Chapter 7

WATER MANAGEMENT

7.1 Water resources

Availability

Georgia is the richest country in the South Caucasus in terms of available water resources. Water balance calculations suggest that, theoretically, Georgians have four times or more water available per capita than their neighbours in Armenia and Azerbaijan. Distribution of water resources in Georgia is uneven, however, in large part due to the range in precipitation from the humid western part of the country to the semi-arid east.

The country lies in two major water basins, with the western portion of Georgia draining to the Black Sea and the eastern part to the Caspian Sea. The Rioni river is the largest tributary to the Black Sea in Georgia, draining approximately 20% of the country. Additional contributions to the Black Sea come from smaller rivers such as (moving southerly) the Kodori, Inguri, Supsa and Chorokhi. Drainage to the Caspian Sea is dominated by the Kura (also known as the Mtkvari) river. While the main stem of the Kura drains 23% of the country, other rivers such as the Iori and Alazani to the north of the main stem join the Kura downstream in Azerbaijan. With the Kura originating in Turkey, and tributaries joining in Georgia from Armenia, the Kura is clearly the most important transboundary water resource to Georgia and its neighbours.

Georgia has 860 lakes and reservoirs, with 74% of total storage in five: Paliastomi, Sagamo, Paravani, Ritsa and Tabatskuri. The 43 reservoirs in the country are used primarily for irrigation and hydropower generation, and less for water supply. Thirty-five of the reservoirs are in east Georgia and eight are in west Georgia. Groundwater resources are plentiful in the country, both in hard-rock aquifers and in alluvial deposits along rivers. This abundance supports 90% of the nation's drinking water supplies, which are groundwater-dependent.

Water quality

Data on quality of the country's surface waters is extremely limited. At best in recent years, the State Department of Hydrometeorology has collected data for up to 10 conventional indicators of pollution at up to 42 monitoring locations. Annual average data are typically cited in reports, but these unfortunately reflect at best a few measurements during any year. The infrequency of monitoring, and questions as to the quality control on sample collection and analysis compared to international norms, complicates any ability to draw conclusions on true ecological health and threats to Georgian water resources. Based on published and unpublished data, and qualitative interpretations by experts, one can draw some tentative observations:

- Ambient surface water quality probably exceeds Georgian (and comparable international) norms many times over throughout the main stems of both the Rioni and Kura rivers;
- The main stem of the Kura is reportedly affected downstream from the cities of Borjomi, Gori, Tbilisi and Rustavi;
- Tributaries to the Kura of concern include the Vere river in the Tbilisi area, the Alazani river downstream from Telavi, the Mashavera river downstream from Madneuli, and the Suramula river downstream from Khashuri;
- Relatively greater impacts on the Rioni river are reported to be downstream from Kutaisi and at Poti near the Black Sea;
- Groundwater quality at the source is believed to be very good but essentially no data are available to support this claim. Data are insufficient to assess whether more vulnerable groundwater (such as in alluvial deposits) is being contaminated by municipal, agricultural or industrial pollution;
- Ambient water quality has improved somewhat since the break-up of the Soviet Union, not from the introduction of pollution control technologies, but from dramatic reductions in

industrial production and subsequent waste-water discharges; and

- Relatively high nutrient readings (especially ammonia) in surface waters are likely to result form untreated discharges of municipal waste water. Synthetic organic chemicals, oil products and metal contamination probably originate from industrial sources since only 10% of industrial discharge is treated.

Water use

The Ministry of Environment and Natural Resources Protection receives annual reports of water use. For example, in the year 2000 reports on 90% of total national water use reached the Ministry, with 345 users reporting. Total water use was 2,010 billion m^3 with 39% going to irrigation, 36% to thermal power production, and 25% to municipal water supply. From this total, 398 million m^3 was returned as permitted discharge, predominantly as municipal waste water (71%) and cooling water (27%). The slowdown in industry is apparent since less than 2% of discharge volumes came from industry. One note, however, is that these data are not controlled for accuracy through independent surveys by the Ministry, and users typically estimate rather than measure use, so there may be significant inaccuracies and inconsistencies. The Ministry also receives records from hydropower stations (nearly 100 stations withdrawing almost 15 billion m^3 per year), though such "once-through" use is considered non-polluting.

7.2 Drinking water

System overview

Drinking water is provided through centralized systems in 77 cities and larger towns in Georgia. The top four systems in terms of population served are Tbilisi (1,272,000), Kutaisi (241,000), Rustavi (159,000) and Batumi (137,000). Centralized distribution to some extent is present in approximately 870 smaller towns and villages. The Ministry of Labour, Health and Social Affairs estimated that, in 1999, 75% of Georgians living in urban areas were served by centralized systems delivering water to individual dwellings. Of the remainder, 8% received water from taps in their yards, 3% from public taps, 10% from unprotected springs, and the balance through other means. The situation in rural areas was quite different, with 37% being served by unprotected wells and springs, 20% by water piped in their yards, 13% from public taps, 10% piped to individual dwellings, 13% from rainwater harvesting, and 4% from protected wells and springs.

