Chapter 7

WATER MANAGEMENT

7.1 Water Resources

Availability

Azerbaijan is poor in terms of available water resources. A large part of the country, notably the Kura-Araz lowlands and the Absheron peninsula, has a significant water deficit due to low precipitation and high evaporation. This part, which houses more than 70% of the population, is completely dependent on irrigation for its agricultural production.

The Kura is the main river in the region. Its source is in Turkey, and the river and its tributaries flow through Georgia, Armenia, the Islamic Republic of Iran and Azerbaijan before discharging into the Caspian Sea. The Kura river basin covers 80% of the territory of Azerbaijan. The general absence of waste-water treatment in the river basin with a population of 11 million and economic activities results in very low water quality in the region and especially in Azerbaijan. This is a major problem, with Azerbaijan being dependant on the Kura river for more than 70% of its drinking water supply.

The coastal areas to the north and south of the Kura basin are drained by smaller rivers to the Caspian Sea. One of these is the Samur river, on the border with Dagestan (Russian Federation), which plays an important role for water supply to Baku and for irrigation of Absheron.

Groundwater provides only about 5% of the total water abstraction. It plays an important role, however, for irrigation and water supply to provincial towns and rural areas, especially in the foothills of the mountain ranges.

Climate and water balance

The climatic zones range from subtropical to temperate and alpine climates. Dry subtropical climate is typical for the Kura-Araz lowlands and Absheron peninsula. Temperate climate dominates the mountain slopes of the Greater and Lesser Caucasus Mountains covered by forests. The high areas of these mountains are alpine environments.

Rainfall varies from the south coast of Absheron, where it is less than 200 mm per year, over less than 400 mm in most of the Kura river basin, to 600-900 mm in the foothills and mountainous zones, 1,000-1,300 mm on the southern slope of the Greater Caucasus, and 1,200-1,400 mm/year in the southern Lenkeran lowlands. Evaporation in the Azerbaijani part of the Kura river basin is as high as 93% of annual precipitation (compared to 61% in Armenia and 50% in Georgia). This is an indication of the serious water balance situation in Azerbaijan compared to its neighbours. The total water balance in the Kura basin is shown in table 7.1 below.

Quantity and quality of groundwater

Groundwater resources are mainly restricted to the foothills and intermountain plains of the Greater Caucasus, Lesser Caucasus, Nakhchivan and Talysh (see map). The total groundwater resource is estimated at 24 million m^3 per day (8.8 km^3 per year). At present 5 million m^3/day or 20% is exploited. Groundwater is mainly used for irrigation (78%), 3% is used by industry and 19% for water supply to provincial towns and rural areas. Groundwater data are given in table 7.2 below.

Table 7.1: Indicative water balance in the Kura basin

(km^3)

	Azerbaijan	Armenia	Georgia
Precipitation	31	18	26
Effective evaporation	-29	-11	-13
River inflow	15	1	1
River outflow	-18	-8	-12
Underground inflow	3	1	1
Underground outflow	-2	-1	-3

Source: Tacis. Joint River Management Programme. January 2003.

Table 7.2: Groundwater

Reservoir	Estimated capacity, m^3/day x 1000	Typical borehole depth, m	Typical borehole yield, l/s	Domestic usage m^3/day x 1000	Irrigation and industrial usage, m^3/day x 1000	Total usage, m^3/day x 1000
Total	**23,764**			**969.3**	**4,094.3**	**5,063.6**
Mountain zone of Greater Caucasus	1,009	100-150	1-5	12.3	7.3	19.6
Mountain zone of Lesser Caucasus	989	100-150	1-5	8.0	8.8	16.8
Absheron peninsula	242	20-70	0,5-2	19.3	33.6	52.9
Samur-Gusar pre-mountain plains	3,471	150-200	15-30	391.2	41.3	432.5
Sheky-Zakatalar pre-mountain plains	3,822	100-150	20-40	72.4	191.7	264.1
Ganja-Gasakh pre-mountain plains	4,219	120-200	15-25	211.8	1,121.0	1,332.8
Shirvan pre-mountain plains	518	80-120	2-8	28.9	15.3	44.2
Karabakh-Mil pre-mountain plains	7,910	120-150	15-20	110.7	2,392.3	2,503.0
Mugan plains	130	50-120	1-5	3.6	40.9	44.5
Jebrail pre-mountain plains	235	150-200	10-15	1.1	6.7	7.8
Lenkeran plains	209	20-120	2-10	34.8	97.7	132.5
Nakhchivan pre-mountain plains	989	120-150	3-10	75.2	137.7	212.9

Source: Ministry of Ecology and Natural Resources. January 2003.

