Chapter 5

MANAGEMENT OF WATER RESOURCES

5.1 Yugoslavia

Water resources

Yugoslavia has an annual water flow of about 1,500 m^3 per capita, which classifies it among the water-poor areas of Europe. Water supply flow is seasonally uneven. The annual average precipitation in Yugoslavia is 734 mm, but there are wide variations. In Serbia annual precipitation varies from 550–650 mm in Vojvodina to 800–1200 mm in the mountainous regions. All the lower areas of Serbia, including the lower Drina basin, have a precipitation of below 800 mm/year. Montenegro has an abundant precipitation of about 2000 mm/year, on average, and locally up to 5500 mm/year, with a maximum of 8500 mm/year. Internally renewable water resources are limited, since about 84% of the available water resources originate outside Yugoslavia. The yearly groundwater reserves total about 244 m^3 per capita.

The majority of rivers in Yugoslavia belong to the Danube River basin (Table 5.1). Some rivers in Montenegro flow into Skadarsko Jezero and the Adriatic Sea. Generally, the mountainous southwest, the east and the south of Serbia have greater water potential than the north and the centre. There are 60 large reservoirs (about 20 of them larger than 10 million m^3) and about 100 smaller reservoirs in the Danube River basin in Yugoslavia. The total retention volume of all reservoirs is about 6.5 billion m^3.

Floods

Floods have always endangered large parts of Serbia, particularly the valleys of larger watercourses in which the biggest settlements, the best farmland, infrastructure and industry are located. Floods are caused by various climatic, meteorological and other natural and anthropogenic factors (precipitation, coincidence of heavy rainfall and high river flows, snow melt, ice-related phenomena, damage to protective structures and changes in run-off conditions). So extensive systems for flood mitigation and for the regulation of watercourses have been built. There are about

Table 5.1: Major rivers and canals

River	Length in Yugoslavia			
	Total length (km)	(km)	Navigable length (km)	Flows into
Danube	2,783	588	588	Black Sea
Tisza	966	168	168	Danube
Sava	945	206	206	Danube
Tamis	359	118	3	Danube
Drina	346	220	..	Sava
Zapadna Morava	308	308	..	Velika Morava
Juzna Morava	295	295	..	Velika Morava
Ibar	272	272	..	Zapadna Morava
Begej	244	75	75	Tisza
Nisava	218	151	..	Juzna Morava
Timok	202	202	..	Danube
Velika Morava	185	185	3	Danube
Lim	220	160	..	Drina
Tara	141	141	..	Drina
Moraca	99	99	..	Skadarsko Jezero
Canals	939	939	673	

Source: Djordjevic, S. Jovanovic, M. and Petrovic, J. Faculty of Civil Engineering. Flood Risks in the Federal Republic of Yugoslavia. Belgrade, Yugoslavia.

3,550 km of flood-defence embankments in Yugoslavia. However, both direct and indirect damage due to floods and non-regulated rivers is still important.

In Montenegro, plains comprise only 5% of its 3812 km^2, of which only one third is periodically flooded. In comparison to the overall flood potential of Yugoslavia, this is minor. However, locally it is of major importance for Montenegro, because of the general scarcity of farmland, which is entirely confined to the flood plains. In addition to the farmland, numerous villages, traffic and communication lines are endangered by flooding, while in the region of Skadarsko Jezero, flooding has detrimental effects on hygiene for the local population, In some regions, the surface run-off reaches 60–80 litres/sec per km^2, or 44 litres/sec per km^2 on average (which is 6.4 times greater than the world average). However, the uneven distribution of rainfall over the year causes seasonal flooding, which is most intensive from November to December and somewhat less intensive from February to May. Yugoslavia flood issues and management measures are the subject of a study financed by the World Bank.

Water supply

The water supply and sanitation sector was well developed in the former Yugoslavia and, even today, coverage in urban areas reflects this legacy. In 2000, 98.4% of the country's population had access to safe drinking water using the commonly accepted definition of "access to improved water sources," i.e. sourced from a pipe, a public tap, borehole/tube well, protected well, protected spring or rainwater. Given the country's level of development, a more useful figure is the percentage of the population that received piped water supply to the home or garden. This figure is 86.6% in Yugoslavia. Regional differences are significant and indicate that outside of the large cities, water supply coverage is low, e.g. in Serbia, 92.9% of the population in the Belgrade area has water piped into the dwelling or garden, while the proportion for the rest of central Serbia is only 77.0%.

These coverage figures may offer too positive a picture. Households appear to have reported what they have, not what is properly functioning. Officials report that many of the piped water-supply systems are operating poorly, if at all, particularly in rural areas. The coverage figures also do not reflect service interruptions, which are significant (table 5.3). Here, too, there are notable regional differences, with Vojvodina experiencing the most and longest interruptions in service.

Water quality

The republican institutes of hydrometeorology routinely monitor surface inland water and groundwater quality. This activity is supported by government budget grants so that budgetary limitations have a large impact on it. There are about 160 gauging stations on rivers within the Danube River basin where both flow and water quality are measured regularly. Water quality of the largest international rivers in the Danube watershed as well as water quality of the largest part of Yugoslavia's national rivers is far from satisfactory. This is particularly true for river stretches downstream of settlements because of untreated municipal and industrial discharges. Since the mid-1990s, water quality in many of the rivers has deteriorated from class II (suitable for bathing and drinking only after treatment) to class III quality (suitable for irrigation and industry only). In Serbia, 50% of drinking-water samples do not meet the required standards and in most Montenegrin cities that figure stands at around 15-20%. Unchecked industrial pollution, untreated waste-water discharges and transboundary inputs are amongst the causes of surface and groundwater pollution.

Ten years of little maintenance and no investment in the water and waste-water supply sectors have resulted in a situation where most water-supply networks have difficulty in ensuring a regular supply of safe water and most municipal and industrial waste waters are discharged largely untreated. The Yugoslav municipalities reporting the best water quality are the large cities (Belgrade, Novi Sad, Nis and Podgorica), where there are more financial resources to adequately operate and maintain the water-supply systems. The municipalities recording the poorest water quality often correspond to those housing refugees and internationally displaced persons, though it is not known whether this is due to prior problems with water infrastructure or to increased demands on the system. Medium-size towns and rural areas have the most difficulty in providing safe and adequate supplies of drinking water.

Table 5.2: Percentage of the population with a water supply of different service levels

percentage

Territory	Piped into dwelling	Piped into garden or plot	Public tap	Tube well/ Borehole with pump	Protected dug well	Unprotected dug well	Other	Missing	Total
Yugoslavia excl. Kosovo and Metohija	83.8	2.8	0.6	4.4	6.8	0.7	0.5	0.3	100
Montenegro	85.1	6.0	1.0	1.1	3.0	0.4	2.2	1.2	100
Serbia excl. Kosovo and Metohija	83.7	2.6	0.6	4.6	7.0	0.8	0.4	0.3	100
Central Serbia	81.3	2.6	0.6	4.4	9.6	1.0	0.3	0.2	100
Central Serbia excl. Belgrade	77.0	3.2	0.8	4.8	12.4	1.3	0.4	0.2	100
Belgrade	92.9	1.2	0.0	3.5	1.9	0.3	0.1	0.0	100
Vojvodina	90.4	2.5	0.7	5.2	0.1	0.0	0.7	0.5	100
Area									
Urban	97.0	1.0	0.1	0.4	0.4	0.0	0.3	0.3	100
Rural	68.0	4.8	1.3	9.1	14.1	1.6	0.8	0.3	100

Source: United Nations Children's Fund (UNICEF). Multiple Indicator Cluster Survey II 2000.

Table 5.3: Percentage of the population with interruptions of water supply

Territory	None	Yes, sporadic	Yes, daily	Yes, during the summer	Number
Yugoslavia excl. Kosovo and Metohija	51.7	28.4	5.0	15.0	5,730
Montenegro	41.5	29.9	7.1	21.4	350
Serbia excl. Kosovo and Metohija	52.3	28.3	4.9	14.6	5,380
Central Serbia	57.4	23.5	5.8	13.4	3,849
Vojvodina Area	39.6	40.3	2.6	17.6	1,531

Source: UNICEF. Multiple Indicator Cluster Survey II 2000.