Quality and health considerations

The quality of drinking water is of particular concern. The Ministry of Labour, Health and Social Affairs has been able to maintain a minimum level of water system surveillance, though questions of quality control do arise, and this must be taken into account in interpreting official statistics. Test methods, especially for microbiological constituents, are not directly comparable to World Health Organization recommendations. Drinking water standards were set by the Ministry of Labour, Health and Social Affairs in August 2001, and were generally adapted from old Soviet norms. Despite these limitations, concerns over systems' violations are real. In total (and depending on data source), approximately 18% to 24% of samples collected from centralized water systems in the years 2000 and 2001 violated Georgian norms for chemical and microbiological constituents. Samples from 13 towns and cities exceeded microbiological norms by 50% or more. Except for the larger cities, monitoring by water utilities for even such basic parameters as disinfection residual is not carried out.

Perhaps a more direct measure of concern regarding drinking water is the occurrence of water-borne disease outbreaks. Water-related diarrhoeal illnesses affected Rustavi during 1997-1998 with 1902 reported cases and in 2000 with 450 reported cases. Outbreaks between 1997 and 2000 also affected Kobuleti (3582 cases in 1997-1998), Khashuri (244 cases), Borjomi (294 cases in 1997-1998), Poti (267 cases in 2000) and five other cities (361 cases). Outbreaks of amoebiasis have occurred in Tbilisi each year since 1997, with a total of 2423 cases up until 2001. Senior officials in the Ministry of Labour, Health and Social Affairs in charge of epidemiological surveillance believe that there is significant underreporting of illness (i.e. most people affected do not visit their clinics and the illness goes unreported.) Therefore, they believe that the actual number of cases is far greater.

Sector constraints

Many related factors have caused these violations of health norms and water-borne outbreaks. Based on published and unpublished sources, as well as discussions with experts, the key reasons are:

Breakdowns in physical infrastructure and the prevalence of cross-connections with waste-water systems. Many of the drinking-water systems were either installed or last upgraded in the 1980s, when construction quality was particularly poor. Drinking-water distribution pipes are often co-located in the same ditches as waste-water collectors. Frequent power failures and pressure drops in drinking-water distribution systems can then create hydraulic conditions whereby contaminated water can enter the drinking-water network. This hazardous condition is believed to be common in the majority of systems in the country.

Inadequate drinking-water disinfection. Georgia does not produce chlorine, the basic chemical that is used most commonly for disinfection of drinking water. Import costs are high and disinfection equipment at many treatment plants is not functioning. As a result, it is estimated that 70% or more of systems are not disinfected. While groundwater sources are generally considered safe (a fact that could be contested due to lack of data) this absence means that no chlorine residual is present in distributed water. Without this residual there is no barrier to the transmission of microbiological pathogens. The adequacy of chlorine residual in the 30% of systems that do disinfect could also be questioned.

Financial needs of water utilities. Utility companies are burdened by payments for energy -- in some cases 2/3 or more of total budgets. This is exacerbated by the inefficiency of the old pumps and other equipment. Water metering of homes is rare, and some believe that Georgian law must actually be changed to allow metering of domestic water use. With very low tariffs set by local government for residential customers, and collection rates of 20% or less in poorer communities, cash flows cannot support operations, maintenance needs and service improvements. To cite Tbilisi as one example, not only have water tariffs been unrealistically low (US$ 0.013/m^3), but even in the relatively richer capital city, collection rates reached only 70% overall, with 40% from residential customers.

Inadequate quality control and surveillance. At least 70% of water utilities do not have even rudimentary laboratories to optimize treatment or check on the quality of water delivered to consumers. Surveillance and testing by local offices of the Ministry of Labour, Health and Social Affairs can only substitute for a very small part of this need.

Inadequate sanitary protection zones. While Georgian law requires that there be three zones of protection around water-supply intakes or wells, official statistics show that even the most rudimentary protection (zone 1) is lacking in at least 14% of urban systems and 46% of rural systems. Unofficial reports suggest the numbers are much higher (i.e. less protective). Additional protection zones are only theoretical and not mapped or enforced to any significant degree.

Lack of incentives for private sector participation in drinking-water services. Other countries facing similar obstacles have been able to take significant strides in breaking down the barriers to public-private partnerships. Such progress has been very slow in Georgia, with only Tbilisi as a current candidate for a lease contract (facilitated by a proposed World Bank loan). The reasons for this condition include the major factors noted above, and an institutional framework not yet conducive to open and transparent public-private partnerships.

Plans for improvement

The working group of Georgia's National Environmental Action Plan (NEAP; November 1997 report) proposed a number of activities to address drinking-water concerns, ranging from furnishing water meters to all industrial users, to reducing operational water losses in Tbilisi and Kutaisi, to ambitious reconstruction of rural water systems (with a goal of 10% of systems improved each year). The final NEAP (adopted May 2000) also recommended improvements in water-supply safety in Kutaisi and Abastumani (the latter for concerns over tuberculosis clinic issues), and included an overarching recommendation for a project preparation unit to develop these and other proposed investments.