In some areas groundwater is shallow and poorly protected, e.g. Absheron peninsula. Groundwater in the lowlands often has a high salt content (nitrites up to 1,2 mg/l and nitrates up to 75 mg/l) due primarily to poor drainage and, to some extent, to the use of fertilizers. On the Absheron peninsula the mineral oil content is high in some areas (up to 50 mg/l). Industrial pollution is found in Sumgayit (heavy metals) and Ganja (aluminium up to 3,5 mg/l and iron up to 50 mg/l). Bacteriological pollution of the upper aquifers is observed in the irrigated areas, towns and on cattle farms.

Quality and quantity of surface waters

The Kura is the major river system accounting for approximately 90% of surface water resources in Azerbaijan. The Kura river rises in Turkey and passes through Georgia before entering Azerbaijan on its 1,500 km journey to the Caspian Sea (900 km in Azerbaijan). The Araz river, a major tributary to the Kura, also rises in Turkey. It flows along the border between Armenia and Iran before joining the Kura. The Kura basin occupies 68,900 km^2 of Azerbaijan or 80% of its territory.

The remaining 10% of the surface water resources is made up of a number of rivers originating from the Greater Caucasus, the Lesser Caucasus and the Talysh, and flowing directly towards the Caspian Sea. Many of these rivers are however not perennial or disappear underground before reaching the sea. The main rivers are listed in table 7.3 below.

In Azerbaijan there are 23 main reservoirs, of which only 3 have a volume over 1 km^3. The Mingechevir reservoir on the Kura river is the biggest, with a capacity of 15.7 km^3. The water is used for power generation and for irrigation. The Jerianbatan reservoir (0.2 km^3), north of Baku, is fed by the Samur river on the border with the Russian Federation through a 180-km-long channel. The reservoir is important for the water supply to Baku and for irrigation.

Table 7.3: Main rivers in Azerbaijan

River name	Annual runoff (million m^3/year)	% of total runoff
Total	**11,962**	**100.0**
Kura and tributaries	10,911	91.1
Lenkeran	319	2.7
Kudialchay	184	1.5
Velvelichay	126	1.0
Kursarchay	119	1.0
Velyashchay	117	1.0
Tangeru	109	0.9
Karachay	41	0.5
Charakjukchay	25	0.2
Istisuchay	11	0.1

Source: Ministry of Ecology and Natural Resources. January 2003.

Reservoir and dam construction also serves flood regulation, and the Mingechevir has improved the situation in this respect in the Kura lowlands. Downstream of the confluence of the Araz river, however, floods frequently occur due to a combination of increased water level in the Caspian Sea and sedimentation in the river bed. Emergency work on the Kura dykes in May and June 2003 mitigated the impact of flooding in the Salyan and Nefchala areas. Deforestation in the upper part of the river catchment areas has led to poor soil protection with damaging mud slides as a result. Flash floods are frequent.

The Kura river system is organically and bacteriologically polluted by the discharge of poorly treated or untreated waste water from the 11 million people living in the catchment area. Due to the collapse of many industries in the early 1990s, pollution has decreased considerably. A number of polluting activities, however, still exist, notably mining, metallurgical and chemical industries. The major pollutants are heavy metals (Cu, Zn, Cd) from mining and the leather industry, and ammonia and nitrates from the fertilizer industry. Concentrations exceed norms up to nine times. Phenols exceed the norms six times and mineral oil, two to three times. Pesticides, especially organo-chlorine pesticides such as DDT, also constitute a problem. DDT is no longer used and the source of this pollution has not been fully investigated; it may be old stock or illegally produced or imported products. (See chapter 10, on Land use, agriculture and desertification.)

Deforestation and overgrazing have led to erosion causing high turbidity of river water. The Araz river is claimed to be one of the most turbid in the world. High turbidity increases the cost of drinking water production. This is important since the main part of the drinking water for Baku and the rest of the population on the Absheron peninsula is abstracted from the Kura river after the confluence with the Araz. The quality problems are especially serious for Azerbaijan since it is the end recipient in the Kura system.

7.2 Water Uses and Pressures on Water Resources

Water use

The State Committee of Amelioration and Water Management receives annual water use reports from all water users (1,860 users in 2002). Total water use in 2002 was 10 billion m^3, with 6% used for domestic water supply, 20% for industrial water supply and 42% for irrigation. Thirty-two per cent of the water abstracted was lost in the systems. Compared to nine years earlier (1993), total water abstraction had decreased, by 38%. Irrigation had gone down by 49% and industrial uses by 43%. Domestic uses, however, had increased from 2.5 to 5%, and water losses from 26% in 1993 to 33% in 2002. Surface water constitutes 95% of the water resources used. Per capita abstraction was 2,149 m^3 in 1993. In 2002 this had decreased to 1,256 m^3 per capita, or a reduction of 42%. Water use data are given in table 7.4.

