

By Rafiq Verdiyev, PhD, Azerbaijan

WATER SUPPLY AND MANAGEMENT IN AZERBAIJAN

1. WATER RESOURCES AND MAIN ELEMENTS AFFECTING THEM

1.1. Physiographic conditions

Republic of Azerbaijan is one of the countries in the South Caucasus and has a territory of 86,600 km². The Republic borders with Russia in the north for 289 km along Samur River, 340 km with Georgia in the northwest, 766 km with Armenia in the west and southwest, 11 km with Turkey, and 618 km with Iran in the south. The length of its Caspian Sea coastline from the Astara River to Samur River is 825 km.

The range of elevation within the Republic varies from 4,480 m. in the Major Caucasus Mountains (Bazarduzu crest) to -26.0 m (Caspian Sea level). The average altitude of the area is 384 m with 18 per cent of the area below sea level, 39.5 per cent is between 0 and 500 m, 15.5 per cent is between 500 and 1,000 m., and 27 per cent is greater than 1,000 m. Sharp changes of altitudes due to the orographic structure of the Major and Minor Caucasus Mountains and the location of the Kur-Araz lowlands form the unique climate in the Republic. Climate conditions and relief of the area plays special role in formation of the water resources of the republic.

1.2. Climate

Physiographic conditions and different atmosphere circulations admit 8 types of air currents including continental, sea, arctic, tropical currents of air that formulates the climate of the Republic. The maximum annual precipitation falls in Lenkeran (1,600 to 1,800 mm.) and the minimum in Absheron (200 to 350 mm.). The maximum daily precipitation of 334 mm was observed at the Bilieser Station in 1955.

Eight out of 11 existing climate types including semi-desert, arid steppe, and mountain tundra are present in the country. The annual average air temperature is approximately 14.6 °C in the Kur-Araz lowlands and 0 °C in the mountains. The absolute minimum temperature observed was -33.0 °C (in Julfa and Ordubad) and absolute maximum temperature of +46.0 °C was again observed in Julfa and Ordubad.

1.3. Water resources

Water resources of the country consist of surface waters formed in rivers, lakes water reservoirs, glacier and ground waters.

1.3.1. Rivers. The fresh surface water resources of Azerbaijan mainly consist run-off of Kura and its tributaries Araz and Ganikh (Alazan) basins rivers, and those which fall directly into the Caspian Sea, including transboundary rivers Samur (flows through the Russian Azerbaijan border) and Astarachay (flows through the Azerbaijan and Iran border).

Kura with its vast river system is the key water provider or, as hydrologists say, is the main water artery of the Caucasus. The river flows through the territories of Turkey, Georgia and Azerbaijan Republics. The total length of the river is 1364 km(of which 185 km relate to the territory of Turkey, 390 to Georgia and 790 km to Azerbaijan) . Total watershed area is 188000 km²(of which 58000 km² relates to Azerbaijan, 34700 km² to Georgia, 29800 km² to Armenia and 66000 km² to Iran and Turkey). The average height of Kura river watershed up the Azerbaijan Georgia border is 1700 m.

The source(beginning) of Kura is group of streams found in the Gizil- Gadik mountain at a height of 2700m in Anadoly area of Turkey. The river flows through the territories of Turkey, Georgia and Azerbaijan Republics/4/.

The second large river is Araz. The river flows through Turkey, Armenia and Azerbaijan territories and falls into the Kura near Sabirabad town. The total length of the river is 1072 km with a total watershed area of 102000 km² (of which 18740 km² relates to Azerbaijan , 22090 km² to Armenia and 61000 km² to Iran and Turkey). Ganikh (Alazan) is the third large river which flows through the territory of Georgia and Azerbaijan and falls into Mingechaur reservoir (Kura river). The total length of the river is 413 km with a total watershed area of 12080 km² and height of watershed 900m.

The Samur river's watershed area is 3620 km² and Astarachay river's 242 km². The watershed areas of rivers which fall directly into the Caspian Sea from North- East slope of Grate Caucasus and Lenkoran- Astara zone are 22500 km² and 5200 km² consequently.