Some of the decline is attributed to the higher level of pollution in those water sources entering Yugoslavia**.** Water resources in Yugoslavia are fed by countries upstream, with water quality ranging from class III (e.g. Tisza River, Sava River) to the more common class IV (e.g. the Begej River). These water resources tend to be contaminated with nutrients, oil, heavy metals and organic components. Examples of very clean water - classes I and I/II - are rare, and are situated in mountainous regions, e.g. along the Tara River and the Piva River in the north of Montenegro, and the Rzav, Studenica, Moravica (up to Soko Banja), Mlava (up to Petrovac) and Crni Timok in the western part of central Serbia.

Although the quality of the coastal marine waters off Montenegro is generally satisfactory, the threat of coastal zone deterioration in Montenegro is crucial due to uncontrolled construction, the lack of waste-water treatment and the lack of a coastal zone management strategy (see also chapter 14, on tourism and the environment).

Sanitation and waste-water treatment

Most of the country's population (99.6%) lives in households with sanitation services of some kind; 88.3% of the population is serviced by a sewerage system or septic tanks. In 1991, 66% of the population lived in a dwelling with either a sewerage system or septic tank. By 1996 the figure was 77% and, in 2000, 88%, indicating improvements in sanitation coverage. As one sign of the positive impact of these improvements, mortality among infants and children under five declined by one half during the 1990s and is associated with improved household sanitation and improved treatment for diarrhoea and acute respiratory disease. Yet serious problems still remain in the sector, particularly in the rural areas. The urban/rural coverage with a sewerage system is

87.5 and 22.2%, respectively. Rural areas rely primarily on septic tanks for sanitation. Many septic tanks are improperly designed and situated.

Roma communities throughout Yugoslavia appear to have particularly inadequate water supply and sanitation. Within Roma settlements, access to utility and public services is non-existent or limited, and the most serious problems are the lack of access to electricity, water, sewerage and rubbish collection. These conditions place the population at increased risk from water-related disease.

Point sources of pollution in the Danube River basin in Yugoslavia include the over 7,000 settlements and communities. There are very few large cities (>100,000) in the Yugoslav Danube River basin. Almost 90% of settlements have populations of fewer than 2,000. The principal municipal point source polluters are the settlements with over 10,000 inhabitants, making up only 2.2% of the total number of settlements but causing more than 90% of the total pollution load. Most of the small and medium industries are located in these settlements.

Policy objectives and management

The legal framework

In Yugoslavia the legislation on measurements and water quality is fairly developed. There are a large number of by-laws. The monitoring of the quality of water directly related to public health, i.e. drinking water and water for recreation, is under the jurisdiction of the federal and the republics' health ministries. Measurements, processing, publishing and distributing data on drinking water are the responsibility of the republics' institutes for health. The data on drinking water quality are published in local and regional bulletins, whereas the constituent republics' Ministries submit separate annual reports to their governments. The Federal Secretariat for Labour, Health and Social Care submits an annual report on drinking-water quality to the World Health Organization (WHO). The criteria and standards for drinking water are fully coordinated with EU and WHO standards and guidelines. The monitoring of ambient water quality is the responsibility of the republics' hydrometeorology institutes. The criteria and standards for surface water are defined by the regulations of the republics. The Federal Hydrometeorological Institute is responsible for international water issues. The results of all testing are published annually.

Irrigation water is the responsibility of the republics' agriculture ministries.

Box 5.1 contains the most important federal legislation on water.

Yugoslavia signed the Convention on Cooperation for the Protection and Sustainable Use of the Danube River (Danube Convention) (1994), and ratification is pending in the Federal Assembly. Yugoslavia has cooperated fully with the International Commission for the Protection of the Danube River. It participated in the development of the GEF-funded Danube Transboundary Diagnostic Analysis, by preparing a national review and holding a national planning workshop in November 1998. When the country ratifies the Danube Convention, it will become eligible for GEF grants for investment projects under the GEF Strategic Partnership Investment Fund for Nutrient Reduction in the Black Sea/Danube Basin (see also chapter 4, on international cooperation.)

Box 5.1: Legal framework for water management

- The Law on coastal sea and epi-continental belt (No. 49/87, 57/89, 24/94, 28/96);
- The Law on Hydrometeorological Affairs of Interest to the Country (No. 18/88, 63/90);
- The Law on sea and internal shipping (No. 12/98, 44/99, 74/99, 73/00);
- The Law on the Water Regime (No. 59/98);
- Regulations on classification of inter-republic water flows, interstate waters and coastal sea waters of Yugoslavia (No. 6/78);
- Regulations on establishing networks of hydrological stations of interest to the country (No. 50/90, 54/90);
- Regulations on the sanitary quality of drinking water (No. 42/98, 44/99); and
- The Decision on maximum permitted concentrations of radionuclides and hazardous substances in inter-republic water flows, interstate waters and coastal sea waters (No. 8/87).

Table 5.4: Percent coverage to sanitation options

percentage

Territory	Flush to sewage system	Flush to septic tank	Improved pit latrine	Traditional pit latrine	No facilities	Missing	Total
Yugoslavia excl. Kosovo and Metohija	57.2	31.1	0.7	10.5	0.1	0.3	100
Montenegro	60.6	28.2	0.6	8.4	0.7	1.5	100
Serbia excl. Kosovo and Metohija	57.0	31.3	0.7	10.7	0.1	0.3	100
Central Serbia	61.7	25.6	0.8	11.6	0.1	0.2	100
Central Serbia excl. Belgrade	53.3	30.4	1.0	14.9	0.1	0.2	100
Belgrade	84.5	12.4	0.2	2.8	0.0	0.0	100
Vojvodina	44.1	47.2	0.3	7.9	0.0	0.5	100
Area							
Urban	87.5	10.1	0.1	1.9	0.0	0.4	100
Rural	22.2	55.5	1.3	20.4	0.2	0.3	100

Source: UNICEF. Multiple Indicator Cluster Survey II 2000.

The institutional framework

Accentuated by the de jure and de facto shift of competencies from the federal level to the republics, the responsibilities of the Environment Department (within the Federal Secretariat for Labour, Health and Social Care) have diminished. The Department continues to play an important role in international matters, such as the negotiation and ratification of international environmental conventions and agreements, as well as obligations stemming from them, such as the monitoring of transboundary water pollution, which is within the competence of the Federal Hydrometeorological Institute.

The Institutes of Public Health in Serbia and Montenegro are responsible for monitoring drinking-water supplies and have the authority to close systems that do not produce water according to standards. In Serbia, officials report they have closed many systems, usually in small towns (5,000 to 10,000 inhabitants). The most common operational problem that leads to closure is the lack of a functioning disinfection system (chlorination). Either the equipment is broken or the chlorine is not available. NATO bombings in 1999 destroyed the two chlorine manufacturing plants and since then supplies have been erratic.

Water management

Urban water and sanitation services are decentralized and delegated to the municipality. A typical utility provides water-supply and waste-water services and, sometimes, solid waste management. Although many are legally independent entities on paper, these enterprises generally have little autonomy and no control over crucial aspects of their business. Investment decisions have until now usually been taken by the municipality or the republics, with a strong bias towards new infrastructure, disregarding the need to improve maintenance and rehabilitate existing assets. Operationally, the sector suffers from huge physical losses, in the region of 50% and more, a lack of demand management, inadequate pricing policies, fragmented institutional arrangements, and a misuse of water supply for non-household activities. By international standards the utilities are overstaffed, inefficient, and lacking modern management and control systems and governance.

There is no federal or republican agency that regulates water utilities, plans service needs or channels funds or support in a coordinated manner. Several ministries (agriculture, forestry and water management, civil engineering, health, and finance) control utility operations in the areas under their authority, all of them involved (including ministries that have no logical involvement with the sector, such as the Justice Ministry), but none with real sector responsibility or leadership functions. This, combined with the "de facto" complete decentralization of service provision to municipalities, results in fragmentation, and a lack of planning and advocacy for the sector. The multitude of uncoordinated laws and regulations applicable to the sector further contribute to its fragmentation. A long period without proper maintenance and almost no investment has resulted in significant operational problems. Most water-supply systems are in a critical condition and require urgent rehabilitation.