Household use of water

Water-supply coverage in Azerbaijan is estimated at 50%, which is relatively high compared with other countries with similar income levels. The rural coverage is probably higher than indicated in table 7.5 below, as water provided by rural communities relying on wells or irrigation canals is not included in the official statistics.

Table 7.4: Water abstraction and use

(million m^3/year)

	1993	1994	1995	1996	1997	1998	2002
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 use	78	99	55	383	284	254	105
Water losses	4,195	3,855	3,747	3,530	3,477	2,941	3,321

Source: The Committee of Amelioration and Water Management. January 2003.

Table 7.5: Water-supply coverage

	Connected to water supply, %
Baku	95
Sumgayit, Ganja	95
Secondary cities	83
Rural areas	11

Source: World Bank. Azerbaijan Water Supply and Sanitation Sector Review and Strategy. 2000.

The reliability and safety of the services are a major problem due to the poor state of repair, lack of maintenance and insufficient resources available for operations. On average water was available to individual households in the Greater Baku area about 22 days per month, four hours per day (household surveys in 1995 and 1998). A US$95 million rehabilitation project recently completed on the Greater Baku water-supply system has improved the headworks (reservoirs and treatment plants), but much higher investments in pumping stations and the pipe network are still needed (estimated at US$1 billion). To cope with this situation, 53% of households in the Baku area have invested in their own overhead storage tanks and 12% in water pumps.

Per capita water use is very high in Azerbaijan. Individual water meters are installed only in very few cases, and it is therefore impossible to determine the actual per capita consumption. Estimates made as part of the Master Plan for Greater Baku show an average consumption in Baku of 580 litres per capita per day. In Baku 5,000 meters were installed as part of the rehabilitation project, and water use in metered households is claimed to have dropped from 600 to 400 litres per capita. The same trend is seen in Imishly, a secondary provincial town, where water meters have been installed as part of a privatization project. For a well-run water utility with household meters, per capita consumption of 150 to 200 litres per day would be expected. The high water consumption figure is a result of several factors: the poor state of the transmission and distribution pipe network, the poor state of installations in the home and the absence of metering.

Water for Baku, Sumgayit and the Absheron peninsula is provided by the Absheron Regional Water Company, a public-owned joint-stock company. Three water sources are used: the Shollar and Hachmas springs, Jerianbatan reservoir fed by the Samur river, and the Kura river. Water quality of the spring sources is high (only chlorination needed). The Samur river water is of reasonable quality after natural cleaning in the Jerianbatan reservoir. Full treatment is still required, however. This is also the case for the heavily polluted water from the Kura river. For this reason the intake on the Kura is used to fill the gap after taking the maximum quantity from the springs and the Jerianbatan reservoir.

Sixty cities and towns with populations ranging from 52,200 (Samukh) to 301,400 (Ganja) have water-supply systems. Only 14 of these towns rely fully or partly on surface water. Groundwater is assumed to provide 90% of their total water supply. The capacity of these systems is heavily used, resulting in per capita uses as low as 30 to 100 litres per day. In rural areas groundwater wells are common but irrigation canals are also frequently used as a source of water for domestic use.

The excessive water losses in the Greater Baku area indicate that the existing water sources would not need to be expanded to serve the region adequately. However, the Greater Baku area relies on water from the Samur river that may be subject to changes to the international allocation agreement with the Russian Federation, and from sources that are also used for irrigation which in the future may be a cause of conflict among users, particularly in the dry season.

The quality of drinking water in the networks does not meet international standards. The limited data available indicate that bacteriological requirements are exceeded and minimum residual chlorine content is not met. There are several reasons for this. First, surface water is highly polluted, making treatment complicated and costly; second, water treatment is insufficient (outdated facilities and lack of chemicals, e.g. chlorine); and third, the water distribution network is leaking and operated intermittently, which causes contaminated groundwater to enter the water network during periods of low pressure.

Waste water

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 10% mechanically. In other urban areas in the country, the coverage drops 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.

Table 7.6: Total loads of pollutants discharged to the Caspian Sea from Azerbaijan in 1998

Source	Flow 10^6 m^3/y	% of total flow	BOD t/y	% of total load	Inorg. N t/y	% of total load	Phosphorus t/y	% of total load	Hydro-carbons t/year	% of total load
Total	**12,619**	**100**	**61,634**	**100**	**57,764**	**100**	**3,622**	**100**	**15,764**	**100**
Rivers	11,960	95	17,242	28	44,673	77	153	4	500	3
Municipal	485	4	38,500	62	12,500	22	3,250	90	9,408	60
Industrial	174	1	5,892	10	591	1	219	6	5,856	37

Source: Tacis. Assessment of Pollution Control Measures. 2000.