Despite such recommendations, progress in attracting investments and loans to address drinking-water concerns has been very slow. While several capacity-building efforts are being supported by donors, only two major investment efforts are now under way on urban drinking-water supply. They do, however, appear to be good examples of integrated and targeted approaches.

- Tbilisi Water Supply and Sanitation Project. Facilitated by a World Bank loan (expected to

reach the World Bank Board of Directors in spring 2003), this US$ 25 to 35 million project includes two key components; a repair and rehabilitation fund to improve drinking water and associated sanitation conditions, and a technical assistance component to improve legislative conditions and utility management. The core effort will be a lease contract to bring in private sector operations. Investments will cover water loss reduction, water demand management, repairing and replacing broken or energy-inefficient pumps, reduction in cross-connections with waste-water collection pipes, and rehabilitating treatment technologies.

- Municipal Development and Decentralization Project. Another World Bank project (in its second stage) seeks to increase "the effectiveness of participating local government units in their identification, planning, delivery, and cost recovery of local infrastructure, and utility services." Over US$ 25 million will be allocated for investments; an estimated 20% of this will go to water supply, sanitation and urban flood control. Investments must be targeted given the US$ 600,000 ceiling per activity. Nevertheless, such investments can be crucial; under the first phase of the programme, Rustavi for example, was able to improve disinfection performance of drinking-water treatment with a direct reduction in water-borne illness as a benefit.

7.3 Waste-water management

Infrastructure

Perhaps nowhere in Georgia is the decline in water sector investment and conditions as obvious as in the area of waste-water management. As noted in table 7.1, only 5 of the 29 municipal waste-water treatment plants in the country are currently operational, albeit at the reduced efficiency of mechanical mode. Biological treatment units (which are more effective at reducing organic and nutrient loading to surface water) are not operational at any of the 22 facilities in Georgia initially fitted with them.

Municipal waste-water plants, too, were often constructed poorly and, due to inadequate operation and maintenance, have degraded further. The case of the regional treatment plant in Gardabani (serving Tbilisi, Rustavi and Gardabani) is instructive in this regard. According to unpublished reports (prepared in 1999 for a possible donor grant), while the plant was initially designed to treat 1 million m^3 per day, only an estimated 600,000 m^3 per day pass through the plant. This reflects the fact that only 43 out of 100 connections to the sewer collectors were actually installed. The rest of the waste water (estimates range from 30% to 50% of the total) from Tbilisi discharges directly to the Kura river without even rudimentary treatment. Some components within the treatment plant (such as the sludge digesters) were never completed. Needed improvements to waste-water collection and treatment systems are extensive and encompass all components.

Box 7.1: Cross-sector relationships; the case of Rustavi

The industrial centre of Rustavi is an excellent example of the crucial linkages between the water and energy sectors, especially in times of economic difficulties. Rustavi has been affected by several water-borne disease outbreaks, the most severe of which (in 1997-1998) saw 500 people hospitalized out of a total of over 1200 cases. According to a senior elected official in Rustavi, 3 million lari (approximately US$ 1.38 million) is needed each year just for the cost of energy to run the drinking-water distribution and treatment system. Energy represents 70% of total drinking-water utility costs. Theoretically, each family of four in Rustavi would need to pay 10 lari per month to cover all costs of service. Given average household income at 60 to 70 lari per month (and pensions at 18 lari per month), this is not considered practical. With the economic crisis, citizens are charged a radically reduced rate of approximately 1.3 lari per month per family. While collection rates are high (65% to 85%) compared to the rest of the country, the total municipal income from water bills of 120,000 lari per year falls far short of the 3 million lari billed for energy alone. As a result, the city of Rustavi is 16 million lari in arrears for energy payments. On the positive side, however, Rustavi has been assisted by the World Bank's Municipal Development and Decentralization Project, and has greatly improved the microbiological safety of its water supply through targeted investments in distribution systems disinfection.

Table 7.1: Status of municipal waste-water treatment plants

Town	Technology	Operational since	Design capacity	Current condition
Black Sea Basin				
Kutaisi	MB	1980	110.0	Mechanical only
Batumi	MB	1983	85.0	Mechanical only
Kobuleti / Ozurgeti	MB	1985	50.0	Out of order
Zugdidi	MB	1975	23.3	Out of order
Poti	M	1981	23.1	Out of order
Samtredia	MB	1978	17.0	Out of order
Tskhaltubo	MB	1976	13.0	Out of order
Zestaphoni	MB	1976	11.5	Out of order
Chiatura	M	1978	8.2	Out of order
Sairme	MB	1978	0.8	Out of order
Kura River Basin				
Tbilisi / Rustavi	MB	1986	1,000.0	Mechanical only
Tskhinvali	MB	1983	25.0	Out of order
Gori	MB	1968	18.0	Mechanical only
Sagarejo	MB	1975	10.2	Out of order
Khashuri	MB	1971	10.0	Mechanical only
Kareli	M	1968	5.3	Out of order
Telavi	MB	1975	4.5	Out of order
Java	MB	1982	3.5	Out of order
Kaspi	M	1978	2.5	Out of order
Bakuriani	MB	1978	2.1	Out of order
Dmanisi	MB	1983	1.4	Out of order
Abastumani	MB	1981	1.4	Out of order
Tetri Tskaro	MB	1981	1.0	Out of order

Source : Ministry of Environment and Natural Resources Protection Background data for report: European Commission Project: SCRE/111232/C/SV/WW.