Research show that total water resources of Azerbaijan rivers which flow into the Caspian Sea within the Azerbaijan Republic together with the Samur and Astarachay rivers make up 31.5 km³. Total water resources of the Kura river are 26.6 km³ and of the Araz river are approximately 10 km³. Water resources of other rivers directly falling into the Caspian sea (Rivers of the Greater Caucasus North-East slope and Lankaran-Astara zone) make up approximately 4.67 km³, of which 2.17 km³ is related to the Samur river and 0.22 km³ to the Astarachay river. 25% (7.5 km³) of total water resources of rivers is formed within the Azerbaijan Republic/4/.

Main transboundary rivers information is given in the below table.

Table 1. Transboundary Rivers Flowing into Azerbaijan

Rivers	Total Flow (km ³)	Transboundary Flow (km ³)	Local Flow (km ³)
Kur (before Araz)	17.0-19.0	12.0-13.0	5.0-6.0
Qanykh (Alazan)	3.8-4.4	2.4-2.8	1.4-1.6
Qabirli (Iory)	0.5-0.6	0.49-0.58	0.01-0.02
Khrami	1.8-1.9	1.8-1.9	-
Ingesu	0.026-0.03	0.022-0.024	0.004-0.006
Agstafachay	0.39-0.42	0.34-0.36	0.05-0.06
Akhinchay	0.15-0.20	0.12-0.16	0.028-0.038

Rivers	Total Flow (km ³)	Transboundary Flow (km ³)	Local Flow (km ³)
Araz	8.8-9.6	7.2-7.8	1.6-1.8
Arpachay	0.44-0.54	0.36-0.45	0.08-0.09
Okhchuchay	0.29-0.32	0.27-0.29	0.02-0.025
Bazarchay	0.58-0.69	0.53-0.63	0.05-0.06
Samur	2.36-2.40	2.36-2.40	-

There are more than 10,000 local rivers in this territory including small shallow rivers. Drainage density makes up 0.36 km/km² across the Azerbaijan Republic that is two times less in comparison with neighboring countries of Caucasus, where upper parts of basins of transboundary rivers are located. The river grid in arid areas of Kura - Araz lowlands is less developed. Many rivers of Shirvan zone are drying up in summer beyond reaching of sea or main river due to the lack of atmospheric precipitation and the high level of evaporation.

In total local water resources of Azerbaijan change between 9.0 and 11.0 cub. km and are distributed by region as:

- Gazakh –Ganja – 1.40-1.50
- Right tributaries of Kura(Below Ganjachay river) -1.10-1.16
- Sheki- Zagatala region- 1.41-1.51
- Shirvan- 1.60-1.70
- Nakhichevan- 0.85- 1.00
- Downstream tributaries of Araz within Azerbaijan Republic- 1,05 -1.15
- Guba- Khachmaz region- 1.30-1.40
- Lenkoran- 1.25-1.40

1.3.2. Lakes. There are nearly 450 lakes with an area of 394 km² in Azerbaijan of which ten have the surface area more than 5 km². Some of the lakes are freshwater and others are saltwater lakes. The largest lake is Sarisu Lake located in the Kur-Araz lowlands with an area of 65.7 km² and capacity of 59.1 Mm³. Jandargol Lake is located on the border with Georgia and has an area of 10.6 km² and capacity of 51 Mm³.