The condition of waste-water facilities in Azerbaijan is generally very poor. Lack of maintenance for more than a decade, the excessive flows due to leakage and infiltration, and the low standard of construction and materials are the main reasons for this. Discharges of insufficiently pretreated harmful industrial waste water into municipal sewer systems impair the efficiency of the waste-water treatment plants not designed to deal with these loads.

The total load of pollutants from Azerbaijan to the Caspian Sea is summarized in table 7.6. The table shows that 72% of biological oxygen demand (BOD), 96% of phosphorus and 97% of hydrocarbons come from domestic and industrial waste water. Nitrogen stems from irrigated areas and is primarily (77%) discharged through rivers.

Table 7.7 shows that Baku accounts for approximately 75% of the pollution load from domestic waste water on the Caspian Sea.

The waste-water system of Baku is operated by the executive power of Baku, organized in a separate department called Bakkanalizatsiya. The system, which consists of a collection network and five treatment plants, is in dire need of rehabilitation. A feasibility study conducted in 2000 estimates the investment needed at US$1.3 billion.

Agriculture

Azerbaijan is dependent on irrigation for most of its agricultural production. In 2002, 4.2 billion m^3 were used for irrigation. This constitutes 41% of the total water abstraction, making irrigation the largest water user. The total area with installed irrigation is 1.45 million hectares (nearly 85% of the cultivated area). Water use for irrigation has dropped significantly since Azerbaijan's independence. In 1993 irrigation used 8.2 million m^3, 95% more than in 2002.

The irrigation infrastructure suffers from a number of problems, including:

- Deterioration of infrastructure and pumping equipment due to insufficient maintenance;
- High reliance on pumped irrigation (over 500,000 ha), which in many instances would make agriculture uneconomic if the energy were valued at its real cost;
- Negligible contribution from users to operation and maintenance expenses;
- Inefficient water distribution and application.

Recent efforts to improve the situation have led to the establishment of institutional mechanisms for the collection and use of water charges and the transfer of responsibility to water users.

Table 7.7: Loads of domestic waste water, treated or untreated, discharged directly to the Caspian Sea from Azerbaijan in 1998

Source	Flow		BOD		Total-N		Total-P		E. coli	
	10^6 m^3/year	%	Tons/ year	%	Tons/ year	%	Tons/ year	%	10^{15} c./ year	%
Total Azerbaijan	**485**	**100**	**37,500**	**100**	**12,450**	**100**	**3,250**	**100**	**2,740**	**100**
Baku	378	78	24,500	65	9,250	74	2,400	74	1,700	62
Sumgayit	60	12	7,500	20	1,800	14	480	15	600	22
Other	47	10	5,500	15	1,400	12	370	11	440	16

Source: Tacis. Assessment of Pollution Control Measures. 2000.

It is estimated that 40-45% of the irrigation infrastructure is in need of rehabilitation. The inefficient use of water and the high water losses in irrigation are major problems in relation to water resources and soil.

Industry

Nearly 70% of Azerbaijan's industrial complex is concentrated on the Absheron peninsula with the two largest industrial centres located in Baku and Sumgayit. After the collapse of the Soviet Union the industries in Azerbaijan lost the bulk of their market. This has led to low production or the outright closure of many factories, resulting in a lower discharge of industrial waste water. Industrial water use has gone down from 3,418 million m^3 in 1990 to 1,977 million m^3 in 2002, a 42% reduction.

Water for industrial use is often supplied by the public system. However, some industries have their own system based on surface water or groundwater.

A study prepared by TACIS in 2000 concluded that, out of 30 operational industries in Baku, 1 discharged waste water to the municipal system and 29 had their own systems discharging to the Caspian Sea. Three industries had biological treatment plants, 20 had mechanical treatment and 7 had no treatment. Three industrial enterprises have significant waste-water production, i.e. two oil refineries and one power plant. They all have treatment plants and discharge directly. Despite this one of the municipal waste-water treatment plants (Zikh) located near a refinery receives sewage with significant oil content. In Sumgayit only 10 of 19 industrial enterprises were operating; 4 had biological treatment, 2 mechanical and 4 had no treatment. Six industries had significant waste-water production: two power plants and four chemical industries. There are no recent data on industrial water pollution. It is known, however, that significant quantities of heavy metals and organic pollutants are discharged by industry.

Outside Baku and Sumgayit, as few as 33 operating industries are registered, the majority connected to agricultural production. Overall, their waste-water discharge is insignificant, although local problems may exist where the capacity of the recipient is limited, e.g. a small river.

7.3 Policy Objectives and Management

Policy framework

The Water Code sets the basis for water management in Azerbaijan and gives the following main principles for use and protection:

- Economic development and environmental protection;
- Provision of the population with quality water;
- Water management should be based on river basins; and
- Water protection functions should be separate from water use and water industry functions.