Support to the Implementation of Environmental Policies and NEAPs in the NIS. Sub-Project Georgia: Increasing the Effectiveness of Economic Instruments.

Working Note: Targeted Analysis of the Georgian Environmental Problems, October 2002.

Notes :

MB = mechanical and biological treatment

M = mechanical treatment only

Design capacity expressed in thousand cubic metres per day

The situation regarding industrial waste water reflects the extensive downturn in industrial production in the country. Water use, one measure of productivity and pollution impact, dropped from a reported 1,542 million m^3 in 1985 to 975 million m^3 in 1992 and to 211 million m^3 in 1998. Only nine major industrial enterprises are listed in most reports as being operational to some extent. In addition, there are more than 130 smaller industrial enterprises that have permits from the Ministry of Environment and Natural Resources Protection (obtained either from headquarters in Tbilisi or from regional agencies) to withdraw water or discharge effluents. One of the principal industrial categories is food processing, which can generate organic contamination. Pretreatment of waste water by the vast majority of industrial users is the exception rather than the rule. The Ministry of Environment and Natural Resources Protection estimates that more than 80% to 90% of industrial waste water is not treated before being discharged to sewers and municipal waste-water treatment plants (where there is a network), or directly to surface waters (where there is no network). If biological treatment units were in operation at municipal waste-water plants (which unfortunately they are not) pretreatment to neutralize metals, acids and other contaminants would be essential for good operation.

Water quality impacts

Published and unpublished data on waste-water discharge to surface water and subsequent impacts are sparse and conflicting. It is believed that most treatment plants do not monitor either the quantity or the quality of their waste water, and reports to the central authorities are rough estimates. As noted earlier, ambient water quality may have improved over the past few years given the slowdown in

industry. While municipal waste water is projected to be the major contributor of organic pollution to surface water, there is evidence to suggest that inflow to municipal plants is diluted by storm water, wastage from leaking drinking-water systems, and groundwater infiltration. This means that if waste-water plants were working properly, they would not be able to operate as effectively as possible due to such dilution. Plants in Georgia are typically designed to handle inflows with biological oxygen demand (BOD) in the range of 120 to 200 mg/l. Limited monitoring data show that inflows are at half this concentration or less (i.e. 60 to 80 mg/l). Ammonia concentrations in surface water do appear consistently higher than recommended norms, likely attributed to the cumulative impact of these somewhat dilute but untreated municipal waste-water discharges.

Waste water is not routinely disinfected. This can increase the spread of water-borne diseases. Concern has been expressed that waste water from health centres and hospitals, including those that treat patients with tuberculosis, may not be disinfected at municipal plants. Possible "hot spots" include: (1) the Kvabliani river and its tributary the Otskhe river downstream of Abastumani village; (2) the Mtkvari river and its tributaries the Borjomula river and the Gujaretistskali river in the Borjomi region; (3) the Mtkvari river and its tributary the Ksani river in the Mtskheta region; and (4) the Vere river within Tbilisi city limits. Water quality and health data to assess the validity of these concerns are lacking.

Plans for improvement

Donor assistance has been sought by Georgia for proposed improvements in waste-water collection and treatment, for example: (1) a US$ 21,500,000 extension and rehabilitation of waste-water collection in Tbilisi, Rustavi and Gardabani, as well as overall improvement in the regional waste-water treatment plant serving these communities, and (2) rehabilitation of the waste-water collector systems for the Kobuleti resort at over US$ 10 million. Except for the most crucial components in the World Bank projects noted above (aimed at preventing cross-contamination), no significant investment effort or programme plan for waste-water management is in the pipeline.

Apart from infrastructure investments, there are only a few donor-supported activities aimed at building stronger regulatory institutions, such as for the compliance and enforcement of waste-water regulations. A major limiting factor in making progress in this area is the lack of basic equipment for carrying out independent field inspections.

7.4 Watershed and transboundary water management

Context

Experts recognize that comprehensive and effective water sector improvements are best supported within an overall watershed-based framework. This has also been the conclusion from numerous international development policy meetings, such as the World Summit on Sustainable Development (September 2002). Article 79 of the Law on Water of Georgia ("Multipurpose Water Use and Protection Plans") supports this approach in that: "Master, basin and territorial multipurpose water use and protection plans define the principal water management and other measures to be implemented for satisfaction of population's and natural economy's perspective water requirements, as well as for protecting water and preventing its adverse impact." Many of these same concepts are seen in the European Union's Water Framework Directive, on which so many countries in Eastern Europe, the Caucasus and Central Asia seek to pattern their efforts. The importance of the Kura river basin for Georgia and its neighbours is, furthermore, a critical regional issue.