Transboundary water

The Danube River

Most of Yugoslavia is located within the Danube River basin (89,000 km^2, or 87% of the total territory and about 11% of the Danube River basin area). Most of this area, 81,660 km^2, lies in Serbia. Inhabitants of the Danube River basin area within Yugoslavia are estimated at 9 million, which is 11% of the total Danube River basin population. The section of the Danube that flows through Serbia is 588 km long; about 138 km constitute the State border with Croatia and about 213 km the State border with Romania. The Danube's largest tributaries, the Drava, the Sava and the Tisza, empty into the Danube in Serbia, increasing its flow about 2.5-fold. Other significant tributaries that empty into the Danube in Yugoslavia include the Velika Morova and the Tamis, which come from Romania, and the Timok, which constitutes part of the Yugoslav-Bulgarian State border.

Over 95% of the water that enters Yugoslavia from neighbouring countries does not meet Yugoslavia's ambient water-quality standards. It is estimated that each year about 580,000-620,000 tons of BOD, about 380,000-450,000 tons of nitrogen in various forms, and about 20,000-25,000 tons of phosphorus enter Yugoslavia. The country then contributes more to the Danube basin's nutrient load with annual amounts of 43,303 tons of nitrogen and 14,128 tons of phosphorus. Thus, although the Danube water coming into the country is polluted by other upstream countries, Yugoslavia is considered one of the biggest polluters, contributing about 13% of the Danube's nutrient pollution. The Danube Pollution Reduction Programme has identified over 30 municipal "hot spots" of water pollution in the Danube basin (Figure 5.1). Distribution of municipal waste-water treatment plants is shown in figure 5.2.

Donor support in water supply and waste-water

In the past two years international financial institutions and both multilateral and bilateral donors have initiated projects in water supply and waste water, in large and medium-size cities and rural areas. These include several projects and activities presented in Box 5.2.

5.2 Serbia

Water resources

All rivers in Serbia belong to three sea basins: the Black Sea basin, the Adriatic Sea basin, and the Aegean Sea basin. The major tributary to the left of the Danube is the Tisza River, coming from Hungary. Its main tributaries are the Begej, the Tamis, the Karas and the Nera, all coming from Romania. The Danube, with a watershed of 817,000 km^2 and a mean flow rate of 6500 m^3/s at its mouth (Black Sea), is Europe's second largest river (after the Volga), and Yugoslavia's largest. Water flow is seasonally uneven, leading to quantity problems throughout Serbia. Water shortages are particularly serious in southern Serbia. Water shortages have required the construction of reservoirs, e.g. on the Drina, Danube and Lim Rivers in Serbia, as part of a regional water-supply strategy.

Water supply

In Serbia drinking water is supplied to 81.8% of homes or gardens. The figures for town and country are 98.0% and 63.3%, respectively (table 5.5). Regional differences can be wide particularly in rural areas, e.g. 70.9% of rural settlements in central Serbia receive piped water, as against 86.8% in Vojvodina.

About 50% of the Serbian population is supplied by public water-supply systems, of which there are 153 serving 168 municipalities. Most of these utilities have a municipal focus but there are several regional water-supply systems that serve more than one municipality. About half of the population receives water from the three largest water-supply systems (Belgrade, Novi Sad and Nis), with the remainder served by medium-sized public water-supply systems. Access to piped water and sewerage for ten representative small, medium and large municipalities is shown in table 5.6. While piped drinking water coverage is 80-100% in these ten communities; sewerage coverage lags behind in all municipalities, ranging from 45 to 80%. It is important to note that refugees account for as much as 50% of the population in some municipalities – a situation that has put a huge strain on the already deteriorated systems.

Approximately 50% of the population is considered "rural" in Serbia. There are three types of drinking-water supply sources for the rural population: (a) official piped water systems that are owned and operated by the municipality; (b) private piped systems built and operated by the communities themselves; and (c) private wells. Of these three types of service only the official piped water systems are monitored and regulated for drinking-water quality by the Institute of Public Health. Private drinking water supplies are not monitored by the Institute; however, on the basis of sporadic measurements, it estimates that about 90% of the private drinking-water supplies do not meet bacteriological standards for drinking water. This suggests that many rural communities and households may be vulnerable to water-related health problems. The size of the rural population at risk is difficult to determine since data on rural water-supply systems are very scarce, but some estimates indicate that about 50% of the rural population uses a drinking-water supply that is private, unmonitored and unregulated.

Water quality

Deterioration of the water-supply infrastructure, including the disinfection systems (chlorination), has contributed to a decline in the quality of piped drinking water. Contaminated water problems are prominent in Serbia, where, in 2001, 29% of samples from piped systems did not meet the physico-chemical or bacteriological standards. There are significant regional differences in water quality in Serbia, for instance between central Serbia and Vojvodina (table 5.7). Throughout Serbia, the main problems with physico-chemical water quality parameters are turbidity, iron, manganese, nitrates and, in Vojvodina, arsenic. In central Serbia the main problem is bacteriological contamination with more than 40% of samples not meeting standards. Vojvodina has severe problems with both physico-chemical and bacteriological standards; 67% of water samples do not meet standards. Schoolchildren appear to be particularly at risk, since 90 schools in Vojvodina have no water-supply facilities and in 508 schools drinking water was found to be bacteriologically unsatisfactory. Only in Belgrade is water quality generally adequate with more than 90% of water samples within standards.

Sanitation and waste-water treatment

The construction of municipal and industrial sewerage systems in Serbia during the past decades has lagged behind water-supply development, as can be seen from Table 5.6. There are distinct regional differences in sanitation coverage, with 44.9% of Vojvodina connected to the public sewerage network versus 66.9% for central Serbia (including Belgrade).

The quantities of municipal and industrial waste-water discharges have changed considerably in the past decade. Roughly 10% of the total waste water discharged in Serbia is from households, and this figure has remained steady throughout the 1990s. What has changed dramatically is the total amount of waste water from both households and industry. Both have dropped by about 60% since the early 1990s. Meanwhile waste-water treatment capacity has remained roughly the same for both domestic and industrial waste-water treatment, and the treated amount in 2000 remains similar to that of 1990.

Serbia has 37 central facilities for waste-water treatment, of which 7 have primary treatment and 30 have secondary or biological treatments. Seven of these facilities are over 30 years old and severely dilapidated and three are not working at all. Belgrade has no waste-water treatment plant and relies instead on the dilution and self-cleansing properties of the Danube. The municipalities of Arandjelovac, Bor, Becej, Vlasotince, Velika Plana, Vrsac, Gornji Milanovac, Dimitrograd, Aladovo, Kragujevac, Kikinda, Medvedja, Negotin, Paracin, Pozareva, Sombor, Surdulica, Soko Banja and Ruan have treatment plants. The efficiency of the municipal and industrial waste-water plants is minimal. It is estimated that only 13% of all treatment plants are satisfactory. Overall, only about 12% of municipal waste water is treated in Serbia.

The result of inadequately treated waste-water discharges is pollution of surface and groundwater. The impact of this on drinking-water supplies is described above. In terms of general water resources, surface water quality monitoring has found bacteriological pollution in small rivers and channels where municipalities and industries discharge their waste water. The most threatened waterways, where water quality is outside the classification system, are the Stari Begej Crnica, Lukavic, Veliki Lug, and Pristevka rivers. In the large rivers (the Danube, Sava, Tisza and Morava), increased bacteriological pollution is found downstream from the big cities, e.g. Novi Sad and Belgrade, but, due to the high velocity, the pollution is brought down relatively rapidly to

within the allowed limits. Non-point source pollution contributes more than 50% of total water pollution. These sources deliver 70% of total nitrogen, 50% of total phosphorus, and 90% of faecal and coliform bacteria.