The highest mountain lake is Tufangol Lake (3,277 m) located in Demiraparan River basin. Its area is 0.1 km² and the capacity is 0.11 Mm³. The most picturesque and freshwater lake of Azerbaijan is Goy-Gol that was formed as a result of earthquake in the Agsu River at an elevation of 1,556 m in 1139. Others lakes (Maralgol, Zaligol, etc.) were also formed as a result of that earthquake. Goy-Gol is running water pond. The area is 0.79 km² and the capacity is 24 Mm³. One of the lakes formed as a result of easy meandering of Kur River is stagnant at Hajiqabul Lake. The area is 84 km², and average depth is 1.4 m, length is 4.2 km., the capacity is 12.1 Mm³

1.3.3. Ground Waters. The underground waters of the republic are characterized by high quality. It is generally used in agriculture and common industries. In Ganja-Gazakh and Garabagh-Mil confined groundwater basins, the underground waters are mainly used for irrigation purposes in different regions of the area. Total capacity of exploitative underground water reserves is estimated to be 8 to 9 km³ per year, which may play significant role in sustainable water supply of Azerbaijan.

Prognosis reserves of ground waters of less mineralization and fresh waters meeting the usage requirements in the Republic of Azerbaijan are indicated in the following Table

Table 2. Prognosis reserves of ground waters

Regions	Prognostic reserves by 2008, th m ³ /day
Mountain areas of the Greater Caucasus	1008,87
Absheron	241,92
Samur-Davachi foothill area	3470,72
Alazan-Ayrichay valley	3822,0
Ganja foothill area	4218,6
Shirvan foothill area	517,7
Garabag –mill foothill area	7909,92
Mugan foothill area(near Talish)	130,0
Jabrayil foothill area	344,0
Lankaran foothill area	209,0
Nakhichevan foorhill area	902,2
Mountain area of Lesser Caucasus	989,35
Total	23764,28

As indicated in the table at present according to calculations carried out in different years, the regional exploitation reserves of ground waters make -23764,28 thousand m³/day (or 9 billion cub m in a year).

Confirmed by the Reserve commission -12100 thousand m³/day, include the waters of highlands and under river beds(160 thousand m³/day) and those with the general mineralization of ground waters of 1580 thousand capacity (is 1-3 g/l of these reserves) to be used for irrigation and technical purposes.

Exploration reserves of ground waters (confirmed) are given in the below table

Table.3 . Exploration reserves of ground waters

No.	Hydrologic Basins	Exploitation Reserves (thousand m ³ /day)		
		Fresh	Less Mineralized (1 to 3 g/l)	Total

1.	Minor Caucasus area	33	-	33
2.	Waters from areas under river beds	127	-	127
3.	Underground waters of foothill plains	10,360	1,580	11,940
Total		12,100		

1.3.4. Total water resources of Azerbaijan Republic

In sum, the water resources of Azerbaijan are distributed as following:

- River waters: 28.5 to 30.5 km³ of which 9.5 to 11.0 km³ belong to internal rivers and rivers flowing into the Caspian Sea
- Freshwater lakes: 0.03 to 0.05 km³
- Exploitation capacity of underground waters: 8.0 to 9.0 km³
- Water resources of glaciers: 0.080 to 0.085 km³

2. WATER USE AND INFRASTRUCTURE DEVELOPMENT

As a water poor region, water supply over the Azerbaijan Republic territory makes up about 100 thousand m³/km². The quotient amounts to an average of about 1 thousand m³ of water per person per year, putting the Azerbaijan Republic to one of the low rankings in the world. Water resources of the Republic are distributed very irregularly over administrative districts. Water resources of Sheki-Zakatala zone, Khachmaz and Kelbajar economic districts exceed those in other areas. Absheron and Kura-Araz lowlands are the most water poor regions. During the period of vegetation the river run-off amounts is only 10-20% of the annual amounts and in the Lenkaran-Astara zone it does not exceed 5%.

According to Budiko classification the territory of Azerbaijan falls into the insufficient rain fall climate zone, with the lower part of Kura river basin in the arid zone. Therefore, it was necessary to redistribute run-off from one part of the territory to another by means of various kind of water economy facilities.

Presently in the territory of Azerbaijan there are many water reservoirs, canals and pipelines with a purpose to provide the population, industry, irrigation, energy and other sectors with water and to carry out annual and long-term run-off regulation. Further development of the water use facilities will lead to increased use of water resources. In spite of existence of a huge number of water facilities on the territory, needs in water provision still remain. It is connected to limited water resources and a lack of an economical water use scheme.