Meeting these objectives poses a big challenge. The present coverage with quality drinking water is 50%. Water management is based on administrative units rather than river basins and there is very little coordination among the countries in the main river basin, the Kura. Although the creation of the Ministry of Ecology and Natural Resources has provided a clearer management structure in the water sector, overlapping functions and responsibilities remain.

A workshop in February 2003 with participants from various agencies and other entities addressing water resources in Azerbaijan concluded that the preparation of a national integrated water use and water protection strategy should be given top priority. The strategy should be based on an integrated river basin management approach rather than administrative territorial water management.

Legal framework

The legal framework for the water sector consists of the following laws:

- The Water Code (1997);
- The Law on Water Supply and Waste Water (1999);
- The Law on Amelioration and Irrigation (1996); and
- The Law on Environmental Protection (1999).

The Water Code sets the basis for water management (see section on the policy framework). The Law on Water Supply and Waste Water sets the legal framework for this sector. Its important features are:

- Responsibility for providing water and sewerage services is given to enterprises;
- The management and operation of water-supply enterprises are to be regulated by a contract with the municipalities they serve;
- Enterprises now have the right to cut services to consumers in case of non-payment or illegal connections; and
- Metering of water supply is recognized as the main method for charging for water services.

The Law on Amelioration and Irrigation regulates the planning, design, construction and operation of amelioration and irrigation systems. It states that design and construction activities require special permits (licences). Systems have to be certified with technical passports.

The Law on Environmental Protection identifies the legal, economic and social bases of environmental protection. It governs the use of natural resources (e.g. water) and protection against pollution (e.g. domestic and industrial). The Law also sets the basis for economic mechanisms, e.g. payment for the use of natural resources, payment for the disposal of domestic and industrial waste, and economic incentives for environmental protection. The environmental requirements and approval procedures in connection with the construction or reconstruction of municipal and industrial facilities are defined in the Law. It includes a very detailed description of the ecological expertise to be conducted.

These laws are supplemented by a large number of decrees issued by the President and decisions issued by the Cabinet of Ministers.

Regulatory instruments, standards and norms

The State Committee of Amelioration and Water Management is responsible for issuing water abstraction permits for surface water. It is also responsible for imposing payments for water use. Since 1997 water that is used in agricultural purposes is chargeable. Rates for fees for water use were changed in June 2003. The fee is charged for technical-operational costs and not for use of water as a natural resource

The National Geological Exploration Service, a department of the Ministry of Ecology and Natural Resources, is responsible for regulating and controlling abstraction of groundwater.

The Ministry of Ecology and Natural Resources issues waste-water discharge permits, which are valid for 3 to 5 years. Its regional offices control and enforce discharge permit conditions.

The Ministry of Health, through its Centre for Epidemiology and Hygiene, is responsible for monitoring drinking-water quality.

Norms and standards

The design of water-supply and waste-water infrastructure is based on the building codes developed during Soviet times known as SNIP standards. These standards set high consumption rates, usually 400 litres per capita per day (lcd). Furthermore, they require a high level of supply safety (e.g. duplication of main pipelines and high storage capacity). The result is oversized and therefore costly systems. The standards lead not only to over production but also to wasteful consumption practices.

The quality of drinking water must comply with World Health Organization (WHO) standards. Most water-supply systems have difficulties in meeting these standards. While they are certainly a commendable goal, it might be better to achieve a minimum acceptable level of safe drinking water. Additionally, the large number of parameters and the high sampling frequency would require very sophisticated equipment and many staff. The result is little follow-up on water quality and compliance.

Azerbaijan's effluent standards for waste-water treatment plants are among the most demanding in the world. For example, the standard for BOD is set at 3 mg/l for fishing water and 6 mg/l for other waters. Standards for other pollutants are similarly strict. In comparison, the EU standard for BOD is 25 mg/l. In Azerbaijan waste water is chlorinated. This is unnecessary and actually gives rise to harmful organochlorine compounds in the effluent. The strict requirements for waste-water treatment naturally increase the construction and operation cost of waste-water systems.

Economic instruments

Charges are levied on surface and groundwater abstraction as well as on use. The charges were introduced in 1992 to stimulate the rational and integrated use of water and to raise funds for water protection. However, the rates have not been adjusted to take account of the high inflation in the 1990s.

Charges on waste-water discharge were also introduced in 1992. The rates are again very low and so is the collection rate, which weakens the effectiveness of the charge system. Furthermore, the near collapse of the charge system has eliminated the primary source of financing for monitoring and enforcement.