Table 5.5: Serbia: Percentage of households with access to piped water

Territory	Total	Urban settlements	Rural settlements
Vojvodina	92.1	96.1	86.8
Central Serbia	88.3	99.2	70.9
Kosovo and Metohija	57.0	96.4	32.0
Total	81.8	98.0	63.3

Source: Serbia's Ministry of Health and Environmental Protection. Directorate for Environmental Protection. Report on the State of the Environment for 2000 with the Priority Tasks for 2001+ (Draft). November 2001.

Table 5.6: Selected municipal water supply and waste-water utilities

Municipal water and waste-water utility	Population served*	Water supply coverage, %	Sewerage coverage, %
Belgrade	1,650,000	80.0	65.0
Nis	317,000	90.0	70.0
Kragujevac	175,000	85.0	65.0
Kraljeva	115,000	90.0	80.0
Smederevo	110,000	98.0	65.0
Sremska Mitrovica	100,000	100 (city); 80 (muni)	80.0
Sombro	80,000	100.0	45.0
Sabac	75,000	65.0	50.0
Bujanovac	71,000	65.0	70.0
Pirot	55,000	95.0	80.0

Source: World Bank. Federal Republic of Yugoslavia. Breaking with the Past. The Path to Stability and Growth. Report No. 22267-YU. July 15, 2001.
Note: *Includes refugees

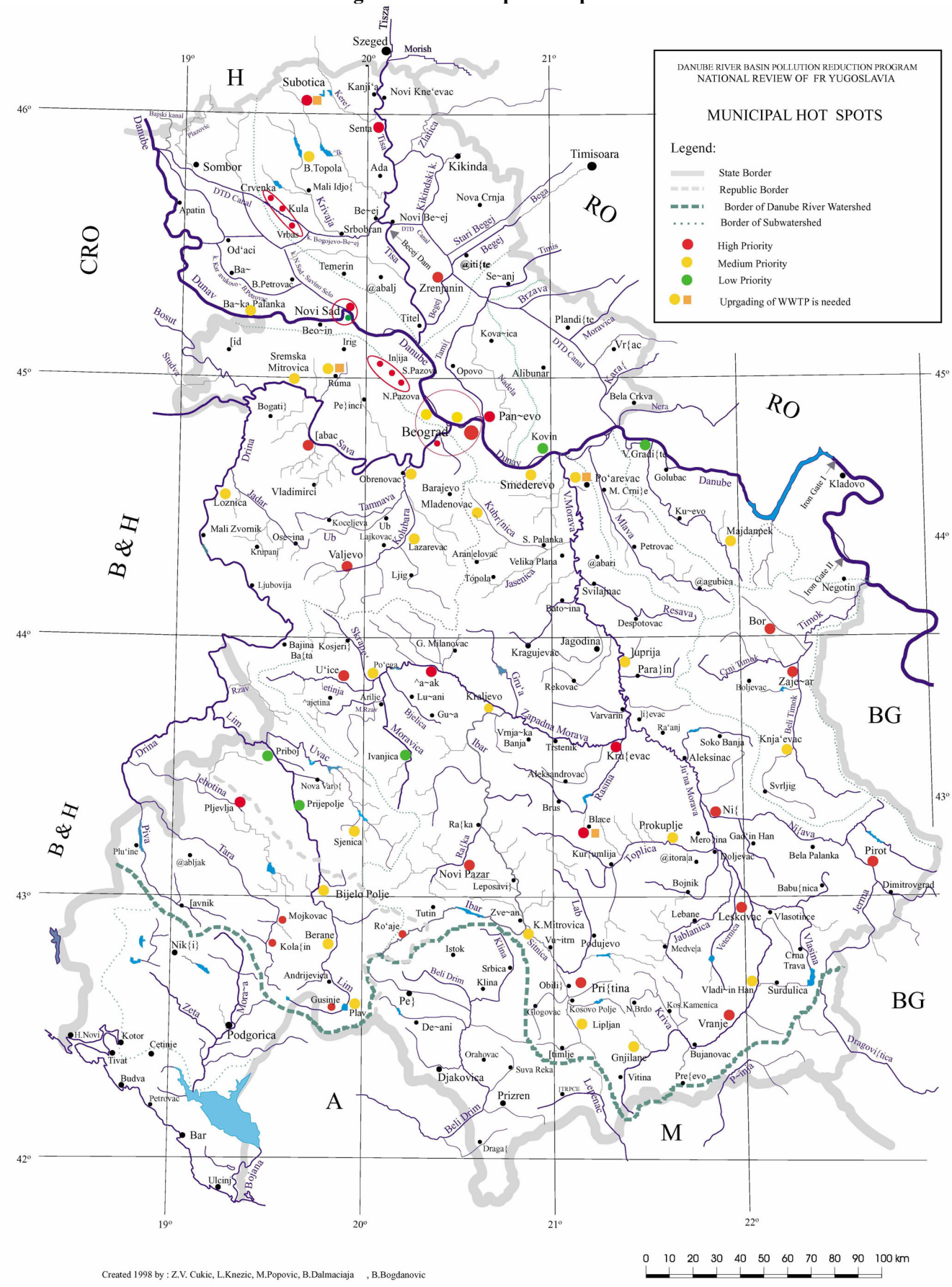
Table 5.7: Percentage of drinking water quality systems not meeting water quality standards in 2001

Region	>5% of samples do not meet bacteriological standards	>20% of samples do not meet physical & chemical standards	Do not meet either bacteriological or physico-chemical standards
Serbia - total	49	41	29
Central Serbia	41	31	17
Vojvodina	75	75	67

Source: Institute of Public Health.

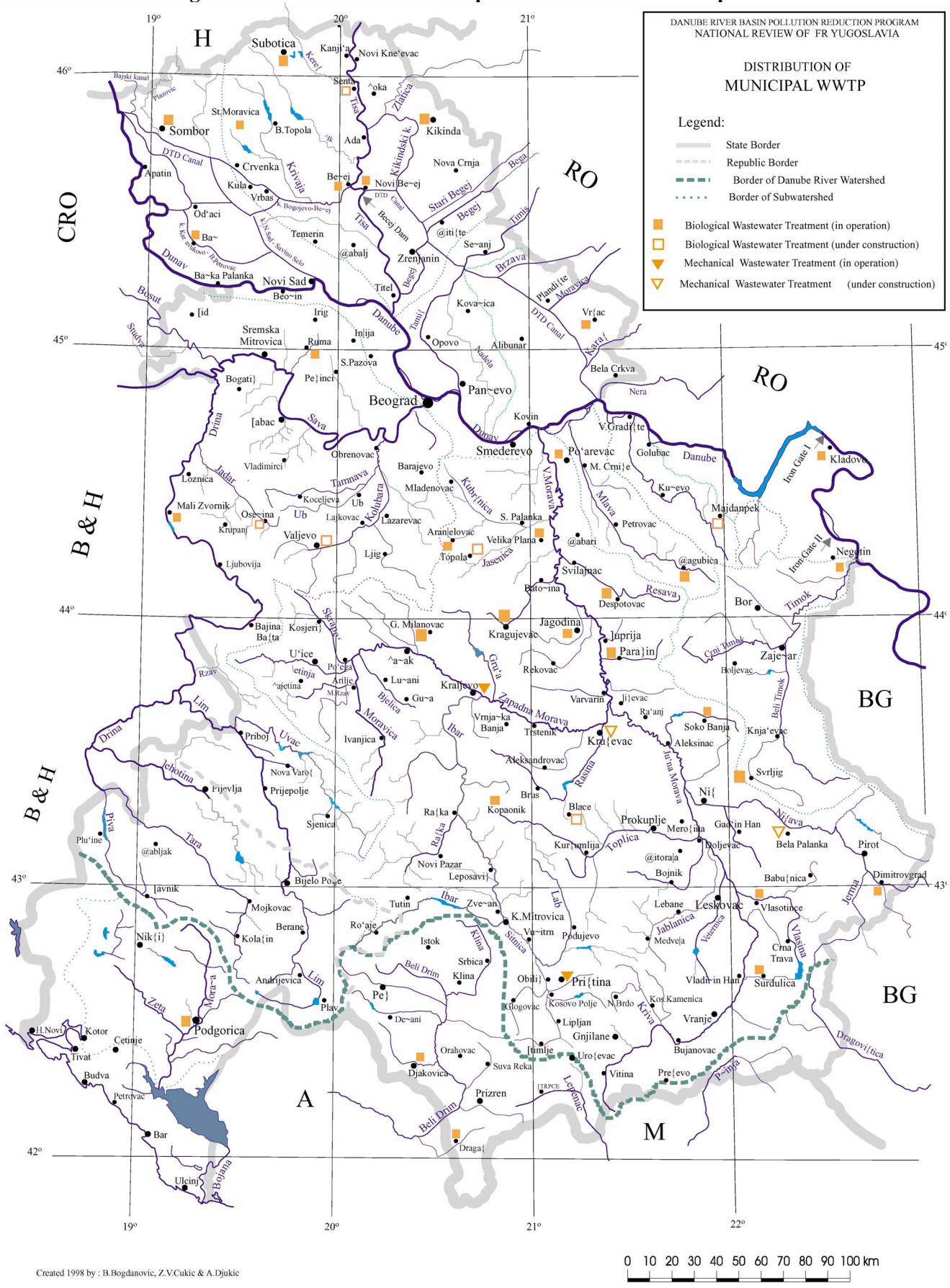
Note: Based on drinking water quality reports on 152 Serbian water supplies, of which 116 are in central Serbia and 36 in Vojvodina.

