Republic of Georgia - Country Report

WATER RESOURCES OF GEORGIA AND THEIR USE

Quick assessment

Water resources are one of the most important natural resources of Georgia. There are 26060 rivers with total length 58987 km. A base of hydrographic network are small rivers with length less than 25km and total length 50480 km.

Georgia's territory is divided in two main regions: Black sea basin and Caspian Sea basin. Total natural river runoff from the territory of Georgia is 56.4km^3 and to the territory (from Armenia and Turkey) - 8.74 km^3. Thus, total water supplies amount for 65.4 km^3.

The biggest river in Georgia is Rioni which annual runoff is 12.6 km^3 . There are large rivers in Western Georgia like Inguri (5.9 km^3), Chorohi (8.9 km^3), Kodori (4.1 km^3), Supsa (1.4 km^3), Bzib (3.0 km^3) and others. In Eastern Georgia there are Kura (7.2 km^3), Alazani (3.1 km^3), Aragvi (1.4 km^3), Big Liahvi (1.4 km^3), Khrami (1.0 km^3), lori (0.8 km^3) and others.

There are 850 lakes in Georgia which total area is 170 km^2. There are 734 glaciers with total area 513 km^2 on the Main Caucasus Ridge.

More than 250 th.ha are covered by swamps including 220 th.ha in Western Georgia and 31 th.ha in its Eastern part.

There are 43 water reservoirs including 34 for irrigation and 9 for power generation. Total useful capacity of all water reservoirs amounts for 2222.6 mln.m^3.

Water supplies in glaciers, water reservoirs and swamps are 35km^3, thus total fresh water resources amount for 100km^3.
Natural ground water resources amount for 18 km^3, including 67% in Western Georgia and 33% in its Eastern part.

Hydropower resources constitute 91.1% from total energy resources and other resources (wood, oil, gas, coal) constitute only 8.3%. Theoretical energy of surface runoff is 228.5 bln.kWt.h and its capacity is 26.1 mln.kWt.h.

There is 3.27 bln.kWt.h/km^2 including 5.06 bln.kWt.h/km^2 in Western Georgia and 1.73 bln.kWt.h/km^2 in its Eastern part.

Major water issues

Major issues are surface water pollution by wastes and irrational water use. Water pollution is connected with human activity. It comes from point and non-point sources.

Point sources:

1. Municipal wastes from cities and settlements.
2. industrial wastes.
3. Wastes from hospitals, recreation and other health centers.

Non-point sources:

1. Surface wastes from agricultural fields.
2. Storm runoff from cities and landfills.

1. Municipal wastes from cities and settlements pollute water with organic matters, nitrogen and phosphorus compounds. Most polluted rivers are Kura, Vere, Alazani, Algeti, Suramula (Caspian Sea basin) and Rioni (Black sea basin).

There are centralized sanitation systems in 45 cities including 33 with treatment facilities. Latter were built in 1972-1986 and mostly are out of operation, the rest work unsatisfactorily. Biological treatment is practically absent.

2. Industrial wastes bring oil products, phenols, heavy metals, etc.

Most polluted rivers in the Kura basin are:

- Kura within Tbilisi and Rustavi (oil products, phenols, heavy metals);
- Mashavera (zinc and copper ions).

In the Black sea basin:

- Kvirila (oil products and manganese ions);
- Rioni and its tributary Ogaskura (oil products, zinc and copper ions);
- Tkibuli (mechanical pollution from coal mining industry);
- Kubiszkali (oil products);
- Luhumi (arsenic ion).

Since 1992 due to economic crisis industrial production fall down to 15-20% of designed one and consumed water reduced from 1542 mln.m^3 (1985) to 229 mln.m^3 (1996). Presently, some large plants start to operate and have some perspectives for development.

Food industries are concluded in centralized sanitation network and pollution depends on efficiency of municipal services.

3. Presently, serious problem is water treatment from hospitals, recreation and other health centers. There are infectious hospitals in all cities and infectious divisions in rayon hospitals and all these hospitals have not treatment facilities.

