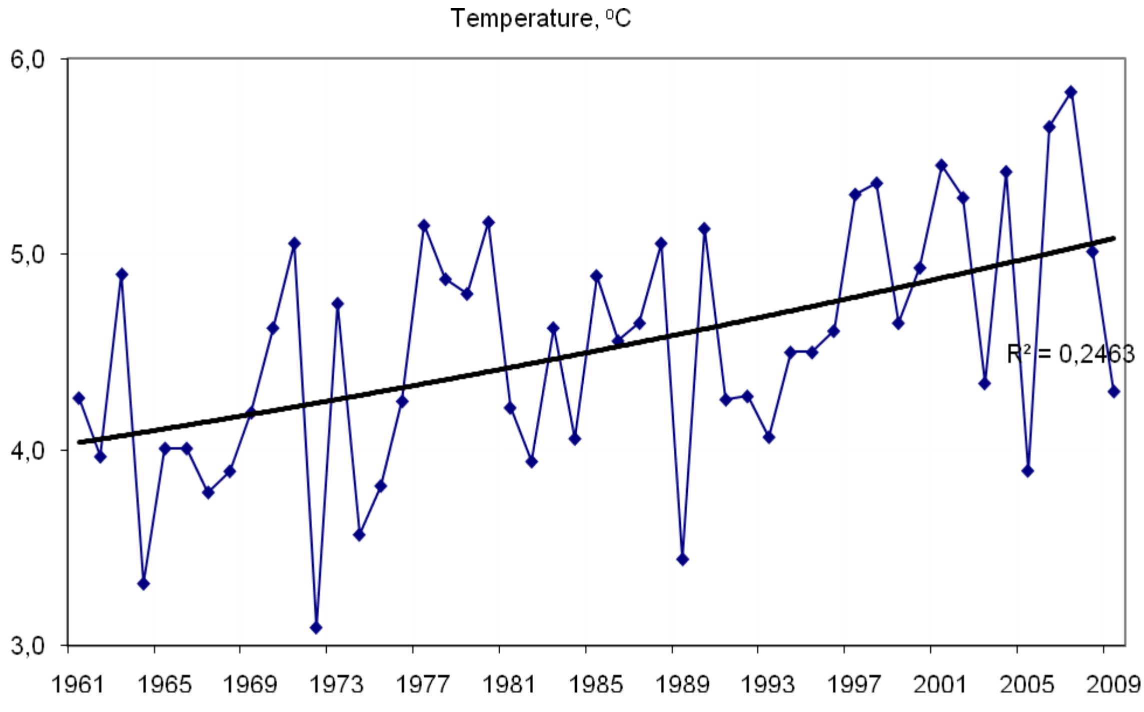
Iskanderdarya River. The river Iskanderdarya is the second greater inflow of the river Fondarya, the watershed of the river located at height 2195 m and leaves from Lake Iskaderkul. This river has 21 km length and the area of basin 974 km^2. The river Iskanderdarya proceeds from a southwest direction in a northeast direction between Gissar Mountains from the south and Zerafshan ridge from the north and in near small town Zerafshan-2 jointed to the river Yagnob. Average long-term the charge of water of the Iskanderdarya river is equal 18.9 m^3/sec but in June and July can reach 111.7 m^3/sec. The module a drain of the river in every second is equal to 24.2 liters. Average turbidity of the rivers is equal to 85.4 g/m^3 and from each square kilometer of the basin are washed away 64.9 t of various sediments. In the Iskanderdarya river basin there are glaciers by the area of 57km^2.
For creation of the long term scenarios on change of environmental conditions of the Zeravshan River Basin and also for carrying out of operative calculations of hydrological parameters of the river is important the creation of database of mid-annual values of air temperature and precipitation. On fig. 1 and 2 mid-annual values of temperature and precipitation of the Zeravshan river basin according to four main meteorological stations of the basin which basic characteristics are generalized in table 6 are presented.

Table 6 Climate index of Meteorological station

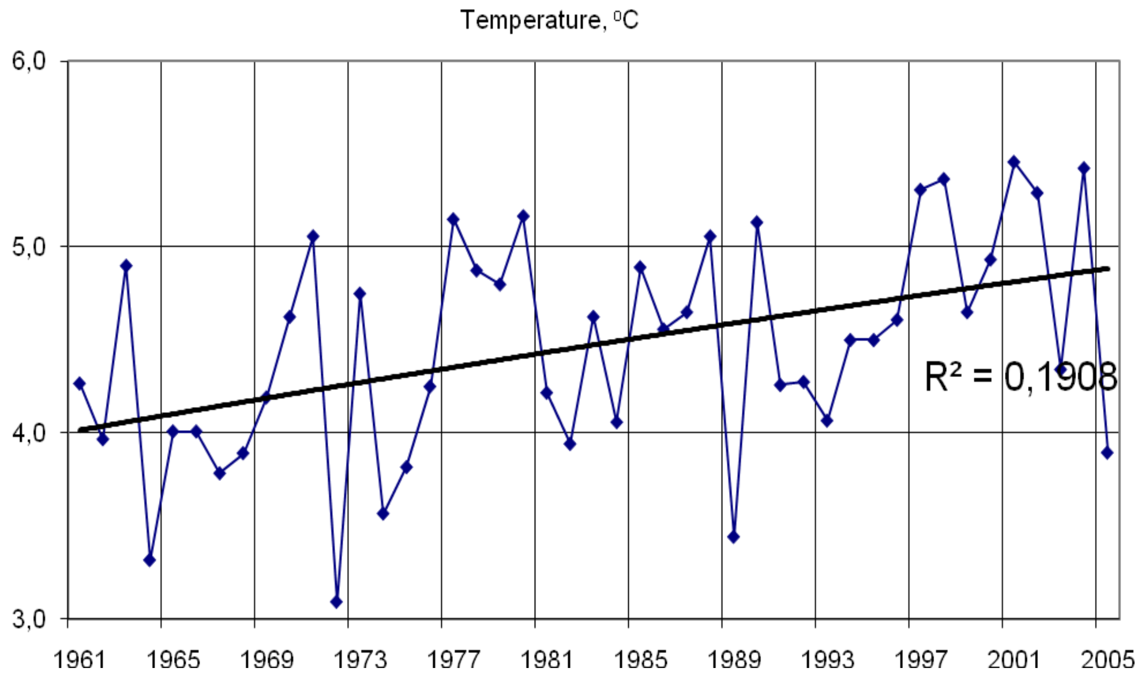
Meteorological station	Absolute high, m	Average air temperature			Absolute air temperature		Annual precipitation, mm
		January	July	Average annual temperature	Maximum	Minimum	
Penjikent	1015	-1.0	25.1	12.2	42	-28	332
Madrushkat	2254	-5.4	18.4	7.1	34	-30	159
Dehavz	2564	-7.4	14.9	4.1	30	-33	270
Anzob	3379	-12.1	9.7	-1.8	24	-36	379


Temperature, ºC
0,0
-0,5
-1,0
-1,5
-2,0
-2,5
-3,0
-3,5
1961
1965
1969
1973
1977
1981
1985
1989
1993
1997
2001
2005
2009
R² = 0,0398