Despite setting the stage in law, there are no effective regulations or incentives in Georgia to launch either watershed-based plans, or administrative bodies to share information or manage quality or quantity on a watershed basis within the country. Georgia is a party to the Convention on the Protection of the Black Sea Against Pollution but not to the Convention on the Protection and Use of Transboundary Waters and International Lakes. There has been considerable high-level attention on transboundary issues of the Kura river basin, though no formal international commission at the government-to-government level has been formed. Instead, informal and promising discussions and pilot projects are ongoing.

Box 7.2: Programmatic initiatives with donor support

Beginning at the regional or transboundary scale, the European Union's TACIS programme on Joint River Management for the Kura Basin includes several projects being carried out by national technical working groups in Georgia, Armenia and Azerbaijan. These groups meet in plenary workshops, which allows country-to-country interaction. Steady progress is being made to upgrade technologies and monitoring of water quantity and quality in the Kura basin, all with an eye towards consistency within and across countries, and data sharing. Transboundary reviews and management can be done only when all three countries have a sound understanding of conditions and threats, and this programme is making important progress in this direction. Capacity-building components include reviews of water management practices, raising of public awareness, and early stages of pollution "hot spot" identification. Broader political concerns mean that a formal basin-wide steering group, international commission, or other high-level and politically endorsed entity is not now possible. Nevertheless, all three countries are clearly supporting and will benefit from technical cooperation. This effort clearly helps set the stage for longer-term formal transboundary cooperation.

With a similar goal of fostering cooperation, the United States Agency for International Development (USAID) has been working in Georgia and neighbouring countries under the Water Management in the South Caucasus programme. As with the TACIS programme, the emphasis is on "parallel bilateral" activities among professionals, with workshops to share experiences regionally. In particular, work has focused on subregional watershed-based planning for two pilot sub-basins to the Kura: the Alazani river basin (north-eastern Georgia and north-western Azerbaijan) and the Khrami-Debed river basin (south-central Georgia to north-central Armenia). Project tasks include data sharing, improvement of technologies and capabilities for water monitoring, assessment of problems and solutions, and preparation of lists of dozens of candidate institution-building and investment projects. It should be noted that while the list of projects has benefited from stakeholder input, there are no current funds identified for the vast majority of proposals. While the final reports from the programme are not government-endorsed (or legally binding) watershed plans, they do set a good basis for future adopted plans.

In addition to these programmes, transboundary and watershed planning has been a topic of other discussions and meetings. For example in July 2001, the Regional Environmental Center for the Caucasus (REC) held an international meeting on "Water Resources Management in the Countries of the South Caucasus" which brought together a wide range in specialists and policy makers from inside and outside the region to discuss these questions. A non-binding resolution to continue dialogue and actions was released, and REC has secured funding to help support continued sharing of information on programmes and initiatives.

Regarding additional pilots, the World Bank-supported Agricultural Research, Extension and Training effort includes pilot projects to reduce nutrient loading from small watersheds in western Georgia through better manure containment and management.

7.5 Protection of the Black Sea

Water quality conditions

The Black Sea is an important recreational and fishery resource for Georgia, and Georgia's actions that affect the Black Sea have regional consequences. Taking the regional view first, the Black Sea has been heavily contaminated with nutrients (i.e. nitrogen and phosphorus series), causing severe eutrophication, with a subsequent steady, steep decline in fish production over the past 25 years. The greatest sources of organic pollution are municipal waste-water treatment plants and agriculture. Poorly treated waste water means that many beaches are unsafe for swimming. Additional contaminants from industrial facilities, oil refineries and leaking tankers affect overall conditions in the Black Sea. Lower-quality invasive species, such as the jellyfish-like *Mnemiopsis leidyi,* and the presence of a hypoxia layer (or "dead-zone") at depth are serious ecological concerns. On the positive side, the comparatively small watersheds that traverse Georgia and contribute to the Black Sea mean that Georgia is by far the smallest contributor of organic pollutants among the six countries that ring the Black Sea. In 1996, for example, Georgia's contribution of BOD was about 4% of the regional total, phosphorus about 3% of the regional total and nitrogen less than 1% of the regional total. Given the limited mixing of the Black Sea, however, these

comparatively small contributions can have a disproportionally large impact in the eastern part of the Black Sea nearest to Georgia.

As was noted earlier, the main waste-water treatment plants in Georgia that discharge municipal sewerage to the Black Sea basin are in poor condition. Those closest to the Black Sea coastline include: Batumi, where there is only mechanical treatment; Kobuleti and Poti, which are not operating at all; and Sukhumi (in Abkhazia), which is also believed to be not operating. In addition to waste water from residents, these facilities receive ship-generated waste water and bilge water, which are also inadequately treated. The short distance from the waste-water plants (which discharge to tributaries of the Black Sea) to the Sea itself allow for very little natural attenuation. This means that tourists and residents who depend on nearby beaches for summer recreation are threatened with microbiological illness from contact with polluted bathing waters. Health officials close down beaches along the Batumi to Poti coastline each year due to microbiological contamination, a condition that can only be solved unfortunately by the costly and difficult reduction of pollution to coastal waters.