There are more than 50 reservoirs in Azerbaijan and most of these were built for irrigation purposes. Tandem reservoir systems on Kur River include Mingechevir,

Shamkir, Yenikend, and Varvara Reservoirs. The “Araz” water junction on the Araz River and the Sarsang Reservoir on the Tartar River also produce energy. The Jeyranbatan Reservoir supplies Baku and Sumqayit cities with potable water. Water to this reservoir comes through Samur-Absheron Canal from Samur River. The total amount of water taken from Samur River by this canal is estimated at 0.80 to 0.85 km³.

The total capacity of operating water reservoirs in the country is about 20.6 km³, the net storage volume is 12.4 km³, the total area is 877 km², and the total capacity of hydroelectric power station (HPS) is 978,500 kilowatt.

Table 4. Information on main Water Reservoirs

No.	Name	Area km ²	Capacity km ³
1.	Mingechevir	605.0	16.07
2.	Shamkir	116.0	2.68
3.	Yenikend	23.2	1.58
4.	Varvara	22.5	0.06
5.	Araz Water junction	145.0	1.35
6.	Sarsang	14.2	0.57
7.	Jeyranbatan	13.9	0.19
8.	Khanbalanchay	24.6	0.05
9.	Sirab	1.5	0.01
10.	Agstafachay	6.3	0.12
11.	Khachinchay	1.8	0.02
	Total	974.0	22.70

Water resources are redistributed by reservoirs by use of different canals. Below (tables 5) is given information on water distribution by Mingechevir water reservoir by use of 2 magistral irrigation canals(Upper Shirvan and Upper Garabakh canals).

Table.5. Water distribution by Mingechevir reservoir

Monthly water discharges, cub. m/sec													
Years	1	2	3	4	5	6	7	8	9	10	11	12	Annual
Water income by Alazan river													
2006	81.4	158	104	170	314	103	119	71	73	183	114	67	130
2007	53.2	48	92	207	244	221	110	49.2	42.4	30.2	135	101	111
Water income by Kura river													
2006	180	247	385	734	778	162	212	100	113	217	239	236	300
2007	210	219	256	475	1084	418	196	80	86	105	190	148	289
Water intake by Garabakh Canal													
2006	64	65	75	83	74	106	105	106	85	68	65	65	80

2007	65	65	81	75	89	103	105	106	90	69	65	65	82
Water intake by Shirvan Kabal													
2006	33	31	36	52	41	72	75	76	51	28	31	27	46
2007	24	34	39	39	54	67	69	73	59	51	27	18	46
Kura (Downstream of reservoir)													
2006	606	567	532	411	364	283	268	278	221	165	163	204	339
2007	323	275	188	275	563	514	271	241	213	211	212	216	292
Environmental flow of Kura near mouth													
Long term	286	298	366	645	760	547	218	147	197	238	273	280	354

As one can see from the above table water released from the reservoir to downstream of Kura river is close to the environmental flow of Kura calculated for station located at its mouth near the Caspian Sea.

In opposite to this water taken from Samur river for water supply of Absheron meet requirements for environmental flow as taken water is less than remained in the river water and which correspondingly is more higher than the environmental flow of the river (Table 6)

Table 6. Water distribution by Samur Absheron Canal

Samur river water discharges, cub m/sec													
Years	1	2	3	4	5	6	7	8	9	10	11	12	Annual
Samur river water discharges, cub m/sec													
2006	19.6	18.5	25	98.2	96.1	104.3	96.2	39	52.4	65	37.9	23.9	50.5
2007	16.7	13.5	13.3	22.5	172.3	165	79	38	28.8	18.8	24.4	14.4	50.7
Water use by Samur – Absheron Canal													
	1	2	3	4	5	6	7	8	9	10	11	12	Annual
2006				14.8	35.8	44.7	37.3	29.5	23.8	32	28.6		20.77
2007	4	9.3	11.8	13.8	39.6	54.6	47.8	25.5	22.5	14.5	19.3	11.6	22.85
Environmental flow of Samur													15.85