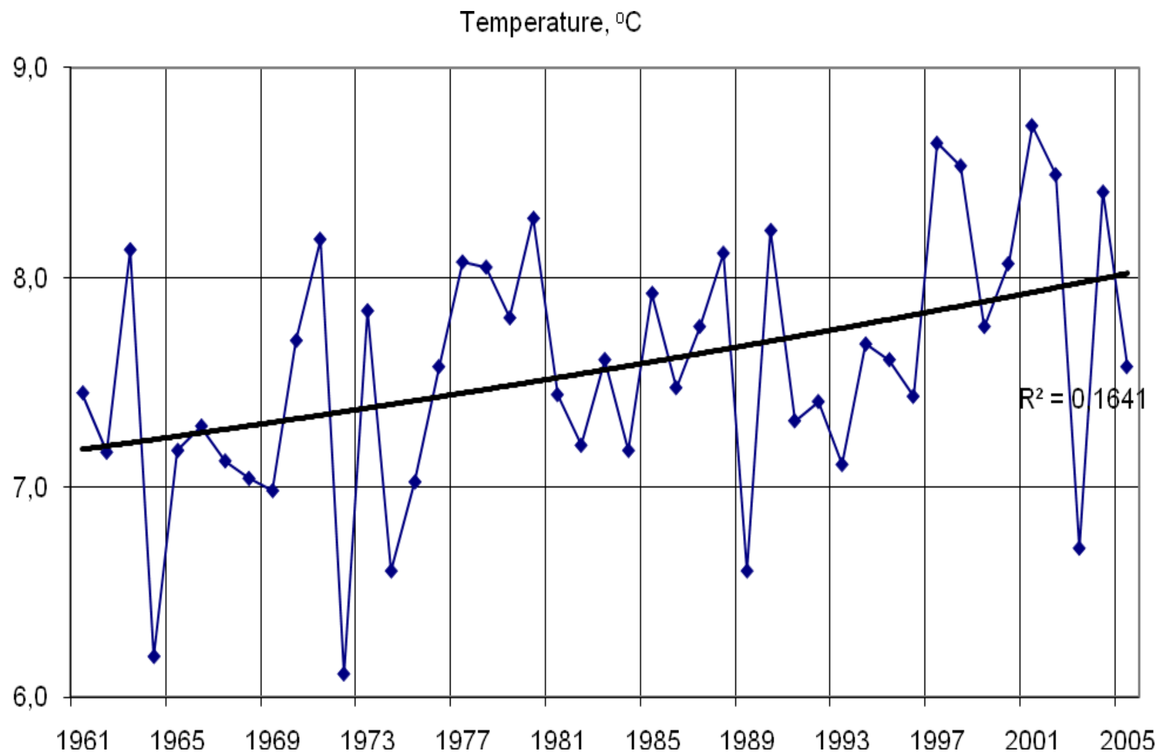
a)


Temperature, ºC
6,0
5,0
4,0
3,0
1961
1965
1969
1973
1977
1981
1985
1989
1993
1997
2001
2005
2009
R² = 0,2463

b)

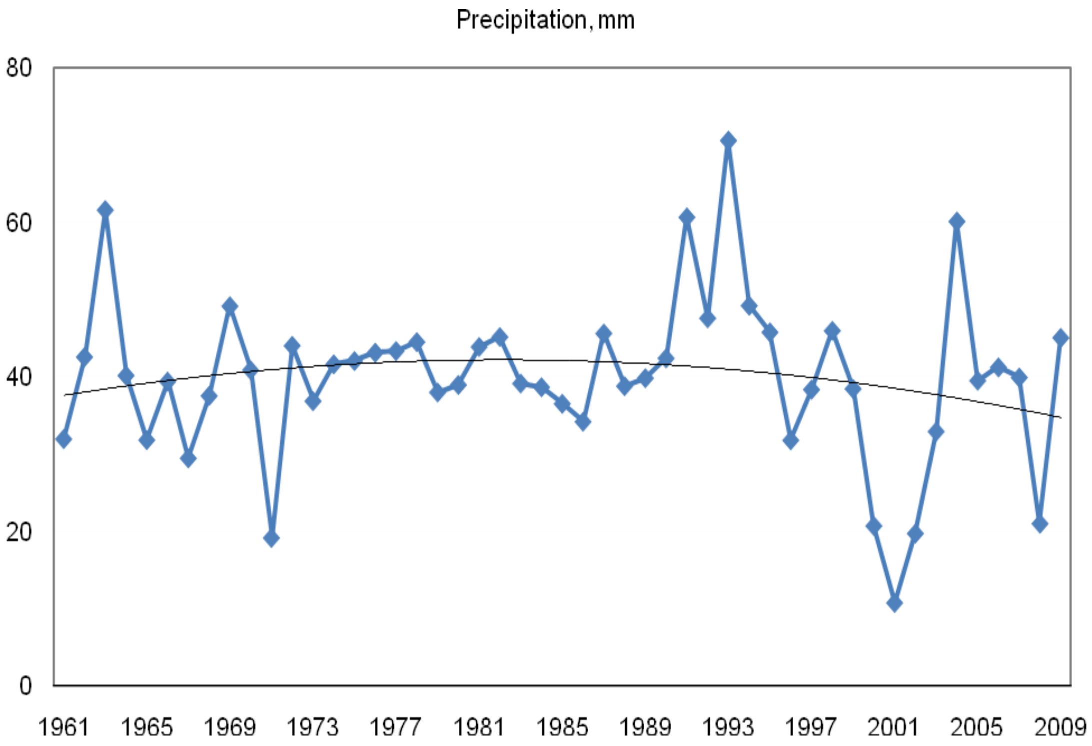


c)