Consumers are charged for water-supply and waste-water services. The tariff systems are based on heavy cross-subsidies from industry to domestic users. The rates for domestic users are very low. The Absheron Regional Water Company charges 185 manats/m^3 or US$ 0.04 /m^3). The rates for budget organizations and industries are 800 manats/m^3 and 2,200 manats/m^3 respectively. At the same time the Company's collection rate is low: 80%. Although the rates are based on consumption, there are few water meters (only 1.1% of the Company's domestic customers have water meters), so in fact a flat rate of 12 m^3 per person per month is used. The rate of metering is higher for industries; 52% of the Company's industrial customers have meters. The revenue collected by the Company does not cover its operating cost and as a result the Company is itself in arrears, especially with its energy bills.

In the provincial town of Imishly, where a German company has signed a 10-year management contract (2000 to 2010) for the water-supply system, the rates per m^3 have been set at 1,000 manats for domestic use, 3,000 manats for budget organizations and 5,000 manats for commercial use. Water use is metered, and the revenue covers the investment and operating costs. The project is meant as a pilot for provincial towns and the company is considering similar projects in two other towns.

Waste-water services are charged to the users. Bakkanalizatsiya, the Baku municipal department responsible for waste-water services, has set the following rates: 40 manats/m^3 for households, 444 manats/m^3 for industries, 354 manats/m^3 for budget organizations and 2,360 manats/m^3 for commercial use. Waste-water quantities are based on water use (either metered or 12 m^3 per person per month). The revenue collected covers only 40-50% of the operating costs and Bakkanalizatsiya, too, is in arrears with its payments to other public entities.

Institutional framework

The following ministries and institutions are involved in water management:

- The Ministry of Ecology and Natural Resources;
- The Ministry of Health;
- The State Committee of Amelioration and Water Management;
- The State Committee of Architecture and Construction;
- The Absheron Regional Water Company; and
- The executive power of Baku.

The Ministry of Ecology and Natural Resources has overall responsibility for the conservation of water resources and the prevention of pollution. In the process of establishing the Ministry, a number of State committees and other organizations were transferred and became departments in the new Ministry, and several of these are involved in the water sector: the National Geological Exploration Service is responsible for the regulation and control of groundwater abstraction, the National Hydrometeorological Service is responsible for surface water monitoring, operating of 99 hydromet stations and publishing the results in an annual report. Water quality monitoring in surface water and groundwater is the responsibility of the National Monitoring Service.

The Ministry of Health, through its Centre for Epidemiology and Hygiene, is responsible for setting drinking-water standards and monitoring its quality.

The State Committee of Amelioration and Water Management is responsible for monitoring water use and issues annual reports based on information from water users (1860 users in 2002). The Committee's activities focus on irrigation, for which it sets water-use norms and handles user relations, for example. It is also responsible for establishing the charges for water use. In addition, it is in charge of land improvement on irrigated land, and the operation and maintenance of the irrigation infrastructure.

The State Committee of Architecture and Construction is responsible, among other things, for water-supply and waste-water services outside the supply area of the Absheron Regional Water

Company. In urban areas the Committee works through the municipal water and waste-water enterprises (*vodokanals*). The Committee is meant to have an advisory and monitoring role; however, due to the relative weakness of the municipalities, the Committee has taken on a managing role too. Rural water supply also falls under its responsibility.

The Absheron Regional Water Company is a joint-stock company responsible for the treatment and distribution of water to Greater Baku, including bulk water supply to the *vodokanals* of Absheron and Sumgayit. The Company's share capital is fully owned by the State.

The waste-water collection and treatment services in Baku are the responsibility of Bakkanalizasiya, a department under the executive power of Baku. The plan is to merge the Absheron Regional Water Company and Bakkanalizasiya into a joint-stock company and privatize it.

Role of intersectoral and international cooperation in water management

The Organization for Security and Co-operation in Europe (OSCE) facilitates regular donor meetings on water sector issues. In May 2003 OSCE and the United States Agency for International Development (USAID) organized a regional workshop in Georgia on the priorities in the water sector. Prior to this, national workshops had been conducted in Armenia, Azerbaijan and Georgia. Although only bilateral cooperation is possible owing to the present political situation, fruitful discussions were held at the administrative level.

The TACIS-financed Joint River Management Programme includes the Kura river. Armenia, Azerbaijan and Georgia participate. The Programme, which started in 2002 and will run for two years, will help to prevent, control and reduce transboundary pollution caused by the water quality of the Kura river. The project focuses on issues such as water quality and quantity monitoring, transboundary pollution reduction, pollution warning systems, legal and regulatory improvements, raising public awareness, and transboundary agreements.