At present water resources of Kura and Ganikh in Georgia and water resources of Araz in Turkey, Iran and Armenia are decreased by 20% as a result of water intake. Also by taking into account of water loss from the channel (river-bed) of Kura river lower course, one may find that available at Azerbaijan Republic water resources of transboundary rivers of

Eastern Caucasus at present is less than natural ones by 30 %. About 11-12 cubic km of water in the Kura river basin is being used for different purposes. Of which 60-70 % goes to agriculture, 20-25% to economy and the rest for water supply of cities and other residential areas. Water losses make up 3- 4 cub.km(See the table below).

Table 7. Water use in Azerbaijan

Water use	1993	1994	1995	1996	1997	1998	2002
Mln cub m/year							
Total abstraction	16,344	14,631	13,970	13,462	12,512	10,235	10,075
-surface water	15,156	13,118	12,820	12,475	11,414	9,554	9,530
-groundwater	1,188	1,513	1,150	987	1,098	681	545
Per capita abstraction, m3	2,149	1,923	1,837	1,753	1,613	1,307	1,256
Domestic use	390	368	327	277	222	264	503
Industrial use	3,459	2,323	2,173	2,225	2,132	2,293	1,977
Irrigation	8,222	7,996	7,668	7,047	6,397	4,482	4,169
Cattle and other uses	78	99	55	383	284	254	105
Water losses	4,195	3,855	3,747	3,530	3,477	2,941	3,321

As Climate Change also leads to the decrease of the water resources it should also be taken into consideration when making future environmentally friendly water protection and infrastructure rehabilitation measures. For example by the National Climate Change Centre of Azerbaijan to calculate Climate Change impacts to water resources the following models the following scenarios had been used: GISS(Increase of annual air temperature by 4.8-5.3 ° and annual precipitation by 6 - 12%), GFDL-3 (Increase of annual air temperature by 4.2-4.4 ° and annual precipitation by 1 - 4%)climate change models and scenario recommended by specialists of Azerbaijan Academy of Science(about air temperature increase by 2 degrees) . Taking into account changes of air temperature and precipitation in accordance with climate change scenarios based on amounts of the available for today at the territory of Azerbaijan (observed) annual run-off of Kura and potential water resources of the it(Natural run off amounts) the climate change impact to the water resources of Kura has been estimated.

As it is seen from the table below(Table 8) by all models from 10 to 20% decrease of water resources of the river is expected in the future if there is now adequate measures of adaptations.

Table 8. Change of water discharges of Kura river under climate change models.

Run –off ranges	Water discharges , m ³ /sec				
	Winter	Spring	Summed	Autum n	Annual
	XII-II	III-V	VI-VIII	IX-XI	XII-XI
Initial scenario (1961-1990)					
Natural	403	1528	897	524	840
Percent of seasonal values of natural run-off from their annual sum	12.1	45.8	26.8	15.6	100
Observed	334	1233	684	400	663
Percent of seasonal values of observed run-off from their annual sum	12.6	46.5	25.8	15.1	100
$\Delta t=2^{\circ}\text{C}$, $\Delta R=0\%$ (scenario supposed by the Azerbaijan Academy of Science)					
Natural	398	1391	766	460	755
Percent of seasonal values of observed run-off from their annual sum	13.2	46.0	25.3	15.1	100
Observed	306	1075	592	354	583
Percent of seasonal values of observed run-off from their annual sum	13.1	46.1	25.3	15.1	100
GISS					
Natural	357	1273	756	412	698
Percent of seasonal values of natural run-off from their annual sum	12.8	45.0	27.1	14.8	100
Observed	255	966	574	312	527
Percent of seasonal values of observed run-off from their annual sum	12.8	45.3	27	14.7	100
GFDL-3					
Natural	341	1319	682	390	682
Percent of seasonal values of natural run-off from their annual sum	12..5	48.5	25.0	14.3	100
Observed	272	1081	437	291	520
Percent of seasonal values of observed run-off from their annual sum	13.1	52	21	14	100

Results of undertaken work show that annual and seasonal amounts of ecological flow(the minimal monthly run-off necessary for existence of river ecosystem) of Kura river near the mouth also get reducing by all three of given climate change models with the air temperature increase(Table 9).