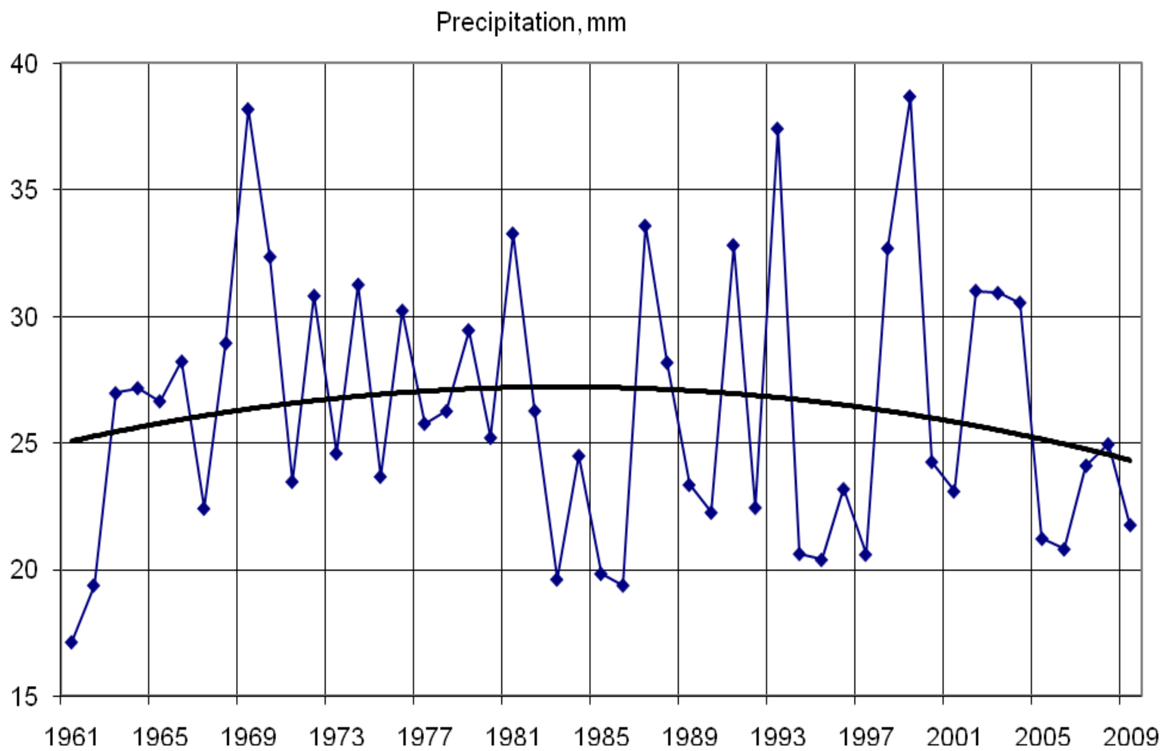


d)

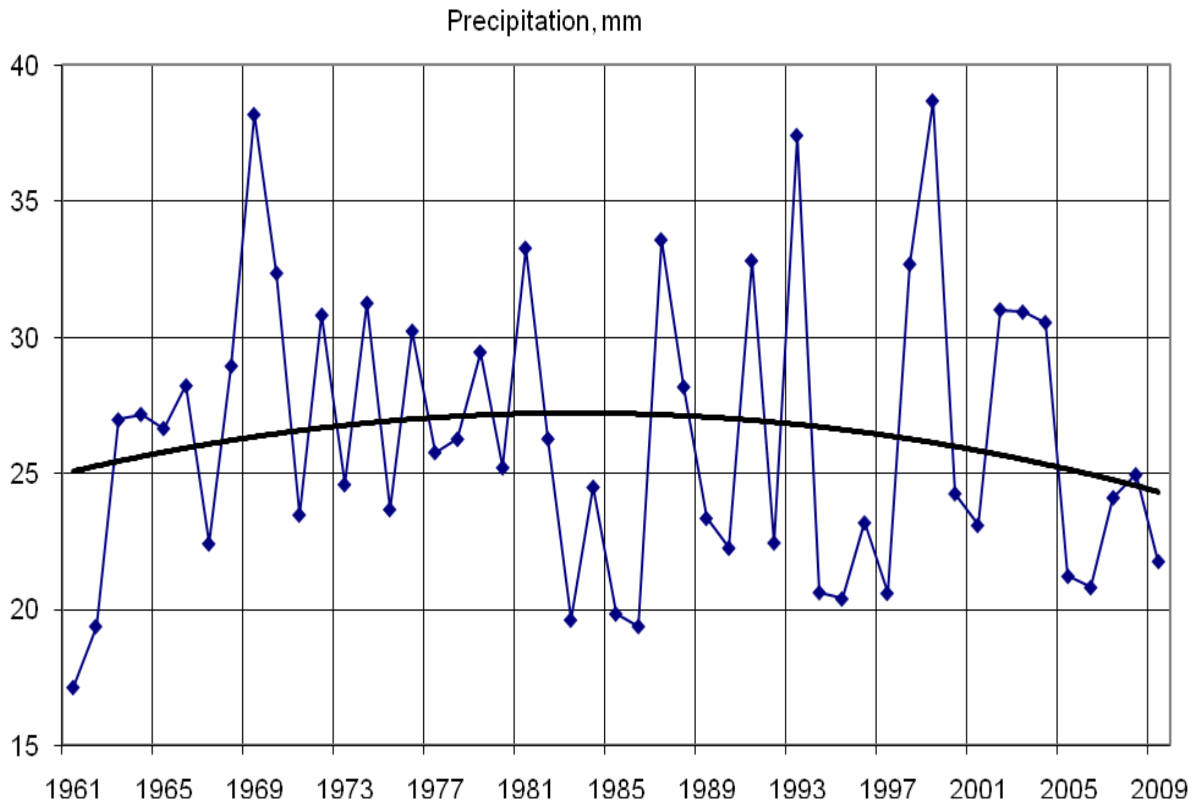
Fig.1. Annual temperature change in the Mountain of Zeravshan River Basin according to the date of meteorological stations: a-Anzob; b-Dehavz; c-Penjikent and d- Madrushkat


Precipitation, mm
80
60
40
20
0
1961
1965
1969
1973
1977
1981
1985
1989
1993
1997
2001
2005
2009

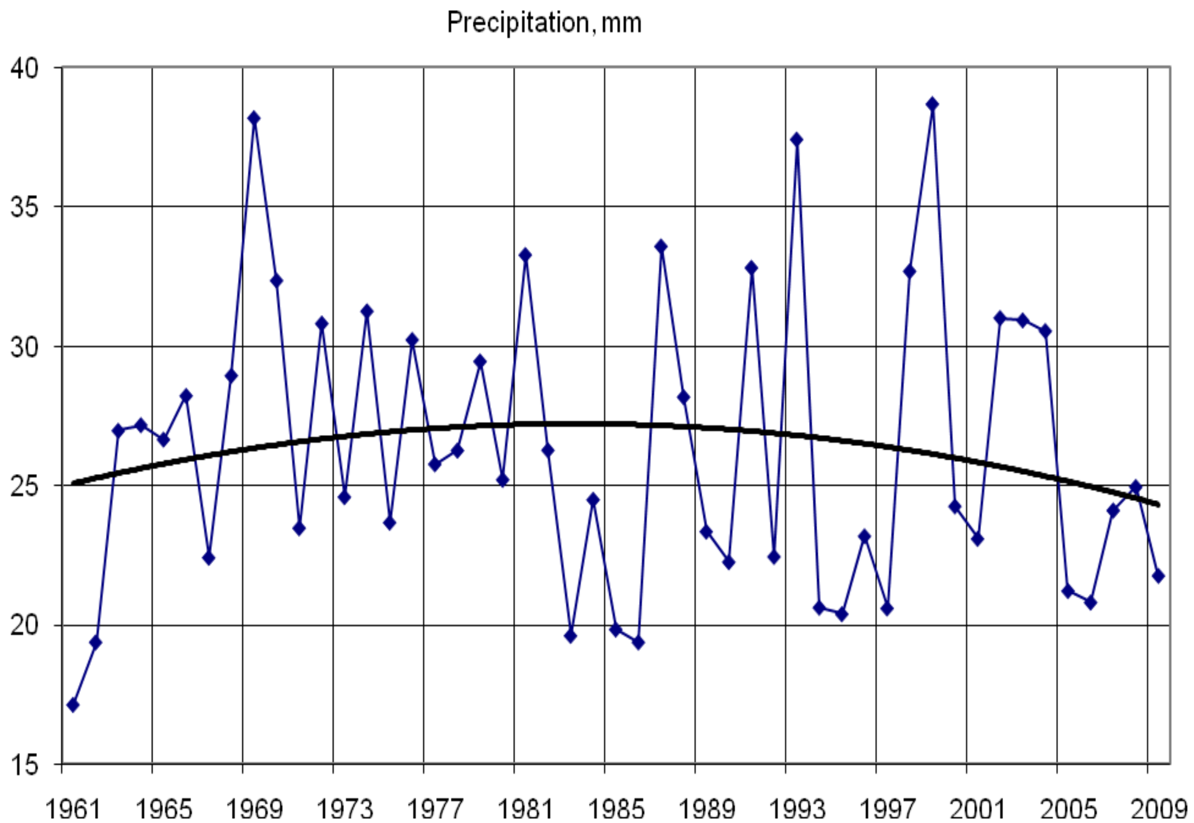
a)