Figure 5.1: Municipal hot spots



Source: International Commission for the Protection of the Danube River, http:// www.icpdr.org
Disclaimer: "The boundaries and names shown on this map do not imply official endorsement or acceptance by the United Nations

Figure 5.2: Distribution of municipal waste-water treatment plants



Source: International Commission for the Protection of the Danube River, http:// www.icpdr.org
Disclaimer: "The boundaries and names shown on this map do not imply official endorsement or acceptance by the United Nations

Box 5.2: Donor cooperation in the water and waste-water sectors

Water supply, sewerage and waste-water treatment				
Republic	**Donor**	**Main activities**	**Funding**	**Comments**
Montenegro	EU through ERA	Funding of several feasibility studies on municipal infrastructure development and maintenance Capital investment in sewerage and waste-water treatment in the coastal region and in Virpazar (small locality on Skadarsko Jezero)	NA €1.7 million	EU intends to act as catalyst for investment in waste-water treatment and aim for cost-effective solutions. May provide co-financing to international financial institution and municipality funds
Serbia	European Bank for Reconstruction and Development (EBRD)	Loan to Nis to develop the city's sewage system between 2002 and 2004 Loans to the cities of Belgrade, Novi Sad and Nis to upgrade water-supply systems	€6 million NA	
Serbia	Germany	Rehabilitation of the Belgrade and Nis water-supply and waste-water treatment systems Revitalization of water-supply, municipal heating and waste-water systems, and development of small and medium enterprises in other cities	€5.1 million €37.3 million	
Serbia	France	Grant for the construction of drinking-water treatment plants and the local water-supply grid in the village of Ivanovo (2001) Grant to finance small, rural water-supply systems in Ruma, Vrnjakc, Banja and Lipovica (2002)	US$ 250,000 US$ 170,000	
Other municipal services				
Serbia and Montenegro	EU through ERA	Maintenance, repair and small-scale construction of infrastructure facilities (2001)	€320 million	Assistance expected to continue on the same scale and in the same areas, as stipulated in the EU Country Strategy Paper for Yugoslavia for the period 2002-2006
Serbia	USAID	Municipal infrastructure development and maintenance, and support to civil society development, NGO involvement in project implementation. Five-year programme	US$ 200 million	
Other				
Montenegro	Germany through KfW	Plans to invest in the environmental sector, specific areas to be determined.	€2.5 million	

Policy objectives and management

The policy framework

The Water Master Plan for Serbia, prepared by the Institute for the Development of Water Resources, was approved in 2002 and presents a strategy for water supply in Serbia for 2002-2012, including financing needs. To meet increasing demand, and to expand coverage, the Master Plan proposes the continuation of the development, begun in the 1980s, of regional water-supply systems for those regions where the capacities of local sources have been exceeded. Construction began on some of these systems, e.g. the Rzaz system, several years ago but was abandoned over the past few years. The completion of construction on all reservoirs where construction has begun (e.g. Stubo Rovni, Prvonek, Selovabut) is recommended in the Master Plan. It also proposes extensive work on the protection, reclamation and revitalization of groundwater resources, the induction of artificial recharge, and the use of advanced treatment technologies where needed. There are detailed proposals to upgrade the water-supply systems in Novi Sad, Vojvodina, Pancevo, Belgrade, Nis, and the regional systems in Bogoviana and Lopatnica. The Master Plan also proposes some solutions to Vojvodina's water-supply problems, e.g. reducing water extraction, improving water quality by treatment and supplementing water supplies from the regional water-supply systems. The total cost of the investment programme required to meet the objectives of the Master Plan, over five years (2002-2007), is €940 million, of which the State would finance 30%.

The Ministry of Agriculture and Water Management, which is responsible for the construction of water-supply systems in rural areas, has set its own priorities for rural water supply. Its priority areas for investment are southern Serbia – Vranje, Bujanovac and Presevo – Bor in eastern Serbia (for quantity issues) and Doljevac and Bojnik for quality problems. The Ministry has prepared a list of 70 drinking-water-supply projects (2002). Most investments are small, involve the rehabilitation or construction of new wells, pipeline extension and repair, and chlorination systems. According to the Ministry, most of these investments should be financed locally by the municipalities, but, in the absence of funds, the municipalities apply to Ministry.

A programme of water pollution control improvements for the period 2002 to 2012, with priority projects to be undertaken between 2002 and 2007, has also been prepared. The investments proposed are huge and estimated at €484 million over the next five years. The sector has prioritized investments focusing on the sewerage system and industrial pretreatment plants. New plants are selected according to environmental criteria, primarily the protection of water resources for drinking-water supplies, and have been identified as the Gruza reservoir, the Celije reservoir, the Ostruznica region sewerage system, Batajnica sewerage system, and treatment plants for Zrenjanin, Cajetina, Crvenka, Obrenovac, Nis, Vlasina Lake and Backa Palanka.

The legal framework

The Serbian Law on Waters (Nos. 46/91, 53/93, 67/93, 48/94, 55/96) is the legal basis for the protection of waters, the use and management of waters, goods of general interest, conditions and methods for performing waterworks-related activities, the organization and financing of such activities, and supervision and monitoring. The Law covers surface and groundwaters, including drinking water, thermal and mineral water and border and transboundary water flows and inter-republic water bodies within Serbia. By-laws cover a range of topics. Surface and groundwater monitoring are covered by the Law on Waters, the Regulations on hazardous substances in waters (Nos. 31/82 and 13/84). Regulations on the methods and the minimum number of waste–waster quality tests (No. 47/83) govern surface and groundwater quality monitoring. Water quality monitoring is conducted by the Republic Hydrometeorological Institute, which is obliged to measure and record quantities of discharged waste water and to submit the data to the relevant public enterprise. This includes monitoring the performance of waste-water treatment facilities (Box 5.2) (see also chapter 3, on information, public participation and awareness-raising).

The new draft law on the environmental protection system provides the legal basis for overcoming some of the institutional shortcomings that have so far hampered the effective implementation of environmental policy including water protection. It is expected that the new regulations governing the competencies of the Ministry for Protection of Natural Resources and Environment will lead to clearer demarcation and better cooperation and that the establishment of an environmental protection agency will, inter alia, lead to more systematic monitoring, better environmental information, and

stricter inspections and enforcement, including for water.

The drinking water quality standards used in Serbia and Montenegro are based on WHO drinking water quality guidelines and the EU directives for drinking water, whichever is more stringent. Drinking water quality monitoring control is the responsibility of the Institutes of Public Health, and is based on several regulations.

Waste water is regulated by: (i) Regulations on hazardous substances in waters; and (ii) Regulations on the methods and the minimum number of waste-water quality tests.