Beach quality is further hampered by poor industrial facility maintenance and inadequate industrial waste-water treatment, particularly from old oil refineries (such as the Batumi refinery) and port facilities. Anecdotal evidence suggests that erosion of solid waste landfills in Batumi also contributes to reduced recreational water quality. Quantitative data on near-coastal water quality are sparse at best, and are of questionable accuracy. Finally, as noted above, insufficient treatment of drinking water in several coastal cities has also led to water-borne outbreaks, notably in Kobuleti and Poti.

Programme initiatives and needs

A number of initiatives supported by donors and international financial institutions are under way to tackle some of the issues noted above, though improving water quality will take considerable time.

Georgia is a party to the Convention on the Protection of the Black Sea Against Pollution adopted in Bucharest in 1992 and ratified by all six countries surrounding the Black Sea by early 1994. The Convention includes specific protocols on the prevention of land-based sources, dumping of waste and coordinated action in response to spills. The Convention itself is a general framework that does not, however, provide sufficient legal or financial impetus for investments and other interventions needed to improve water quality. The Black Sea Environmental Programme (based in Turkey) coordinates implementation actions and is beginning a second year of its second phase of operations.

The Integrated Coastal Zone Management (ICZM) Programme, financed largely by a US$ 4.4 million credit from the World Bank and a US$ 1.3 million grant from the Global Environment Facility, targets several crucial needs. It will establish an institutional framework for integrated management, help protect and restore critical wetlands to improve water quality, bolster monitoring and coastal erosion-prevention programmes, and develop a national oil spill contingency plan. The programme is a key initial step in meeting Georgia's part of the regional Black Sea Strategic Action Plan.

A number of technical projects implemented through the Black Sea Environmental Programme have both country-specific and regional benefits. The most recent initiative (currently in the bidding process) calls for an international study group to be formed to conduct consistent and accurate field surveys of water quality and ecological conditions of the entire Black Sea. The effort seeks to define "…the main gaps in setting targets for nutrient control in the Black Sea and how these can be closed or reduced by good and cost-effective science".

The Department for Black Sea Protection of the Ministry of Environment and Natural Resources Protection serves as a central point for cooperation and coordination. The Black Sea Inspectorate (based in Batumi) is staffed to a somewhat better extent than the Ministry's other regional arms. Proposed new investments in refineries and port facilities along the Black Sea coast in Georgia will be subjected to full environmental review and are expected to include more up-to-date pollution control facilities.

Despite such positive signs, key deficiencies remain, for example:

- There are no active, funded programmes in place to improve the water and waste-water infrastructure of key port cities, particularly Batumi, Kobuleti and Poti. Some initial facility improvement plans were considered in the past few years for Poti (with possible European

Union partnership), and for Kobuleti (with possible Japanese Government partnership) but do not appear to be active at present. Industrial and municipal pollution, with consequent human health impact, will continue without such basic investment.

- The ICZM programme will set a good basis but does not include sufficient capital for the mitigation of coastal erosion, oil spills, ports and ship-based waste. Investments in hardware and equipment for oil spill response and port/ship waste-water treatment are not included.
- There is still a lack of resources to strengthen basic needs for field surveillance by the Ministry of Environment and Natural Resources Protection (to oversee waste-water discharge) and the Ministry of Labour, Health and Social Affairs (to oversee drinking-water quality, bathing-water quality, and track water-borne illness).
- There is still a need to translate knowledge of resources and threats into a specific national action plan for Black Sea protection by Georgia.

7.6 Policy objectives and management

The policy framework

While there is no separate policy document that directly spells out Georgian policy for protecting and managing water availability and quality, the Law on Water does outline a number of key principles that comprise a policy framework. Some of these are:

- Water protection is a major element of environmental protection for Georgian citizens, with consideration of both current and future needs;
- Drinking water for the population is the highest priority of all uses;
- Both groundwater and surface water are under State control;

- Management of water varies depending on the hydrologic importance;
- A system of "user-polluter pays" is key; and
- Pollution is not allowed (though specifics as to what defines pollution are lacking).

The legal framework

There are more than 10 major laws in Georgia that have significant influence over the protection and management of water resources and associated environmental concerns. The most comprehensive is the Law on Water, which has been in force since October 1997 and was last amended in June 2000. The 96 separate articles of this Law cover a very wide and comprehensive set of issues such as pollution control policies, protection of drinking-water sources, licensing of water use and discharge, categorization and protection of resources, particular measures for the Black Sea, flood control, and many others. All surface waters, groundwater and near-coastal waters are deemed to be under the control of the national Government. Many of the provisions of the Law are supplemented by legislative orders and decrees, as well as by regulations of the Ministry of Environment and Natural Resources Protection, which specify necessary actions in greater detail. The Ministry holds overarching responsibility for implementing the Law on Water, though other Ministries are key players on specific topics. Implementation of the Law is carried out by personnel at the regional or municipal level.