Precipitation, mm
40
35
30
25
20
15
1961
1965
1969
1973
1977
1981
1985
1989
1993
1997
2001
2005
2009

b)



c)



d)

Fig. 2. Annual precipitation change in the Mountain of Zeravshan River Basin according to the data of meteorological stations: a-Anzob; b-Dehavz; c-Penjikent and d- Madrushkat

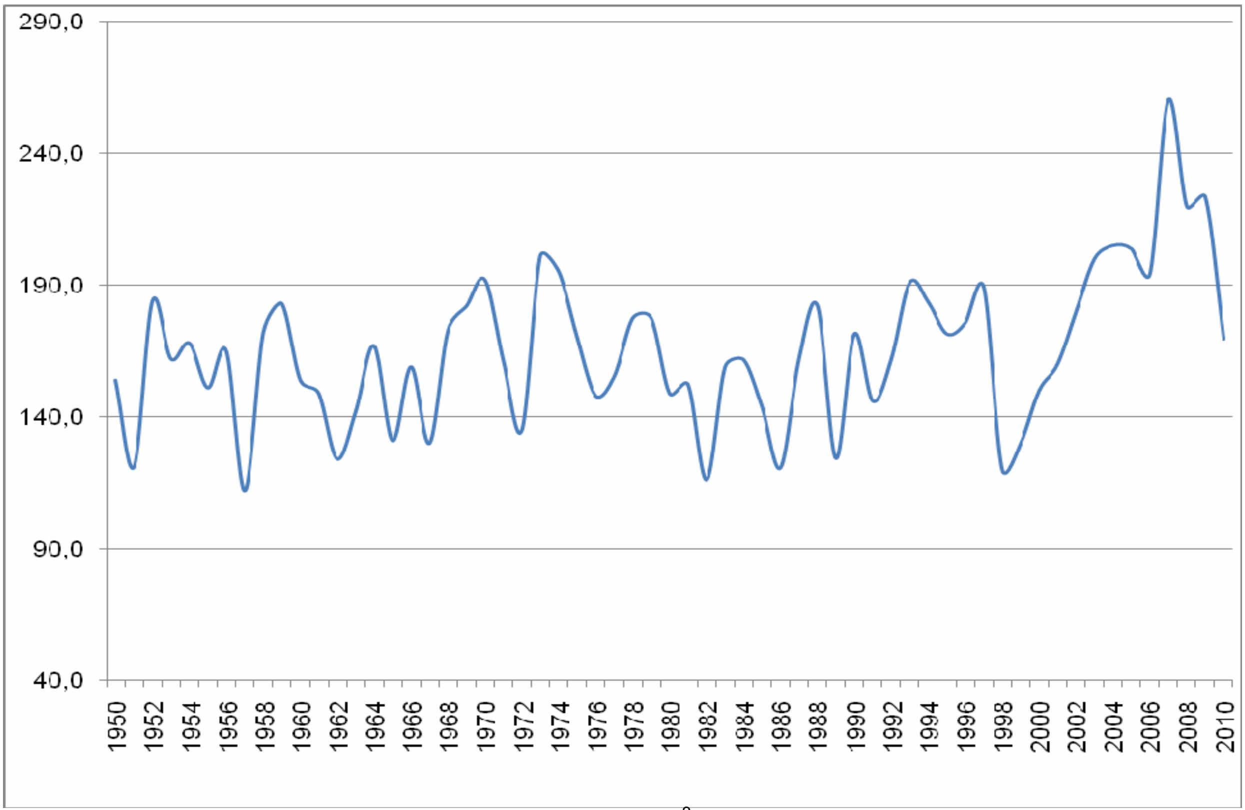


Fig. 3. Trends of annual average Zeravshan River runoff (m^3/sec) on the date of Dupuli Hydropost

ECOLOGICAL AND SOCIAL - ECONOMICAL ESTIMATION OF THE FLOOD IMPACTS IN ZERAVSHAN RIVER BASIN

Among all the regions of Tajikistan 93 % of territory which borrow mountains in the Zeravshan River Basin the formation of floods is observed most often (almost 7% of the total across Tajikistan) and their average number in a year reaches 150. More than 300 thousand inhabitants live in the Zeravshan River Basin located in the Ajni and Penjikent regional centers. The local population is affected almost annually with great economic losses (Fig.4- Fig. 5).

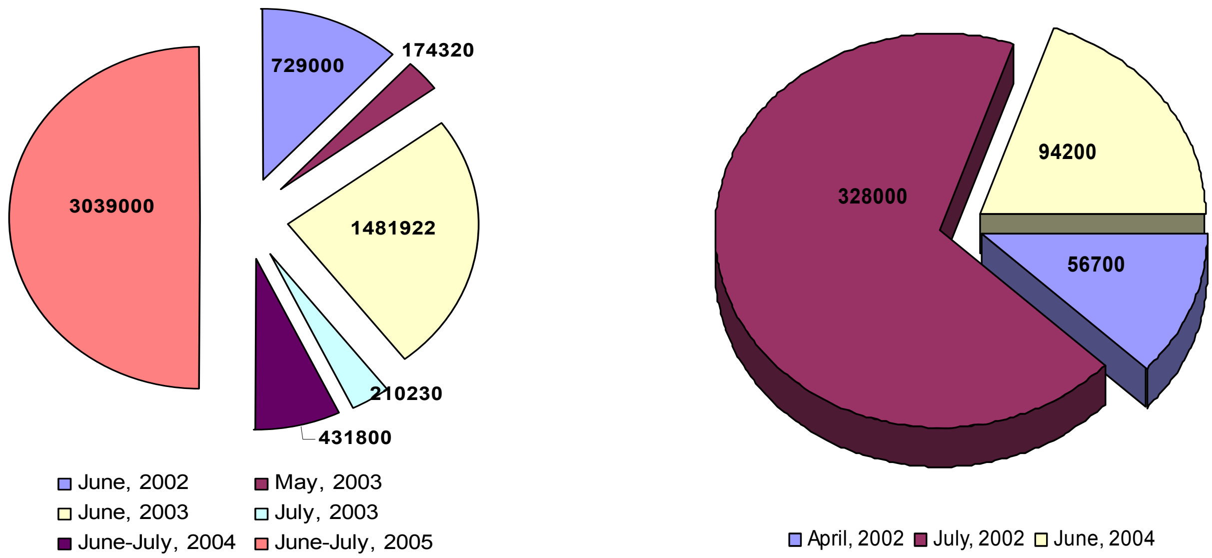


Fig.4. Economical damage of the floods in Penjikent (a) and Ajni (b) district (US Dollars).