The World Bank, in cooperation with Azerbaijan's Committee for Housing and Communal Property and the Absheron Regional Water Company, prepared the National Water Supply and Sanitation Sector Review and Strategy in 2000. Its proposed strategy encompasses four key reforms: (i) institutional and governance; (ii) financial; (iii) technical; and (iv) service. The institutional strategy proposes that the water-supply and waste-water systems of Baku, Sumgayit and Absheron be merged into one enterprise operated by an international utility operator. For medium and small urban areas (population >5,000) the proposal is to restructure water-supply and waste-water utilities and decentralize responsibility supported by regional service units. In rural areas (communities <5,000) with relatively simple water-supply systems, the vision is that communities own, manage and help finance their facilities. The financial strategy encompasses rigorous bill collection, tariff levels for full cost recovery, revision of cross-subsidies and improved financial management. The technical reform includes installation of water meters, reduced network leakage, increased energy efficiency, pretreatment of industrial waste water, and appropriate and low-cost solutions for rural areas. The service reforms include the following elements: improved service to the poor, appropriate and affordable standards and level of service, and development of human resources.

As part of the implementation of the Water Supply and Sanitation Sector Strategy a number of World Bank financed projects are underway. One project will propose a regulatory framework for the utility sectors, based on either a common framework or individual regulations for water, gas and electricity. Another project will develop a framework and policy for the water sector, and a third project will develop a privatization strategy for the combined water-supply and waste-water company of Greater Baku.

The World Bank and the European Bank for Reconstruction and Development (EBRD) are financing the Greater Baku Water Supply Rehabilitation Project. The Project, which started in 1996, made emergency short-term improvements in the water-supply system in order to restore the provision of water supply to Baku, i.e. rehabilitation of the water-treatment plants on the Kura river and the Jerianbatan reservoir, and of intake and distribution systems. In November 2000 a strong earthquake hit Azerbaijan and badly damaged the water-treatment plants and the distribution network in Baku. A supplemental credit has been given to repair the damages.

Kreditanstalt für Wiederaufbau (KfW), Germany's development bank, is financing a project in Imishly, a provincial town with approximately 40,000 inhabitants. The project started in 2001 with the rehabilitation of the water-supply system and the installation of water meters. A ten-year management contract for the Imishly water utility has been signed with a German utility company.

USAID finances the South Caucasus Water Management Project covering the Kura basin. The Project's goals are to improve water quality and quantity monitoring, to improve capacity to analyse and to implement watershed management pilot projects.

The Asian Development Bank finances the Secondary Towns Water Project. The Project, which started in 2002, includes the rehabilitation of existing water-supply systems. So far three towns have been selected: Goychay, Aghdash and Nakhchivan.

Protection of transboundary rivers

Azerbaijan is Party to three agreements with its neighbours on transboundary rivers: with the Islamic Republic of Iran on the Araz river, with Georgia on Gandar Lake and with the Russian Federation on the Samur river. The authorities in Dagestan have requested a renegotiation of the Samur agreement in order to get a larger share of the water, reflecting the division of catchment area between Dagestan and Azerbaijan.

No agreement exists on the Kura river, the most important transboundary river in the region. The Kura and Araz rivers are by far the most important water resources for Azerbaijan. The poor water quality of the river system is a consequence of pollution from cities, agriculture and mining in Armenia, Georgia and Azerbaijan. The solution to these problems requires coordinated national and international efforts. The Republic of Azerbiajan is Party to the Convention on the Protection and Use of Transboundary Waters and International Lakes, but not all neighbouring countries are Parties, making solution of this problem more complex.

Several of the projects mentioned above are transboundary with the aim of improving regional cooperation. Important elements of any future agreement, such as improvements in water quality and quantity monitoring and data handling, are included in the projects.

The National Programme on Environmentally Sustainable Socio-economic Development, launched by the President in February 2003, stresses the need for increased regional and international cooperation to protect transboundary rivers from pollution and ensuring the effective use of water by riparian countries.

7.4 Conclusions and recommendations

The water sector of Azerbaijan faces enormous problems. Adverse climatic conditions with low precipitation and high evaporation cause widespread water shortages. Poor-quality water-supply and irrigation networks cause very high losses. Payment systems are not based on actual water use and therefore give no incentive to save water. Water resources are polluted owing to the lack of waste-water treatment plants in Azerbaijan and neighbouring countries. The quality of drinking water does not meet the required standards. Owing to inflation, economic instruments such as abstraction charges and user fees have become meaningless.

The Government of Azerbaijan has taken a number of steps to reverse this negative situation. The most recent of these is the National Programme on Environmentally Sustainable Socio-economic Development launched in February 2003. It includes a number of specific actions aimed at improving the situation before 2010. The following recommendations in most cases coincide with the Government's plans and should therefore be considered as support to its efforts.