Six tuberculosis hospitals in Abastumani are particularly dangerous because have not treatmant plants and wastes are released directly to Ozhe and then Kura river. Two tuberculosis hospitals in Borzhomi have biological treatment facilities which are out of operation now and wastes are released to Gudzharula and then Kura river. In Tbilisi infectious center has not treatment facilities.

4. Agricultural wastes bring mineral fertilizers and pesticides. Major water consumer is irrigated farming. According to data of 1987, there were 469.2 th.ha of irrigated lands including 409.2 th.ha in Eastern Georgia (Kura basin) and 60 th.ha in its Western part (Black sea basin).

In 90-ies due to political and economic crisis in the country reclamation systems almost fully came out of operation, pumping stations hydrostructures were destroyed. Funds allocated for O&M are unsatisfactory for repair and rehabilitation that caused irrigated area reduction.

In 1997 under WB support project for irrigation and reclamation systems rehabilitation has been prepared. Its implementation start is planned since April 2002. About $100mln. allocated for this purpose. The project will be implemented during 12 years in three stages.

Potential pollutants are cattle breeding and poultry farms, most part of which is not functioning now. But after their rehabilitation treatment facilities will be needed to install.

5. Storm runoff from cities and landfills also pollute surface waters. Landfills have not treatment facilities and observation wells. They are mostly located on river banks. Landfills in all cities are "burning points" and do not meet water protection requirements.

In 1996 WB experts studied landfills in Tbilisi and prepared recommendations on special polygon for garbage and special plant for its processing.

Major owners in water sector

In accordance with Georgian legislation, water resources are property of state, which gives licenses for water use. Major consumers are power engineering and irrigated agriculture. As it was mentioned before, Georgia is rich in hydropower resources. There are about 100 large and small hydropower stations with designed capacity lObln.kwt.h or 20% of economic potential. Presently, for different reasons, total capacity is 4.5bln.kwt.h.

In Soviet time Georgia was included in common energy system that allowed to provide all economic branches with electricity. At the moment, when Georgia is implementing reforms in its economy, hydropower development became very important. Small hydropower plants construction is recognized as priority but it is postponed due to lack of funding. Hydropower plants constructed in Soviet time are ageing and need rehabilitation but donors refuse to finance this endeavor.

In past year Chinese investors allocated money for construction of derivative Khadori hydro power plant in Alazani upstream, with designed capacity 24000kwt.h, but the government has not money to complete its construction.

Climatic conditions variability dictates necessity of land reclamation. In Western Georgia with humid climate and intensive precipitation drainage is expedient. In Eastern Georgia with arid climate irrigation is needed.

By 1987 there were 469.2th.ha of irrigated lands (including 140.6 th.ha with water lift) and 162.3 th.ha of drained lands (including 31.1 th.ha with mechanical drainage) under Water Department administration.

Presently, due to lack of financing for O&M irrigated and drained are is reducing. About 89% of irrigated lands are irrigated with water lift using pumping stations, which technical state is unsatisfactory.

In 2001 187.2 th.ha were irrigated including 850 th.ha with water lift. Water diversion was 996172 th.m^3 from which 449248 th.m^3 were supplied to the fields. Irrigation systems efficiency is 0.46. Only 40 th.ha drained lands were used.

Main sources of water are Kura, Alazni, lori, Aragvi, Didi, Patara Liahvi, Ksani, Algeti rivers of Eastern Georgia. There are 34 irrigation water reservoirs, which are also sources for irrigation. Major reservoirs are Sion (325 mln.m^3, useful volume is 315 mln.m^3), Tbilisi (308.0 mln.m^3, useful volume is 155 mln.m^3), Algeti (65 mln.m^3 , useful volume is 60mln.m^3), Zonkar (40.3mln.m^3, useful volume is 39.0 mln.m^3), Jandar (54.28 mln.m^3, useful volume is 25.03 mln.m^3), etc. Total useful volume of all irrigation water reservoirs amounts for 826 mln.m^3, but many reservoirs are filled with pumping stations, which are out of operation because lack of electricity.