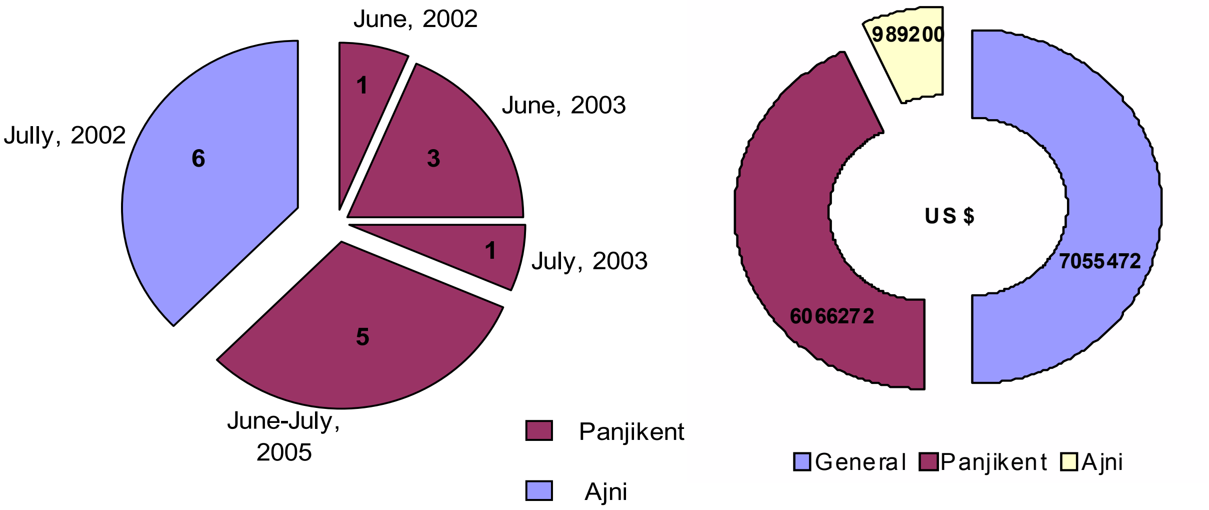


Fig. 5.Total human victims at flooding in Ajni and Penjikent districts (person) (a) and economical damage in result of floods of 2002-2005 years(b)

Table 7 Emergency situations connected with the water factor in mountain areas of the Zeravshan Valley (1998 - 2009)

Emergency situations	Matcha (Moutain)		Ajni		Penjikent	
	Total	General material damage, th. somoni	Total	General material damage, th. somoni	Total	General Material damage, th. somoni
Flood					9	14287.20
mudflof	3	31.10	9	6619.70	10	12209.10
Avalanche	2	66.90	3	25.00		
Strong thunderous rains	3	31.58	3	162.40	2	1857.24
Landslips	2	119.00	15	1848.00		
Drought	-	-	2	1967.30	2	9773.20
Total:		248.580		10622.40		38126.74

WATER QUALITY CONTROL OF THE ZERAVSHAN RIVER

Water quality has become a global issue. Every day, millions of tons of inadequately treated sewage and industrial and agricultural wastes are poured into the world's waters. Every year, lakes, rivers, and deltas take in the equivalent of the weight of the entire human population—nearly 7 billion people—in the form of pollution. Every year, more people die from the consequences of unsafe water than from all forms of violence, including war—and the greatest impacts are on children under the age of five.

From the international level to watershed and community levels, laws on protecting and improving water quality should be adopted and adequately enforced, model pollution-prevention policies disseminated, and guidelines developed for ecosystem water quality. Standard methods to characterize in-stream water quality, international guidelines for ecosystem water quality, and priority areas for remediation need to be addressed globally (UN-Water Statement on Water Quality World Water Day).

Water relations between Central Asia republics during the Soviet Union time were regulated by "Complex Use and Protection of Water Resources Schemes" in Amudarya and Syrdarya basins.

The main purpose of working out basin "Schemes" was to define real volumes situated within the Amudarya and Syrdaya basins and available for using water resources. It was also providing their fair allocation among region republics, meeting all the water users interests.

It should be noticed, that the number of important aspects were not considered and included in "Schemes", for the situation has greatly changed after 1980 (years of the last "Schemes" specification and completion of hydraulic range composition). Mainly it concerns the ecologic acquirements and sanitarian clears thrown into rivers and channels. Overusing basin water in irrigational lands planned as maximum use by “Scheme” resulted in exhausting water resources and appearing new problems. They are:

- deterioration of ecological condition, sometimes leading to ecological disaster in river lowlands of Aral basin.
- great pollution of river water with pesticides, herbicides, other harmful elements and increasing of water mineralization.

The problem of studying the water quality change and development of mechanisms of its control is still actual and concerns not only the separately taken country of Central Asia, but all the states of the region.

For stabilization of an ecological situation in the region a number of measures is offered, for example, by Jalalov (2001). According to one of them it is necessary to make as a principle the limited water intake with some changes allowing the water users down the river flow to intake the greater water volume in percentage terms. The adoption of this limited water intake system, according to same Jalalov (2001), will allow regulating water intake from the rivers not only in view of irrigated lands, but also in view of water quality, degree of its mineralization.

Nowadays one of the most polluted rivers of Central Asia is Zarafshan River. The capacity of this water is changed under the influence of collector drainage water of irrigating basin zone and wastewater of Samarqand, Kattakurgana, Nagoya, and Bukhara cities. Mineralization of water exceeds from origin to estuary from 0.27-0.30g/l to 1.5-1.6g/l.

The most exceed of MC among heavy metals is observed in Cr and Zn. Moreover in Zarafshan river high contain of antimony was found out and it’s phenol pollution composes 3-7.5 MC, as Chembarisov (2001) gives.

Results of reduced chemical analysis of these materials indicate that mineralization of river's water changes within surveyed area from 0.3 to 2.7 g/1. Down the stream from mountains to Navoi meridian mineralization increases from 0.3 to 1 g/1 and then up to Bukhara oasis it reaches 2.6 g/1. In the same direction the chemical composition of water changes - hydrocarbonate ion decreases and sulphate ion increases. Mineralization level of collector-and-drainage water, broadly used within Bukhara oasis, is higher making 2.5-4 g/1. Lower mineralization (0.6 - 0.7 g/1) occurs in canals water taken from Amudarya River and used for irrigation and partially for potable water supply. According to the results of atomic absorption method the chemical contents of Zerafshan waters is closely related to the collecting points and varies extensively (mg.eqv/%): HCO_3^-:15.0-28.0; Cl^-: 11.74-27.0; SO_4^{2}-: 55.0-69.72; Ca^{2+}:27.0-36.79; Mg^{2+}:24.0-45.00; Na+K:28.0-36.82.It was defined that the HCO_3^- content is decreasing and the Cl^- and SO_4^{2-} are generally increasing from Navoi to Bukhara(Toderich and et.al.,2002).