It is revealed that atmosphere precipitation increase prevents run-off to reduce except relative amounts of winter run-off.

Table 9. Ecological run-off (water discharges, cub.m/sec.)of Kura river near mouth under climate change

1	Monthly ecological run-off, cub.m/sec.												An- nual
	1	2	3	4	5	6	7	8	9	10	11	12	
Kura-Salyan Actual(Observed)	286	298	366	645	760	547	218	147	197	238	273	280	354
Kura-Salyan by GISS	268	275	311	544	660	426	201	120	137	199	248	267	305
Kura- Salyan by GFDL-3	252	263	295	520	624	406	161	91	125	191	228	254	284

Identification of measures to improve state of water resources and to remove negative consequences of climate change to them, which should be realized with purpose to prevent climate change consequences and to contribute stable development of the country.

The existing and future water and water use balance in the country is described in the table below

Table. 10. Existing and future water and water use balance in Azerbaijan

Components of the balance	Existing mln. m3	Expected, mln. m3		
		T=20C, dR=0	GISS	GFDL-3
Water Use and Sanitary flow	24887	24976	24976	24976
Water losses	3000	3500	3500	3500
Water use and losses together	27887	28476	28476	28476
Existing surface waters	23400	20995	20200	19000
Use of water from trans-boundary river Samur	1000	1000	1000	1000
Water deficit	2487	6481	7276	8476

By the National Climate Change Centre number of measures have been identified to reduce in the future water deficit according to the Climate Change scenarios(Table 11).

Table 11. Necessary measures to reduce in the future water deficit according to the Climate Change scenarios.

Needed measures of adaptation	Existing mln. m3	Expected, mln. m3		
		T=20C, dR=0	GISS	GFDL-3
1. Water deficit	-2487	-6481	-7276	-8476
2. Ground waters available for yearly exploitation	3400	3500	3500	3500
3. Economy of water in result of reconstruction of water supply network	4500	4500	4500	4500
3. 4.Cleaning of about 4 40% of polluted waters	2000	2500	2500	2500
5.Decrease of deficit in result of measures	+7413	4019	3724	2024

As it is seen from the table undertaking of the above measures can significantly reduce the future water deficits.

3. DRINKING WATER SUPPLY

In Azerbaijan all existing water sources are used for drinking water supply. Main sources of water supply in regions are surface and ground water sources of near located areas. Polluted waters of Kura river below Mingechavir reservoir is used by local population as a drinking water sources.

From all volumes of water supplied to the city of Baku annually (16 cub. m/sec) the purest are waters of :

- Khachmaz (1956, 2.65cub.m/s) and;
- Shollar lines (1917, 1937 , 187 km from Baku, about 1.5 cub. m/sec).

Water from Djeiranbatan water intake (Samur-Absheron canal, of 26.4 cub.m/s water 12.3 cub m/s is pumped to reservoir) has some pollution by ground and surface water, air (iodine, zink, Cu,) is also of good quality (7.5 cub. m/sec drinking and 5 technical)

From Kura river:

- Kura I-1972, 3.9cub.m/s;
- Kura II -1987, 5.2 cub.m/s

Water taken from Kura river is more polluted. Currently water intake is 7 cub.m /sec of which 4 reaches Baku

About 1.7 cub km of ground waters (20% of the total) annually is used for water supply to provincial towns and rural areas.

Government is implementing Oguz Gabala Baku water pipeline project (5 cub. m/sec)

As indicated above the scarce water resources of regions of Azerbaijan are used by different purposes without considering of environmental requirements. Many of rivers usually dry during the low flow period. Most of the river can only meet local water demands.