Rural water-supply systems operate in a legal and institutional vacuum, completely relying on the tradition of self-reliance and without any assurance that the rural population is receiving an adequate quantity of water or that it is not being exposed to severe health risks from poor-quality water. Rural sanitation and solid waste operate in even more of a void. The most vulnerable group is the poor, who can least cope with these problems.

The institutional framework

There is no federal or republican agency that regulates water utilities, plans service needs or channels support in a coordinated manner. Several ministries control different aspects of water supply, e.g. the Ministry of Agriculture and Water Management is responsible for some rural water-supply systems, for irrigation and for flood control. The Ministry of Justice and Local Government is responsible for waterworks. Urban water services are decentralized and delegated to the municipalities. Until 1990, municipalities were in charge only of the day-to-day operation of water utilities and the Serbian authorities were responsible for investment, identification, financing and implementation. Since 1990 these functions have also been largely transferred to the municipalities and direct investment stopped.

The water utilities are publicly owned, municipal companies that are managed by the local authorities. Each of them has a managing board, comprising representatives of the most important municipal stakeholders. A typical utility provides water-supply and waste-water services and, sometimes, solid waste management.

Water management

As indicated above, the sector suffers losses of 50% or more. Most areas have high per capita water consumption, well above the rates in comparable and more developed European neighbouring countries (consumption of 300 litres per person/day is not uncommon; the average in Western Europe is 180-200 litres). The water sector is not financially self-sustaining. Currently, the revenues of water utilities do not cover their operating costs. Utilities are running down their facilities and water and waste-water services are deteriorating.

Box 5.3: Legal framework for water management

- The Law on Waters (No. 46/91, 53/93, 67/93, 48/94, 54/96)
- Regulations on water classification (No. 5/68)
- Regulations on the categorization of watercourses (No. 5/68)
- Regulations on systematic water quality monitoring in 2000 (with the Programme) (No. 8/00)
- Regulations on the contents of technical documentation submitted in the process of applying for water resources compliance and water resources permits (No. 3/78)
- Regulations on the method of determining and maintaining sanitary protection zones for drinking water supply facilities (No. 33/78)
- Regulations on harmful substances in waters (No. 31/82)
- Regulations on the methods and the minimum number of waste-water quality tests (No. 47/83, 13/84)
- Regulations on conditions under which enterprises and other legal persons perform specific types of surface and groundwater quality investigations, including waste-water quality investigations (No. 49/90)
- Regulations on the conditions and methods for drinking water fluoridation (No. 6/97)
- Decree on deciding which enterprises and other legal persons fulfil the conditions for performing specific types of surface, groundwater and waste-water quality investigations (No. 16/91)
- Plan on water pollution protection (No. 6/91)
- Guidelines on methods and procedures for determining the level of treatment of waste water (No. 9/67)

The water utilities charge for communal water supply and sewage services provided by the public utility companies. The tariff system in Yugoslavia is based on the cost of producing and supplying water plus an administrative charge, i.e. the "cost-plus" (rather than a supply/demand) scheme with cross subsidies for the population by industry, which keeps profit at a minimum for the utility. The economic decline made cross subsidies impossible and resulted in a substantial reduction in water consumption by industry. The 20/80 revenue ratio (population vs. industry) in 1990 became 50/50 in the mid-1990s and fell even lower later. Meanwhile, poverty and industrial decline reduced the collection rate below 50% despite the prevailing low tariffs. Even though the tariffs were raised in October 2000, they are still below production costs. In addition, electricity charges are only 25% of the economic cost and are expected to rise soon. This will make it even more difficult for the water utilities to cover their operating and maintenance costs. In sum, municipal water and sanitation services are in deep financial and technical trouble, preventing utilities from initiating the rehabilitation work that is urgently needed to prevent the collapse of water and waste-water services (see also chapter 2, on economic instruments and financing).

5.3 Montenegro

Water resources

In Montenegro the surface water resources include rivers, lakes, and the Adriatic coastal waters. The most important river systems are the Moraca/Zeta the Lim and the Tara/Piva. Skadarsko Jezero, which borders Albania, is the largest lake in the Balkans, with a surface area of 391 km^2.

Water supply

Most drinking-water supplies in Montenegro come from pristine, groundwater sources, primarily springs, which provide 70% of the drinking water. Of the 25 municipal water-supply systems in Montenegro, only two (Pljevlja and Nerceg Novi) use surface water. The municipal water-supply systems supply 213 settlements (40 urban and 173 rural) and approximately 500,000 people. Some 90% (91.1%) of the population receives piped water into the house or garden. There are frequent interruptions in service, particularly in the summer. Of the 109,403,000 m^3 of drinking water produced annually, only 48% is delivered; 52% is unaccounted for. Elimination of these enormous water losses should be amongst the sector's top priorities. The main water-supply problems in Montenegro are: (i) insufficient water quantity for the coastal cities during the summer tourist season, when the population rises from 180,000 to 500,000; and (ii) pollution by municipal and industrial waste-water discharges.

Water quality

The quality of most Montenegrin surface waters is generally adequate during most of the year, but there are exceptions and hot spots. Water quality monitoring of the rivers, lakes and coastal waters reveals the negative impact of industrial and municipal waste-water discharges. The most polluted are two small rivers in the vicinity of Pljevla in northern Montenegro – the Vezisnica and the Cehotina. The stretch of the River Ibar also exceeds standards for BOD, ammonia, phosphates, nitrates, phenols, detergents, mineral oils, manganese, mercury and pathogens. The water quality of Skadarsko Jezero meets all water quality standards for its category, with the exception of ammonia and the resultant eutrophication is documented in the northwest part of the lake.

Surface water quality in Montenegro is a major issue for the tourist and recreational areas along the coast. Tourism is likely to be the engine of growth for the coast, and a clean environment together with clean water and air, scenic mountains and picturesque towns are what attract tourists. The coastal marine waters are generally satisfactory, especially in open stretches; however, the more confined bays with human settlements are affected by waste-water discharges. In many cases, the coastal waters, especially those near Sutomore, Bar and Ulcinj, do not meet bacteriological standards for bathing water in the summer. The exclusive resort of Sveti Stefan has one of the most highly polluted beaches in the country. Increased phosphates and detergents near Budva and Bar are creating problems. Of the closed harbour towns, only Tivat meets the highest water quality standards. Signs of eutrophication have been observed in Herceg-Novi, Kotor and Tivat, probably due to discharges of untreated waste water. The expected increase in the number of tourists along the coast, particularly in the hot period of year, could result in bigger waste-water discharges in the Adriatic Sea, with their consequent effect on water quality (see also chapter 14, on tourism and the environment)

Despite the good quality of groundwaters in Montenegro, the quality of drinking water has

deteriorated with 25% of samples in 2000 below bacteriological standards. The range of unacceptable water varies significantly by region, with coastal cities generally faring the worst (Table 5.8). Larger cities, e.g. Podgorica and Danilovgrad, are more likely to be able to afford the disinfection of drinking-water supplies, which is reflected in the higher water quality figures, more than 97% of samples meet bacteriological standards. While many cities have seen improvements in their drinking-water quality in terms of bacteriological standards since 1997, e.g. Podgorica, Kotor, Berane, others have seen a sharp decline in water quality, e.g. Ulcinj, Tivat, Bar. Similarly with chemical standards, several municipalities, e.g. Ulcinj, Tivat, Andrijevica, have seen quality decline sharply since 1997. Drinking-water quality in Podgorica has improved overall during the past four years.

There is some evidence suggesting that the water quality of rural water systems is even worse than that of the urban systems. A survey conducted by the Montenegro Institute of Public Health in 2001 showed that, out of 194 private wells that were analysed in rural areas, 120 (62%) did not comply with bacteriological standards.

Sanitation and waste-water treatment

Only 60% of homes are connected to a public sewerage system, with large regional differences. Sewerage systems have been established in the central parts of Podgorica and many of the larger towns in Montenegro but are usually not extended to the town outskirts. The Podgorica waste-water treatment plant was designed for 55,000 people and is now servicing 150,000. This means that a large percentage of the waste water collected is discharged untreated. Outside Podgorica about 55% of dwellings are connected to sewerage systems. In five municipalities the coverage is above 90%, while in nine the figure is below 50%. Kolasin, Tivat and Bijelo Polje have no systems at all. No urban community has a comprehensive sewerage system. The systems are all dilapidated and out of date. In smaller towns and rural settlements sewerage systems are non-existent. A total of 28.2% of the population uses septic tanks and absorbing wells (wells previously used for drinking water converted to disposal sites) for waste-water disposal. Tanks that collect waste water and sludge from septic tanks dump their contents into rivers or pour it on the ground.