Now after the statement of Republic Tajikistan about the maximum use of hydropower potential of waterways of the Zeravshan river basin the question of water quality of the river Zeravshan though it existed throughout many years, in new coloring began to rise from Uzbekistan. Many consider a problem of water quality in organic communication with activity of Anzob mountain-metallurgical industrial complex.

Anzob Mountain-Concentrating Combine (AMCC) the mining enterprise for extraction and enrichment of complex mercury-antimonic ores of the Dzhizhikrut deposit. It is located in area Ajni in 13 km of a highway of Dushanbe-Khujand in a right-bank part the rivers Dzhidzhikurut which are the left inflow of the river Jagnob (the river Jagnob is the right inflow of the river Fondarja which in turn is the left inflow of the river Zeravshan). The Dzhizhikrut deposit has been opened in 1940 and in 1945-1959 intelligence works were spent and industrial expluatation has begun from 1954. The Dzhizhikrut deposit is located in the ore field area with the same name which is a part of the Zeravshan-Gissar mercury-antimonic belt. The main ore minerals – antimonite and cinnabar. Since 1966 1970 reconstruction of industrial complex was spent and for the purpose of prevention of hit of sewage of industrial complex in the river Dzhizhikrut in village of Ravot (8-10 km from industrial complex) on left to river bank Jagnob was are built waste dams**(WWD).** With 1970 on 1994 pipelines of sewage functioned normally, and since 1994 as a result of heavy rains pipeline pieces has been destroed. In 2009 the industrial complex has completely restored pipelines and now dams in the complete set and works in the established mode.

METHODS

For definition influence of the AMCIC on qualities of waters of the river Zeravshan were made sampling of water from the river in two points - on Fondarya and Pete Rivers is located accordingly before and after wastewater dams of AMCIC (Fig.6).

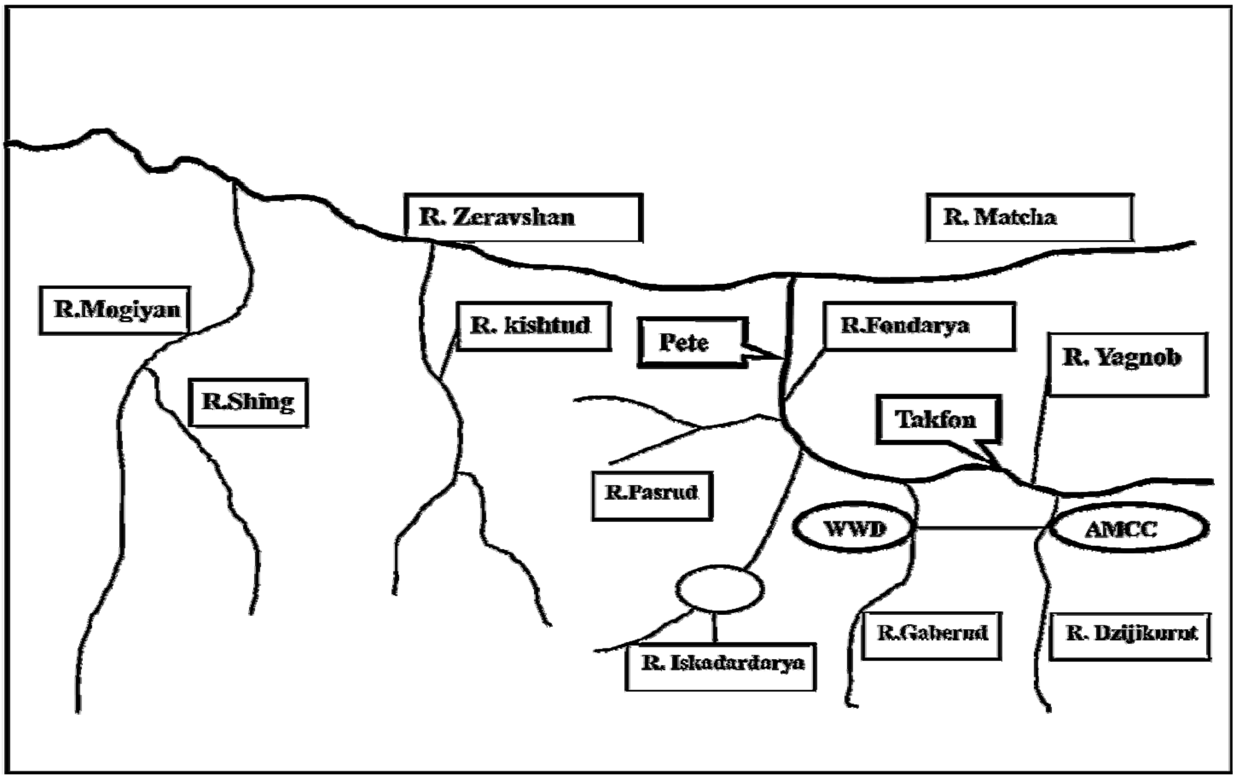


Fig. 6. Scheme of Zeravshan River and her tributary

Comparison of results chemical analyses have shown about absence of the factor of pollution of the river Zeravshan by wastewaters of industrial complex. Results of analyses are presented in table 8 and 9.

Table 8 Chemical analyses of the Zeravshan river waters from point above WWD

Date	T, C	pH	NO3	NH4	PO4	Cr(VI)	Cr(IV)	Hg	Sb	Cd	Zn
06.03.2010	14,2	7,96	27,68	0	102	0,03	0	0	0	0	0,02
17.04.2010	15,3	8,17	11,74	0	147	0	0	0	0	0	0,019
22.05.2010	15,9	8,3	10,95	0	110	0,009	0	0	0	0	0,014
11.06.2010	16,4	8,19	9,74	0	87,4	0,014	0	0	0	0	0,013
31.07.2010	16,8	8,29	8,04	0	127	0,025	0	0	0	0	0,02
12.08.2010	17,3	8,21	3,34	0	149	0,031	0	0	0	0	0,015
06.09.2010	17,1	8,34	19,3	0	132	0,035	0	0	0	0	0,025

Table 9 Chemical analyses of the Zeravshan river waters sampling from point down WWD

Date	T, C	pH	NO3	NH4	PO4	Cr(VI)	Cr(IV)	Hg	Sb	Cd	Zn
06.03.2010	14,4	7,96	30,72	0	103,15	0,029	0	0	0	0	0,019
17.04.2010	15,5	8,17	12,1	0	146,6	0,014	0	0	0	0	0,017
22.05.2010	16,2	8,3	11,17	0	112	0,01	0	0	0	0	0,015
11.06.2010	16,6	8,19	10,64	0	88,1	0,015	0	0	0	0	0,014
31.07.2010	17,0	8,29	7,73	0	129,2	0,029	0	0	0	0	0,021
12.08.2010	17,4	8,21	4,21	0	151,3	0,034	0	0	0	0	0,019
06.09.2010	17,0	8,34	22,42	0	131,1	0,037	0	0	0	0	0,029