In order to identify necessary sources of drinking water relevant surveys are being carrying out.

As potential drinking water reserves following sources of water have been considered different times:

- Kura III(9 cub m/sec), before it was planned to be constructed at the location of Kura 1 and Kura II , then because of bad water quality plan changed to Mingechavir, but its quality also didn't allow to realize the project
- From Samur- was rejected by Russia because of environmental issues
- From upstream of Hakara river(Qochaz and Shalva, 7 cub m/sec, 1988) – because of Armenia occupation haven't been realized yet
- Water resources of Tartar river which can be used as a sufficient source of water for the above reason isn't used yet for this purpose.
- Possible other surface water sources of Gazakh Ganja and region and Alazan Haftara valley and Guba-Khachmaz region (upstream of clean or slightly polluted mountain rivers

As an alternative can be used following ground water sources:

- Third Baku Water supply pipeline from Khvalin-Khazar and Baku-Gusar underground horizons of Samur- Devechi foothill(3, 6 and 9 cub m/sec)
- Extra water intake from Oguz Gabala area(5 cub m/sec)
- Possible ground water sources of Lesser Caucasus and Alazan Haftara valley

There are many issues relating to the sphere water supply and sanitation. As result of water scarcity, improper state of the water supply and distribution network water supply coverage in the republic still needs to be improved, mainly in rural areas. Today these indicators are as below:

Connected to water supply population (in %):

- Baku 95
- Sumgayit, Ganja 95

- Secondary cities 83
- Rural areas 11

In sanitation sector

- The waste - water network in Baku serves about 72 % of the city, but only about 50 % of the waste water is treated; 90 %- biologically and only 10 %-mechanically.
- In other urban areas in the country, the coverage drops up to 32 %. There are waste - water treatment plants in 16 cities and towns; most are partly or completely out of operation.
- In rural areas, on-site sanitation is used, primarily latrines

The quality of water supplied to population in many cases doesn't need required standards. To address these issues government undertake necessary steps in cooperation with the donor community.

4. WATER POLICY AND INFRASTRUCTURE MANAGEMENT IN AZERBAIJAN

Water sector is one of the most important parts of country's economy and engineering-municipal infrastructure of the republic. Central, regional and territorial governances, joint stock companies, private and municipal structures are involved in the water activities. Their performance is regulated by sartorial Laws and number of standard acts and bylaws.

The water policy is mainly implemented through water legislation, particularly, through Water Code of the country. Water Code is basic legislative act of the country regulating water sector. Based on this Code, several Laws, and number of bylaws were adopted. Particularly, the Law on Water Supply and Wastewaters, Law on Melioration and Irrigation, Law on Hydrometeorological Activities, Law on Entrails, Law on Municipal Water Economies, Law on Safety of Hydrotechnical Installations, etc.

The following organizations are dealing with the issues of water resources management in Azerbaijan:

- Ministry of Ecology and Natural Resources;
- Amelioration and Water Farm JSC
- Azersu JSC

Relationships between agencies and water users connected with use and protection of water bodies and water resources (water relationships) are regulated in accordance with water legislation of Azerbaijan Republic. Ministry of Ecology and Natural resources(MoE) as a major water related policy making state agency implement programs related to monitoring and protection of water resources. Management in the field of use and protection of water bodies in municipal ownership is carried out by municipalities within the limits of authority defined by law.

The use of surface water resources and management of water infrastructure is carried by the Amelioration JSC, ground waters by the MoE.