The Law on Water does provide for the licensing of water use and the discharge of pollutants, an approach that has been in place since 1999. Licences for waste-water discharge are good for 3 to 5 years, those for municipal water systems and irrigation for 25 years. There are 99 operating licences in Georgia, with 72 of these for abstraction of water, 27 for industrial waste-water discharge, and 10 for recreational or resort use. Decisions on major facility licences and those affecting the highest priority water bodies are taken by the Inter-ministerial Council for Water Use.

It should be noted that none of the municipal waste-water treatment plants is operating under licence, and the 27 industrial facilities under licence represent only about 5% of total waste water generated by industry. Facilities in place before 1999 operate under a system of allowable limits. Under both systems, users pay a fee to withdraw clean water and discharge waste water (i.e. that has been contaminated to some allowable level). If the discharge is above the allowable limits, a proportionally higher fine is paid. The core of the system is self-reporting by users to national authorities. Since a small minority of industrial users carry out accurate monitoring of their discharge and the Ministry's oversight is minimal, the system is not believed to be an effective means for discouraging pollution. Industrial discharge that goes to municipal treatment plants is not subject to licensing by the Ministry or limits; instead the

quantity and quality of discharge are set by negotiation and contract between the industry and the waste-water utility.

Water quality standards are issued administratively. The Ministry of Labour, Health and Social Affairs set standards for drinking water and recreational use, as well as waste water used for land irrigation, in August 2001 (order No. 297/n). The Ministry of Environment and Natural Resources Protection set surface water quality standards in September 1996 (order No. 147). Most of these standards are adapted from those in place during the Soviet era, albeit with some regard to international norms. Even those updated to reflect international norms (such as those of the World Health Organization) are essentially not implemented due to the lack of monitoring, testing and oversight in the field.

The institutional framework

In addition to the Ministry of Environment and Natural Resources Protection, several other Georgian government bodies have key roles in the water sector:

- Ministry of Labour, Health and Social Affairs, which sets drinking water and recreational water standards and oversees the quality of drinking water delivered by water utilities. The Ministry also tracks and responds to major water-borne disease outbreaks. Budget and personnel restrictions mean that the Ministry can now maintain only the most rudimentary oversight role, with significant questions as to quality control.
- State Department of Geology. While having some nominal role in oversight of groundwater development, it is largely the repository of geologic and hydrologic data on aquifers used for water supply.
- State Department of Hydrometeorology. While technically responsible for monitoring surface water quality, its current network is severely constrained. As noted above, improvements in equipment and methodologies have been a major focus of several donors.
- Ministry of Finance, which historically has made funds available from the central Government for water investment (albeit now quite limited with decentralization), now primarily acts as the counterpart for disbursing and managing funds from the limited programmes of the World Bank. This Ministry also sets water use and emission rates incorporated in the licences from the Ministry of Environment and Natural Resources Protection.

Despite the fact that a structure appears to be in place for water quality management and control, concerns over effectiveness remain. Field personnel of the Ministry of Environment and Natural Resources Protection do not have the basic tools for monitoring compliance by industry with either licences or emission limits. These deficiencies include vehicles for transporting inspectors to field sites, sampling equipment, field and central laboratories, and computers for aggregating data, among other things.

Georgian legislation that prohibits on-site inspections without a court order (instituted reportedly as an anti-corruption measure) hampers the ability of field personnel to carry out effective inspections. Municipal authorities in Tbilisi could get such orders in only 4 out of 10 situations that they deemed worthy of unannounced environmental inspections.

A permit programme or compliance effort for municipal waste-water treatment plants appears to be totally lacking. Fines and fee structures do not appear to provide the right incentives to encourage pollution control or investments in better water efficiency. Innovative approaches such as investment tax credits or targeted loan programmes for good compliance are not in place. There is no competitive domestic programme for providing funds for water infrastructure improvement (e.g. a water fund or revolving loan programme).

Citizens' suits and legal actions to force the Government and polluters to improve practices are either not allowed or not effective in forcing change. Public participation in the vast majority of decisions on water is not the norm.

7.7 Conclusions and recommendations

Georgia is rich in available ground and surface water resources, but the infrastructure and management systems currently in place to use these resources effectively and sustainably are severely constrained. Surface water quality may have improved to a small degree over the past decade due to the dramatic reduction in industrial productivity and subsequent pollutant discharge. Unfortunately, the risks of water-borne disease and other negative health impacts have increased due to breakdowns in water infrastructure, and reduced prevalence of drinking-water treatment. More than

80% of urban waste-water systems fail to provide even the most rudimentary treatment. Water utilities are unsuccessful at raising sufficient revenue from water tariffs to meet even basic operating expenses for energy and treatment chemicals. Incentives for mobilizing capital from public and private sources are lacking. Legal and policy instruments available to local and national authorities are insufficient to deter further degradation.

Given the scope of these difficulties and serious budget constraints in the country, recommendations for sector improvement need to be both feasible and focused on areas that can make a real difference in the near to mid term. Some promising donor-supported activities are under way to address drinking-water quantity and quality, watershed and transboundary water management, and protection of the Black Sea.