It worth to note, that Jandar reservoir takes water from Kura river through Gardaban main canal. From this reservoir 8.4 th.ha are irrigated in Azerbaijan through Akstafi reservoir. According to agreement between Georgia and Azerbaijan water should be taken annually in amount of 100 mln.m^3 (including 30mln.m^3 for irrigation in Gardaban rayion of Georgia), 50mln.m^3 are taken Akstafi rayon and 20mln.m^3 remain in Jandar reservoir for ecological equilibrium support.

Taking into account, that WB since 2002 starts to finance rehabilitation of reclamation network, could be expected, that after 10-12 years irrigation systems will take water in amount of 1600-1900mln.m^3 and irrigation systems efficiency improvement will allow to use water rationally.

In previous years industry was among major water consumers in Georgia; now it works on 15-20% of past capacity. It is supposed, that in the near future it will work for its full capacity.

Water legislation in Georgia

Water legislation in Georgia is based on Constitution of Georgia, ratified international agreements, laws of Georgia "About environment protection", "About water" and other acts. Law "About environment protection" has been accepted by the parliament on 10 December 1996. It is legislative act determining principles of natural resources management (including water), licensing, common principles of supervision and control as well as ecological normatives and economic mechanisms use in environment protection field.

Law "About water" was accepted by the parliament on 16 October 1997 and determines principles of warning and "pollutant pays". According to this law, water is property of state and its use is permitted under license. There are several types of licenses, among those:

- license for water diversion from surface and ground water bodies;
- license for wastes release to surface water bodies;
- license for surface water use for recreation and sportive purposes.

Special Inter-branch Expert Council under Ministry of Environment and Natural Resources is in charge to issue licenses.

"Tax Code of Georgia" was accepted by the parliament on 13 June 1997. It determines taxes for water diversion and wastes release to surface bodies. Tariffs for 43 matters are established. Rest of pollutants are paid according to special coefficients dependant on their toxicity.

"Rules on surface water bodies protection from pollution" are approved by the order 130 of the Minister of Environment Protection. These rules determine water quality standards for various categories of water bodies:

-drinking category includes bodies used for drinking purposes;
-municipal category includes water bodies used for recreation purposes;
- fish category includes water bodies used for fish breeding and migration.

For law "About water" violation supposes criminal, civil and administrative punishment. Damage due to pollution is calculated according to "Provision on damage due to pollution of surface water bodies" approved by the Minister's order dated 7 May 1998.

Monitoring

There is hydro-reclamation monitoring system under State Department of Hydrometeorology in Georgia. Department carries out monitoring of air and surface waters. Before 90-ies monitoring was carried out in 91 points. Department received hydrochemical samples from 47 points of Western Georgia (Black sea basin) and from 44 points of Eastern Georgia (Caspian sea basin).

Presently, full scale monitoring is impossible due to lack of financing. Monitoring of wastes is performed by Monitoring Center and its regional laboratories. Analysis is done for suspended matters, ammonium, oil products, heavy metals ions, etc.

Water quality assessment

The following categories of surface water bodies are established based on water use purposes:

- first category - water bodies used for drinking purposes;
- second category - water bodies used for recreation;
- third category - water bodies used for fish breeding.

For each category five classes of quality are established:

First class - very good quality (blue color of water). Pure oligotrophic water in natural conditions; insignificant anthropogenic pollution is allowed. Water is characterized by stable high concentration of oxygen close to full saturation. Low concentration of bioorganic elements and bacteria facilitates salmon breeding. Protective water potential is very high.

Second class - quality is good (green color). Insignificantly polluted mezotrophic water. Certain amount of organic matters from wastes after treatment. Water bodies are well saturated with oxygen all round year. Protective potential is well maintained. Inflows do not contain harmful matters.

Third class - water quality is satisfactory (yellow color). Temperate eutrophic water containing insignificant amount of organic matters and bioorganic elements. Sometimes lack of oxygen is possible. Protective potential is weak. Pollution with harmful matters and microbes. Harmful matters concentration varies from natural to toxic level.

Fourth class - water quality is unsatisfactory (orange color). Eutrophic water significantly polluted. Contains organic, bioorganic and harmful matters. Sometimes lack of oxygen is possible. Organic matters destruction and settling facilitate anaerobic processes and cause fish perishing. Pollution exceeds protective potential. Microbes do not allow use water body for recreation. Harmful matters negatively impact fauna and flora. For fauna and flora harmful matters concentration varies from permanent to highly toxic level.