Water Policy of the country is also implemented through National Plans, State Programs and Action Plans. By the end of 1996, Government of Azerbaijan with support of World Bank,

developed National environmental Action Plan, which highlights importance of water resources management and protection. In 2006 by decree of president the State Program on improvement of ecological situation in Azerbaijan has been adopted

So far many water related projects have been carried by the government. The world Bank supported GREATER BAKU WATER SUPPLY REHABILITATION PROJECT (1996-2006) reached following performance indicators:

- (i) Improvement in hours of service from the pre-project average of 6 hours/day to an average of 12 hours/day by the end of the project;
- (ii) Reduction in unaccounted for water (UFW) from the pre-project level of 66 percent to 36 percent by the end of the project;
- (iii) Improvement in water quality and water pressure by the end of the project;
- (iv) Adjustment of residential and industrial water tariffs as necessary to cover operating costs;
- (v) Change in the billing system from flat to metered rate is occurring;
- (vi) Reduction in the ratio of employees per thousand service connection or households; and
- (vii) Institutional improvement

ADP project will ultimately benefit 147,000 people in Goychay, Agdash, and Nakhchivan, providing access to adequate potable water at low costs by 2010 through WSS improvements and new infrastructure.

These include:

- New well fields to replace nonfunctioning ones, including those destroyed by floods
- New pipe systems, elevated reservoirs, and chlorinating facilities to replace the existing water distribution system
- New main and branch sewers, sewerage pumping stations, and waste stabilization ponds
- Institutional reform in Azerbaijan's WSS sector will begin with replacing the state-owned and operated SuKanals with open-type, JSCs in each of the project towns.

Financed by support of the WB the National Water Supply and Sanitation project envisages possibility of provision of safe, reliable and sustainable water supply and improvement of sanitation systems (WSS) in 20 Rayon of Azerbaijan, including -10 Rayons (1st phase) up to 2008, and 10 Rayons (2nd phase) up to 2009/6-8/.

Objectives of the project:

- improve water supply by rehabilitation and improvement of existing networks, to treat water supplied to network according to existing standards, to provide subscribers with water meters for regulation of water use;
- protect urban areas covered by the project from potential negative impact on surface and underground water sources, to install and rehabilitate selected sewage systems required for health and environmental needs;
- institutional strengthening for efficient management of potable water provision and waste water.

- Realization of the project will positively effect on environmental safety, economic, social development and health of population; will put the basis for correspondence to legislative requirements

Major project activities:

- (i) rehabilitation and extension of water supply and sewerage systems in twenty rayons;
- (ii) construction of wastewater and septic sludge treatment facilities;
- (iii) preparation of an urban Master Plan for the Baku area and updating the Water Supply and Wastewater Master Plan; and
- (iv) development and implementation of an Institutional Development Plan (IDP) for Azersu and its subsidiary companies, to improve the efficiency and sustainability of WSS services (including implementing a meter-reading/billing/collection system and a financial restructuring and recovery plan; implementing a demand-management program, improved technical and financial monitoring performance, etc.

In addition the Government of Azerbaijan in cooperation with ADB, KfW, SIDA and other donor organizations implemented and is planning to implement different projects directed at improvement of water sector management

By the decree of the President of AR issued on June 21,2007, on measures on improvement of access of public to safe drinking water, during 2007-2008 the program on portable water provision of population of 100 villages using Kura and Araz rivers as drinking water will be implemented by the MoE and water supply system then transferred to municipalities. Main aim is to provide access people there to safe drinking water

- For work in 2007, 3 Mln AZN will be allocated by the Government.
- People of villages , without access to safe drinking water will get water treated by modern filters
- Pipelines ,tanks, treatment facilities and taps will be installed;
- Municipalities will be operating the water supply system, where social position of population also will be taken into consideration when developing of tariffs

Implementation of above programs will create good foundation for environmentally friendly water infrastructure development in Azerbaijan.

Reference:

1. The Hydrogeological and Engineering Geological Expedition of the National Geological Exploration Service under the Ministry of Ecology and Natural Resources of Azerbaijan Republic(www.ecogov.az)
2. The Institute of Geology of national Academy of Science(www.gia.az)
3. http://www.unece.org/env/epr/epr_studies/azerbaijan.pdf
4. Rafiq Verdiyev Water resources of Eastern Caucasus rivers under climate change, Baku 2002, 200 unit,214p.
5. www.eco.gov.az
6. www.worldbank.org
7. www.azersu.az