Given the expense of treatment chemicals and the high cost of energy faced by water utilities, it is reported that 70% of utilities do not disinfect their water supplies. With the prevalence of cross-connections (i.e. mixing) with raw waste-water collection systems, water-borne disease outbreaks are on the rise, and health risks from contaminated water are significant. Public officials and utility representatives should try all legal and policy means to correct this immediate health risk. It is acknowledged, however, that some systems may not be able to maintain an adequate disinfection residual due to elevated natural or human-induced organic constituents. Severe taste and odour concerns, or fears over dramatic increases in disinfection by-products could arise. In these cases, alternative sources of water (including bottled water, fuel subsidies for boiling water, and tanker trucks) should be found to the extent practical.

Recommendation 7.1:
The Ministry of Labour, Health and Social Affairs in cooperation with the Ministry of Environment and Natural Resources Protection and local governments should ensure that:

- *Drinking-water utilities disinfect their water supplies with chlorine or other chemicals so that sufficient disinfection residual is maintained within distribution systems to ensure microbiological safety;*
- *The public is notified of particularly hazardous drinking-water conditions, suggesting, inter alia, alternatives for children and boiling of water; and*
- *Utilities that do not disinfect are justified in this decision; for example those systems tapping protected wells or springs with very short, protected distribution networks.*

Investments are needed to reduce water losses, eliminate cross-connections with waste-water collectors, and improve cost-recovery through water metering and other means. This is the approach that has been taken in Tbilisi, which has brought in a private sector operator (under a leasing contract). While this may be difficult to replicate in other cities, management contracts with central government support could be a viable strategy. Grant money from foreign donors could be used (as in the case of the World Bank's municipal programme) to finance infrastructure investments with the greatest health benefit, for example disinfection technologies and strengthening of surveillance laboratories. The project preparation unit could also coordinate donor assistance and partnerships for innovative financial mechanisms such as revolving loans and development credits, and help foster institutional change to sustain positive results from the pilots (see recommendation 4.4).

The overall degradation in the municipal waste-water system infrastructure, constraints on raising revenue for improvements and greatly reduced industrial productivity limit practical recommendations for improvement. Some of the largest industrial "hot spots" are not operational, or are working at a fraction of their design capacity. Nevertheless, cooperation with industrial subsectors that are relatively more viable economically can set the stage for broader improvements in the future. To cite one example, Georgia is an agricultural centre for the region and food processing is comparatively strong. Waste-water discharge from food processing can be high in nutrient concentrations, but treatment schemes are comparatively simple.

Voluntary cooperation between the industry (to assess and implement changes in operations and treatment schemes) and regulatory authorities would be a positive sign for overall sector reform. Additional candidate activities include more thorough and accurate self-monitoring and reporting by industry to regulatory authorities, and quicker notification of unintentional releases of industrial waste water.

Recommendation 7.2:
The Ministry of Environment and Natural Resources Protection, in cooperation with other relevant ministries, should begin to tackle the problems of waste-water management through the launching of a waste-water programme for the most urgent hot spots.

Good watershed-based planning can assist in the implementation of more cost- and health-effective water services and water pollution control. Positive outcomes and processes (such as stakeholder involvement, better monitoring and critical needs assessment) that have shown to be promising in EU and United States-financed pilot projects should be seriously considered for wider application. The role of the Ministry of Environment and Natural Resources Protection in partnerships in these pilot schemes could be strengthened to foster dissemination and sustainability. Inter-ministerial working groups could be formed as one way to expand cooperation and engagement on pilot schemes. Regulations to accelerate the adoption of improved approaches, including the formation of watershed- or river-basin-based organizations could then be developed. Finally, opportunities should be sought (to the extent politically feasible) for engagement by senior officials and policy makers in Georgia with their counterparts in Armenia and Azerbaijan on transboundary water issues.

Recommendation 7.3:
The Ministry of Environment and Natural Resources Protection should:

- *Undertake a policy review on the use of watershed-based planning for the implementation of improved water services and water pollution control;*
- *Draft regulations, including incentives, for watershed-based planning; and*
- *Accelerate transboundary cooperation in this area.*

This coming year will see a number of positive initiatives to improve the country's understanding of near-coastal water quality and threats. Oil spill contingency plans will be developed; the institutional framework for integrated coastal zone management will be strengthened; and it is hoped that new port and energy facilities will be designed with greater environmental protection. The next step, attracting investments in critical water and waste-water infrastructure, needs to be taken but will be challenging. Taking the experience of other regional programmes (such as the Danube and Baltic Sea efforts), it is recommended that Georgia should move forward with developing a national action plan. The plan would examine needed improvements in municipal and industrial facilities, and provide a consistent basis for evaluating investment needs and benefits from both human health and ecological perspectives. A draft plan has been developed and received some Parliamentary review, but more serious attention to making this a centrepiece for investment attention should be considered.

Recommendation 7.4
The Ministry of Environment and Natural Resources Protection should accelerate preparation of a Georgian national action plan for the Black Sea.

Water management should also take into consideration good irrigation practices and the introduction of environmental sound technologies. (see recommendation 11.2.)