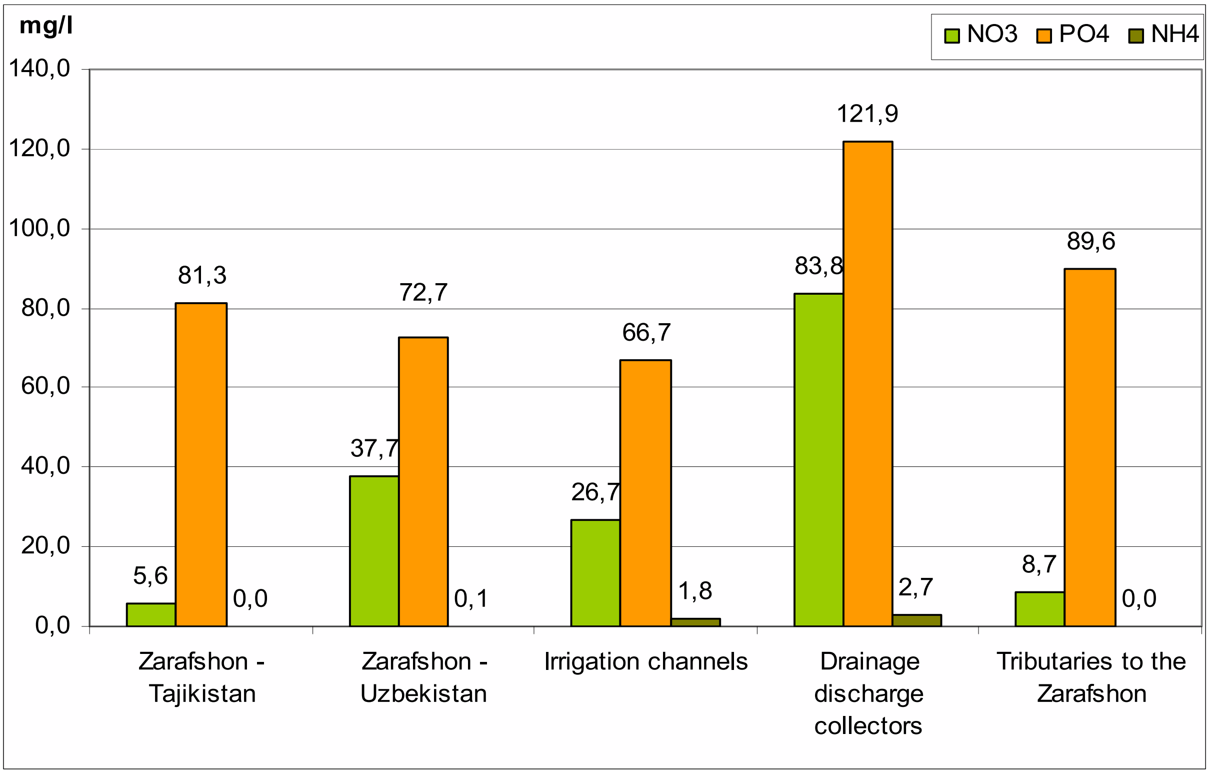


Fig.7. Content of nitrate, phosphate and ammonium in waters of of the Zeravshan River on the Tajikistan and Uzbekistan territory, waters from irrigation channesand drainage collectors in Uzbekistan and tributaries to the Zeravshan River

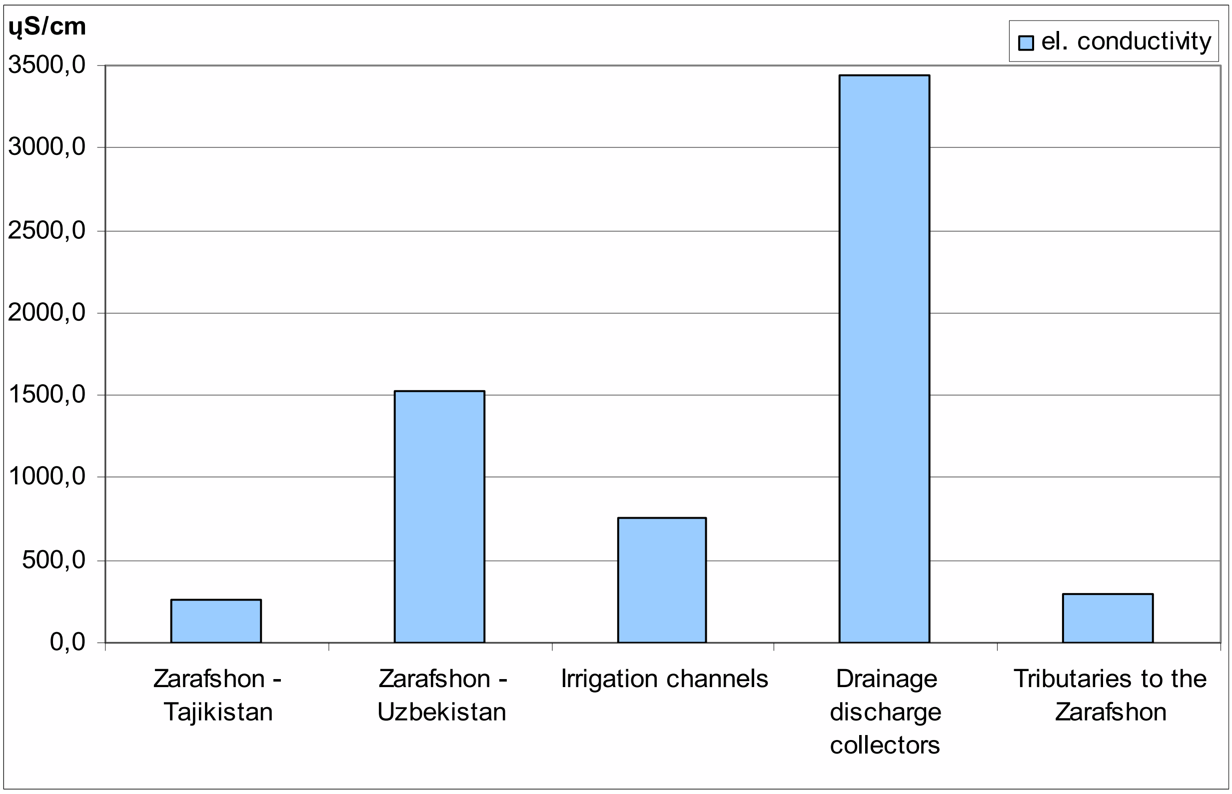


Fig.8. Electrical conductivity of waters of the Zeravshan river on the Tajikistan and Uzbekistan territory, waters from irrigation channesand drainage collectors in Uzbekistan and tributaries to the Zeravshan river