Fifth class - water quality is bad (red color). Very highly polluted hypertrophic water. Main problem is connected with oxygen regime, when lack of oxygen causes anaerobic processes. Reducents exceed producents. Water has not protective potential. Harmful matters concentration exceeds high toxicity level for fauna and flora.

Assessment of impact on health

Safe drinking water supply is major issue for Georgia. Tapped water is in 85 cities (156 intakes based mainly on ground water with total capacity 3.1mln.m^3/day); 45 cities have sanitation facilities including 33 with treatment system with total capacity 1.6 mln.m^3/day (including regional treatment facilities in Gardabani with capacity 1.0 mln.m^3/day). Water supply pipelines length is 9500 km and collectors for water disposal length is 4000 km. Presently, due to difficult economic situation, critical situation takes place in most water supply systems. Most intakes' sanitary state is unsatisfactory: 60% of water pipes and 50% collectors are fully depreciated. Water quality control is weak and water quality sometimes does not meet standards. More dangerous situation occurs in sanitation and treatment of industrial and municipal wastes in cities and settlements. Treatment facilities mostly are out of operation and destroyed. Because of that, wastes are released to surface water bodies. This is one of the reasons for infectious illnesses growth, carcinogenic and mutant factors.

Impossibility for supply-sanitation facilities O&M is explained by the fact, that almost all water consumers can't pay. Most part of population and state enterprises can't pay for water supply and disposal and this create financial difficulties for facilities.

This crisis situation is aggravated by uncertainty in management sharing between center and local authorities. Many settlements are provided with water from sources under administration of different bodies and operation level is very low. Because supply and sanitation facilities are transferred to local authorities, latter are obliged to develop this sector. But local bodies have

not enough competence to solve these problems.

Chronic under-financing determines sharp reduction of reliability and does not allow to introduce water saving equipment and technologies, provide ecological security of population.

Presently, Ministry of Urbanization and Construction is preparing the following laws: "About drinking water and water supply", "About permission to Ministry to issue licenses on operation of networks, structures and engineering equipment in water supply and disposal". Above laws are directed to population health protection and regulate relations in water supply guarantying drinking water supply to population.

But it worth to note, that if financing would not be increased at least three times, funds will be unsatisfactory to support present level of water supply.

Researches and technologies

Problem of ecologic security, including water bodies, requires relevant researches, in first line, in the field of diagnosis and forecast of environmental situation. One of diagnosis methods is choice of those diagnostic signs as changes causing accidents and set of signs for failure forecast. It is necessary to possess methods of assessment of different ecological systems, including water bodies, achieving level, when situation is out of control.

Modern scientific achievements allow assess quantitatively state of different ecological systems and objects basing on theory of reliability and risk. These methods permit establish allowable level of ecological risk and solve the tasks of cost optimization required for water system security and reliability.

Taking into account above mentioned, it is supposed to use findings of the Institute of Water Management and Ecological Engineering of Georgia. Utilization of these findings permits to realize global water collaboration in accordance with modern requirements of science and practice.

Georgian scientists have developed package of technologies in information systems, monitoring systems, water quality assessment and ecological evaluation. In particular:

- methodology (model) for water bodies (rivers, lakes, etc.) pollution assessment;
- automated system for water pollution control;
- packages of applied programs for mathematical models realization in river pollution;
- packages of applied programs for automatic revealing accidental pollutants in rivers;
- packages of applied programs for optimal decision making;
- packages of applied programs for measurement information processing;
- automated working place of ecologist-researcher;
- automated working place of ecologist.

All these developments meet modern world requirements with regard for world standards on similar products. The following issues solution is proposed for the first stage of the program:

- development of packages of applied programs for dynamic management of allowable releases dependant on common state of the river with regard for economic interests of water users;

- creation of universal computerized automated system for water pollution control with access to Internet with circulating in it information.

Cost of these researches will be repeatedly returned at expense of their duplication and introduction without additional capital investments in Central Asia and Caucasus.