Many of the problems mentioned above are related to the lack of efficient cooperation among the stakeholders in the water sector. The creation of the Ministry of Ecology and Natural Resources was a clear improvement in this respect. The State Committee of Amelioration and Water Management focuses on water regulation and irrigation. The water-supply interests are defended by the Absheron Regional Water Company and the State Committee of Architecture and Construction. Waste-water management involves a number of entities: Baku and Sumgayit executive powers, the State Committee of Architecture and Construction and industries. Others with an interest in water include:

hydropower-generation plants, farmers' associations and domestic water users. All these stakeholders should be involved in establishing a common vision for the water sector. The basis should be a river basin approach rather than an administrative, territorial approach.

The deteriorating water quality of the Kura river is a major problem for Azerbaijan. It cannot be solved without involving Armenia and Georgia. Although multilateral negotiations cannot take place at the political level at present, initiatives by international organizations have made technical cooperation possible. This will be very important for the preparation of political discussions once this will again be possible.

Recommendation 7.1:
The Ministry of Ecology and Natural Resources and the State Committee of Amelioration and Water Management should coordinate the development of a national strategy for the water sector based on the integrated river basin management principle. Such a strategy should also be agreed upon by other stakeholders.

Transboundary initiatives are encouraged in order to pave the way for international cooperation especially within the Kura river basin.

Azerbaijan is extremely poor in terms of water resources (low water availability per capita) and its water losses are significant, due largely to poorly constructed systems that date to before independence. Payment for water is based on nominal consumption rather than actual (metered) consumption, although a new programme to install water meters has recently been initiated. Without meters, the system is not able to reward those households or industries that would wish to save water. Water losses in distribution networks due to poor construction and the lack of maintenance are another big problem. The former system focused on constructing new facilities rather than on keeping existing ones operational. Money alone will not solve this problem; there is also a need to foster a maintenance culture.

Leaking water-distribution systems combined with intermittent supply cause polluted groundwater to infiltrate the pipes during periods of no pressure. Repairing the leaks will therefore also improve water quality. (See also discussion of irrigation in Chapter 10, land use, agriculture and desertification.)

Recommendation 7.2:
The Ministry of Ecology and Natural Resources, the Committee of Amelioration and Water Management, the water utilities and the water users should give high priority to reducing the high water losses in water-supply and irrigation systems. For this purpose, they should carry out a detailed analysis and prepare a step-by-step plan that prioritizes the work that needs to be carried out. The plan should include the following:

- *The water utilities should install water meters so that they can charge for their services on the basis of actual consumption;*
- *The Ministry and the water utilities should launch awareness campaigns to encourage water conservation in home installations and industrial enterprises;*
- *The water utilities should repair leaky pipes in the water-supply networks; and*
- *The State Committee of Amelioration and Water Management should reconstruct the irrigation infrastructure.*

Rivers, groundwater and the Caspian Sea are severely affected by the discharge of untreated or poorly treated waste water. This is a threat to human health and to the environment. Waste water is collected from 72% of the inhabitants of Baku but less than 50% of it is treated. Sumgayit's treatment plant is on the brink of collapse, and none of the plants in the secondary towns is working. Out of 40 operating industries in Baku and Sumgayit 33 have insufficient treatment (mechanical only or no treatment). Industrial water pollution has gone down since the political change but only due to the collapse of many industries. If these industries start up again, the facilities will be in worse condition than before and in need of major rehabilitation or reconstruction.

Recommendation 7.3:
The Ministry of Ecology and Natural Resources should ensure that the amount of untreated or poorly treated domestic and industrial waste water is reduced. To this end,

(a) The Ministry, in cooperation with the executive powers, should carry out an analysis and prepare a step-by-step plan with clear priorities;
(b) The respective executive powers should rehabilitate their sewage systems and waste-water treatment plants and/or build a new one; and
(c) Industries should be required to pretreat their waste water properly before discharging it into municipal systems.

Although most of the legal framework was updated after independence, a number of regulations and norms from the previous system still apply. Some of these are inexpedient in a system where resources, e.g. energy, are charged at cost. The SNIP norms lead to an excessive use of resources: the per capita consumption rates are at least 100% higher than western standards and so are the system requirements for water storage and transmission capacity. The present norms for waste-water treatment are unrealistic and much higher than international standards, i.e. Azerbaijan requires maximum 6 mg BOD/l compared to the EU standards of 25 mg/l.

Charges for the abstraction of water have not been adjusted since 1993. Due to the high inflation in the mid-1990s, the charges have lost their real value and the money is no longer collected. The intentions behind the system of promoting the efficient use of resources and at the same time financing water management and monitoring activities are thus not fulfilled.

Recommendation 7.4:

(a) The Ministry of Ecology and Natural Resources should review and adjust the system of norms and standards. SNIP norms should be replaced by international norms that will lead to more feasible solutions. Waste-water discharge regulations should be harmonized with international, e.g. EU, standards.

(b) Water-user charges should be increased to account for inflation.

Figure 7.1: Main rivers in Azerbaijan