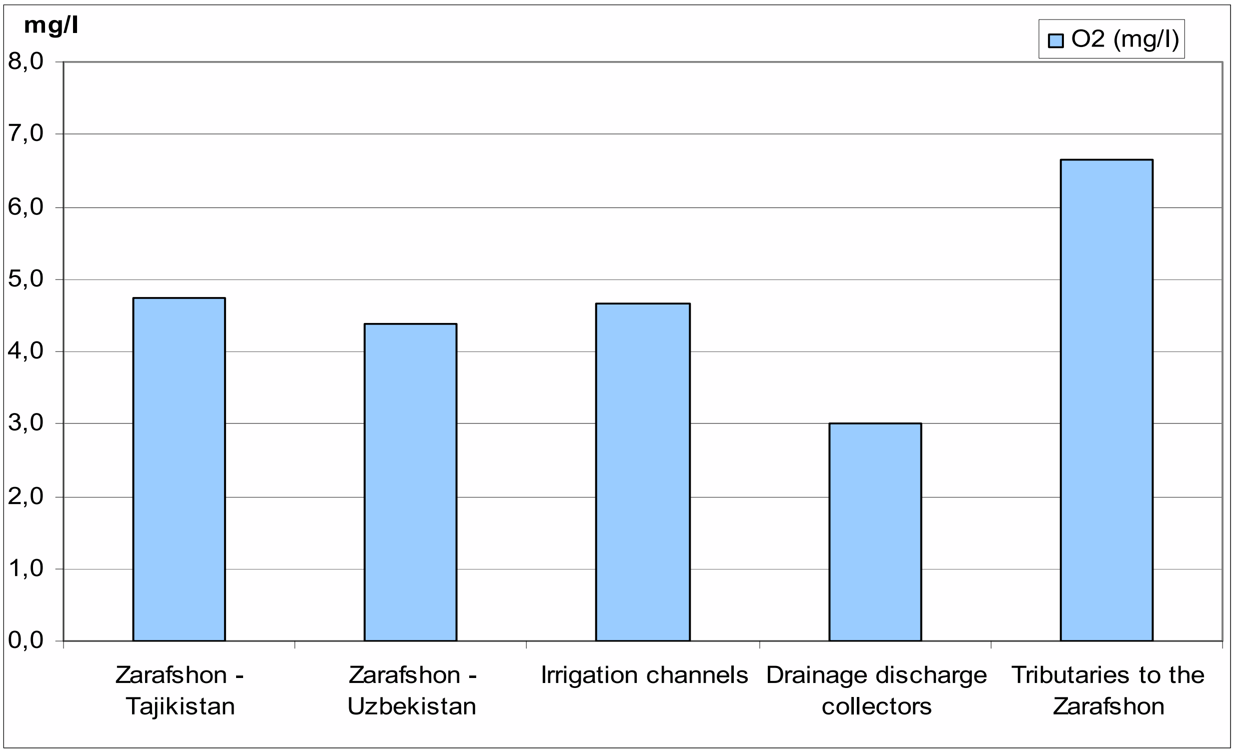


Fig.9. Content of oxygen in waters of of the Zeravshan river on the Tajikistan and Uzbekistan territory, waters from irrigation channesand drainage collectors in Uzbekistan and tributaries to the Zeravshan river

From the Table 8, 7 and Fig.7-Fig.9 becomes evident that in waters of the Zeravshan river and its inflows the maintenance, and as a last resort, excess of concentration of heavy metals of maximum permissible concentration isn't observed. The penetrating comprehension of water importance in the region and social responsibility for steady water supply, for example, called immediate reaction of 5 Governments in Central Asia. In February 1992 there was founded Interstate Coordination Water Commission (ICWC). The foundation of ICWC in difficult and unpredictable post-Soviet time enabled the countries of the region to pass painlessly the period of water “anarchy”, to ensure equilibrium and consent in the region and has shown strategy of all countries to ensure today and in future mutual understanding and respect in fruitful cooperation.

It gives the ground to hope, that the problem of contamination and ascending of a degree of water arteries mineralization can be solved with the same success by creating (similar ICWC) Interstate Coordination Water Quality Commission (ICWQC). The structure of such organization is presented on the Fig.10.

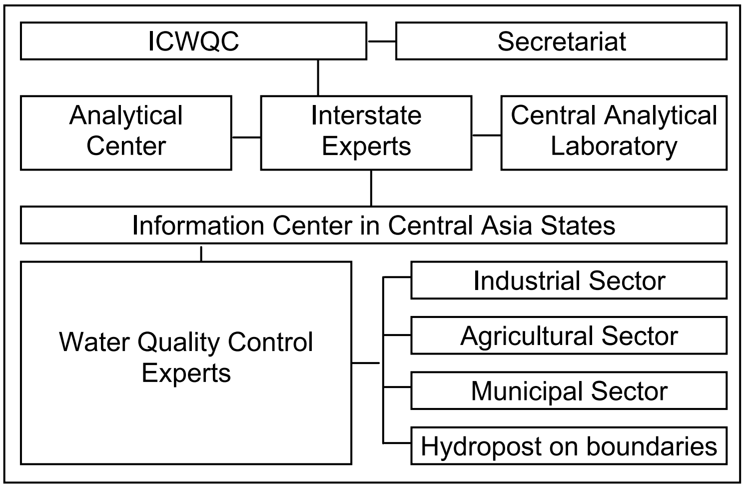


Fig.10. Structure of the Interstate Coordination Water Quality Commission

Structural subdividing “The interstate experts” unite the leading technicians in valuating the quality and composition of waters from all five states of Central Asia.

The main function of this body is to compare the republican experts' information about water composition and to solve disputable questions by carrying out the independent expert appraisals of water quality of Tranceboundary Rivers. ICWQC Secretary appoints the stuff and sets terms of power of the interstate experts. In Information Center established in each country of Central Asia the water quality control statistics in industrial, agricultural, municipal sectors and hydroposts are gathered, generalized and systematized.
Thus, the data concerning water arteries quality from each country come to Analytical Center of ICWQC.
It should be noted, that after reaching the complete transparence of relative composition and quality of all water arteries in Central Asia the next stage is the development of mechanisms to encourage and take measures to the states polluting water environment. These problems together with other questions should be studied in ICWQC Secretariat for considering at Meeting of Central Asia Heads of Governments.

CONCLUSION

As a result of monitoring and generalization of results of supervision it is established continuing growth of reduction of the Zeravshan river basin glaciers. Hydrological characteristics of the river Zeravshan and inflows testify to a large supply of hydropower resources and perceptivity of building a number of the hydroelectric stations which promotes deficiency reductions electroenergy and preservations of a biodiversity and a wood cover in Mountain Zeravshan valley.
Results of comparison of the analysis of waters have shown about absence of essential pollution of waters of the river by wastewaters of the Anzob mountain-concentrating industrial complex. It can be considered as a special case testifying to reliability only of one dam. In wide aspect and for the purpose of the centralized and timely prevention of pollution of waters creation of the centers on constant control quality of waterways is necessary.

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