At least 18 million m^3 of municipal waste water is discharged each year into rivers and gorges, often in the vicinity of urban areas, sometimes close to drinking-water sources. An unknown volume drains directly into the ground. Commercial enterprises use water from the existing networks and discharge it polluted into the city sewerage system. No information on industrial discharges is available.

Table 5.8: Percentage of samples not meeting bacteriological and chemical standards, 1997 and 2000, in selected cities

City	% samples not meeting bacteriological standards		% samples not meeting chemical standards	
	2000	1997	2000	1997
Ulcinj	47.6	25.0	28.6	6.0
Tivat	31.8	5.9	54.9	23.6
Andrijevica	22.9	25.0	50.0	25.0
Bar	21.2	11.7	3.6	7.7
Pluzine	20.4	25.0	20.4	14.9
Kotor	16.7	32.7	16.7	19.2
Mojkovac	16.6	14.3	32.6	60.7
Kolasin	15.6	7.3	29.6	16.7
Budva	9.5	1.2	1.9	0.0
Berane	2.6	12.6	3.6	13.7
Danilovgrad	2.5	8.3	6.6	13.6
Podgorica	2.8	11.2	3.7	33.0

Source: Statistical Yearbook 2000 on Population and Public Health in Montenegro. Podgorica, 2001.

Policy objectives and management

The policy framework

In Montenegro's Economic Reforms and Recovery Strategy environmental issues are reflected in a special programme for infrastructure development, highlighting the need to develop and improve the water supply and waste-water treatment. The programme also emphasizes the urgency of an integrated coastal zone management strategy, to steer the development of tourism in Montenegro. The Long-term Water Supply Protection for Montenegro Study, adopted in 1999, is the foundation for water-supply development in Montenegro.

The legal framework

The Law on Waters is the legal basis for water protection in Montenegro. By-laws cover a range of topics (Box 5.4).

The institutional framework

Like Serbia, responsibility for water management in Montenegro is shared amongst ministries and the municipalities. The Ministry of Agriculture, Forestry and Water Management and the Ministry of Environmental Protection and Spatial Planning have some responsibilities. The Ministry of Environmental Protection and Spatial Planning has taken the lead in sector planning and organization, including the involvement of the private sector. All water sector infrastructure belongs to Montenegro. It delegates its use and the responsibility for service provision to municipalities, each with its own water company. The Institute of Public Health in Montenegro is responsible for monitoring drinking-water supplies and has the authority to close systems that do not produce water according to standards.

Water management

The water management problems in Montenegro are essentially the same as those noted for Serbia. While the privatization of the water sector is under consideration in Serbia, Montenegro is piloting a new approach to utility management involving the private sector. A public-private partnership for utility management called Monte-Aqua has been formed by merging the assets of four principals: (i) Aquaregia Public Company, created by merging the water companies of Ulcinj, Bar, Budva, Tivat, Kotot, Herceg Novi and Ceinje, and the Montenegrin Seaboard Regional Network Public Company; (ii) a German company, Aquamundo, which sponsors the project; (iii) DEG Investment Fund from Germany; and (iv) a private company, Mercur, from Budva. Monte-Aqua will rehabilitate, upgrade, extend and manage the water supply and sanitation services of the area under its responsibility. Six of the seven coastal municipalities that will be part of this regional scheme have signed letters of intent to participate in the programme according to the concept of public-private ownership. Phase I of this programme started on 16 January 2001, with financing from KfW and GTZ (DM 14.5 million) for technical assistance and urgent investments in rehabilitation and improved operations.

The investment for all town water-supply networks and the Montenegrin Seaboard Regional Water Network to 2020, as well as investment in priority facilities and work for improvements and further development, is €178.55 million. Of this, 52% will be used to complete the construction of the Montenegrin Seaboard Regional Water Network (€89.76 million), 44.5% would be allocated to all other town water networks and 3.8% to rural water networks (€6.74 million). Investment into priority facilities and work that is needed to improve the present water-supply systems is €19.66 million.

User charges for water supply and waste-water services are kept low by local authorities, since they are considered "social services". Like Serbia, charges are not sufficient to cover maintenance or even, at times, operating costs related to these services. Low collection rates and system inefficiencies are also among the reasons why the public utilities are incurring such high losses, which have to be covered by the municipal and central governments, increasing their budget deficits. However, some steps are being taken to achieve cost recovery through charges. In Podgorica, charges for water supply, waste and waste-water collection were raised significantly in early 2002.

Box 5.4: Legal framework for water management

- The Law on sea and internal shipping (Nos. 13/78, 8/79, 19/87, 36/89, 13/91)
- The Law on water supplying, removal of waste water and depositing of solid waste in the territory of municipalities: Herceg Novi, Kotor, Tivat, Budva, Ulcinj and Cetinje (No. 46/91)
- The Law on coastal assets (No. 14/92)
- The Law on waters (Nos. 16/95, 22/95)
- Regulations on the classification and categorization of waters (Nos. 14/95, 19/96, 15/97)
- Regulations on measuring methods and the monitoring of the quality of sea water for bathing and recreation (No. 9/91)
- Regulations on the contents of technical documentation necessary for issuing water resources compliance and water resources permits (No. 4/96)
- Regulations on keeping the water registry and surface and groundwater cadastre, the users and polluters of water, torrent flows and erosive areas and water production premises and facilities (Nos. 5/96, 19/96)
- Regulations on methods for determining and maintaining sanitary protection zones for drinking-water sources and restrictions in the related zones (No. 8/97)
- Regulations on waste-water quality and the methods of their emission into the public sewerage system and natural recipients (Nos. 10/97, 21/97)
- Decisions on establishing the Public Enterprise for the water supply, the treatment and removal of waste water and depositing solid waste for areas of the Montenegrin coast and Cetinje (No. 50/91)
- Decision on establishing a public enterprise for managing the coastal assets (No. 25/92)
- Decision on establishing a public enterprise for water resources (No. 39/92)
- Decision on criteria, level and payment methods for compensation for water pollution protection, compensation for material extracted from the pipeline system and compensation for use of water resources facilities (Nos. 15/96, 19/96, 35/98)
- Decision on starting the drafting of the spatial plan for the coastal assets (No. 16/97)
- Programme of systematic water quality investigations into water operations (the zone of sanitary protection) and public beaches (No. 13/00)
- Regulations on permitted amounts of hazardous and harmful substances in soil and water for irrigation and their testing methods (No. 23/94)

5.4 Conclusions and recommendations

Recommendation to the Federal Government and Serbia

Yugoslavia is responsible for about 13% of Danube nutrient pollution and hence contributes to the deterioration of the Black Sea ecosystem. Policies and incentives to reduce nutrient run-off in agriculture and improved municipal and industrial waste-water treatment in the Danube Basin are needed to alleviate this problem.

Recommendation 5.1:
*The appropriate authorities of the **Federal Government** and the Federal Hydrometeorological Institute should design and, in collaboration with **Serbia**'s Ministry for Protection of Natural Resources and Environment, should implement a Danube nutrient reduction investment project consistent with the nutrient reduction targets called for by the Convention on Cooperation for the Protection and Sustainable Use of the Danube River.*

Recommendations to Serbia and to Montenegro

Direct and indirect damage due to floods and non-regulated rivers is significant in Serbia and Montenegro. The approach to floods has focused on the joint use of structural mitigation measures (e.g. building and use of reservoirs and dykes) and non-structural measures (e.g. identifying hazard-prone areas and limiting their use). Preparedness, early warning and recovery measures have received less attention.

Recommendation 5.2:
***Serbia**'s Ministry of Agriculture and Water Management, in collaboration with its Ministry for Protection of Natural Resources and Environment, and **Montenegro**'s Ministry of Agriculture, Forestry and Water Management, in collaboration with its Ministry of Environmental Protection and Physical Planning, should prepare a comprehensive national flood disaster management strategy, which includes preparedness, mitigation, recovery and reconstruction. The impact of floods can be further reduced by integrating hazard mitigation measures into land-use planning and investment projects.*

Water, sanitation and waste-water management and water use are deteriorating. While statistics indicate that, in 2000, 98% of the country's population had access to safe drinking water, neither the quality nor the coverage of service is uniform. Rural areas rely heavily upon private water-supply systems that are beyond the purview of any water quality monitoring programme. Given the poor water quality in general, this situation could render rural communities and households susceptible to water-related health problems. The lack of access to water and sanitation is a major public health issue, particularly for urban slums largely inhabited by internally displaced persons, Roma and refugees. The international private sector has shown interest in the management of the larger water systems in Belgrade, Nis and Novi Sad as well as in the coastal cities of Montenegro, and its involvement in service delivery will probably be the most efficient way to address these systems' current problems. However, in contrast to the big cities' water utilities, water companies in medium-size cities and rural areas have limited access to financial resources and are not expected to attract private sector interest immediately.

Recommendation 5.3:

***Serbia**'s Ministry for Protection of Natural Resources and Environment, in collaboration with its Ministry of Agriculture and Water Management and its Ministry of Health, and **Montenegro**'s Ministry of Agriculture, Forestry and Water Management, in collaboration with its Ministry of Environmental Protection and Physical Planning and its Ministry of Health and Social Policy, should:*

(a) *Undertake a thorough study of rural water-supply systems, both formal and informal, as the basis for designing a programme for improving rural water supply. In Serbia, the Ministry of Agriculture and Water Management has a list of priority projects in small town and rural water-supply systems that could serve as the basis for an assessment of rural water needs. The assessment should include, inter alia, the state of the existing water-supply systems, an inventory of informal water-supply systems, an inventory of private wells and a survey of water quality in private wells;*

(b) *Provide the legal and institutional framework for monitoring, regulating and supporting the rural water sector, as a priority;*

(c) *Focus on water-supply systems for medium-size cities and rural areas. This includes urgent investment to get infrastructure working again, lower operating costs, provide operational and management information and deal with immediate water quality problems;*

(d) *Include in a rural water-supply programme a component for health education and promotional activities that would incorporate, among other things, education and training on the appropriate design and use of wells, design and use of home-made chlorination systems, school sanitation and health, and water quality monitoring in remote rural communities; and*

(e) *Give top priority to the provision of water-supply and sanitation services to communities or persons who are underserved.*

Recommendation 5.4:

***Serbia**'s Ministry for Protection of Natural Resources and Environment, in cooperation with its Ministry of Health, and **Montenegro**'s Ministry of Health and Social Policy, in cooperation with its Ministry of Environment and Physical Planning, should expand drinking water quality monitoring to rural areas.*

In most medium-size cities in Serbia and Montenegro small investments to strengthen the capacity of utilities to manage demand properly could have a quick and high return and help avert most of the current shortages. However, this action will be effective only if accompanied by adequate pricing policies and support from the municipal authorities.

Recommendation 5.5:

***Serbia**'s Ministry of Agriculture and Water Management and **Montenegro**'s Ministry of Agriculture, Forestry and Water Management should:*

(a) *In the medium term, improve the financial situation of water and waste-water utilities through appropriate pricing policies, management strengthening and better operating procedures;*

(b) *Allocate funds to achieve a cost-effective mix of institutional strengthening, improved efficiency and service expansion;*

(c) *Give priority to maximizing the efficiency of existing water utility systems with a first step directed towards reducing the huge losses in the systems; and*

(d) *Continue developing private sector involvement.*

The water utilities are not financially sustainable and all are in dire straits. There is virtually no maintenance or investment in new technology, so water services are deteriorating. If water-supply services are to improve and be sustainable in the long run, the municipal or regional sector institutions or utilities must be put on a sound financial footing. Reducing water consumption lowers operating costs and postpones the need for investment in additional capacity, thereby improving the financial situation of a utility.

Although many utilities have in the past had good experience with the adoption of metered-based billing and bill collection, most of them now collect less than 50% of their bills. Poor collection is a crucial obstacle to financial viability. Accounting systems that conform to international standards should be introduced as part of the process of strengthening water utilities.

Increased tariffs have several benefits. First, they will reduce per capita water consumption to levels that are more in line with Western European standards. Second, increased revenues will allow utilities to carry out maintenance activities, remedying physical losses. Increased revenues will also decrease the need for subsidies and make funds available for expanding services.

The following initiatives would help ensure the financial viability of the water utilities.

<u>*Recommendation 5.6:*</u>
***Serbia**'s Ministry of Agriculture and Water Management and **Montenegro**'s Ministry of Agriculture, Forestry and Water Management should:*

(a) *Reduce consumption through water-demand management and demand-reduction programmes that would include a cost-effective metering strategy, consumption-based billing, tariff levels that are sufficiently high to induce consumers to use less water, and public awareness on water conservation;*

(b) *Adopt adequate commercial management systems;*

(c) *Replace the current "basic cost-plus" tariff formula with one that provides incentives for cost reductions and allows for an acceptable level of profits and reduces large differences in tariffs among household, industrial, and other users. Targeted support for vulnerable users should be included as part of the tariff reform; and*

(d) *Improve the efficiency and reduce the operating costs of the utilities with policies aimed at: improving their financial management and control, streamlining personnel, making plant and network operations more efficient through rehabilitation and adequate maintenance, reducing water and energy consumption, using good materials, and insisting on quality civil works. These efforts should involve the customers as part of a more general effort to improve client orientation.*

Access to improved sanitation services (connections to sewage systems and septic tanks) has improved in the past ten years. In urban areas 97.6% of homes are connected to sewerage systems or septic tanks, while 77.7% of the population in rural areas has the same disposal service. About 20% of the population in rural areas still relies on the traditional pit latrine. Urban municipal and industrial waste-water discharges, largely untreated, are a major cause of water pollution. Considerable investment is needed in the sector.

<u>*Recommendation 5.7:*</u>
***Serbia**'s Ministry for Protection of Natural Resources and Environment, in collaboration with its Ministry of Agriculture and Water Management, and **Montenegro**'s Ministry of Environmental Protection and Physical Planning, in collaboration with its Ministry of Agriculture, Forestry and Water Management, should set priorities for the selection of the most urgent needs in waste-water treatment infrastructure, such as waste-water treatment plants that discharge into or upstream of vulnerable zones, e.g. drinking water resources, recreation areas, and protected areas.*

Recommendations to Serbia

Recommendation 5.8:
The Ministry for Protection of Natural Resources and Environment and its Ministry of Agriculture and Water Management should set up a methodology and related practicum (instruction) and carry out a survey of spot and diffuse pollution sources by catchment and sub-catchment, inter alia, to provide a basis for mapping pollution loads.

Recommendation 5.9:
The Ministry for Protection of Natural Resources and Environment should:

(a) Introduce standards and norms for water quality (surface and ground) taking into account physical and hydro-ecological aspects of water systems, consistent with relevant international legislation;

(b) Establish, in cooperation with competent authorities for standardization, methodological standards for sampling and laboratory analyses (chemical, microbiological, biological) of natural waters; and

(c) Initiate and enforce accreditation of laboratories that examine natural and waste waters and ensure standardized inter-calibration methods and procedures.

Recommendations to Montenegro

The threat of coastal zone deterioration in Montenegro is a crucial issue due to uncontrolled construction activities and a lack of waste-water treatment. Signs of eutrophication and bacterial contamination in tourist areas are visible. The coastal areas are also very short of drinking water during the peak summer season. There is no coastal zone management plan to guide decision-making on coastal development and pollution control. Montenegro's aspirations to develop its tourism sector (it is targeting 22 million tourist nights or four times the current figure by 2020) demand a reversal of these negative trends. Developments need to be supported by a stricter application of water, sewerage and waste-water treatment standards, investment in waste-water treatment and land management planning. Water pollution control through improved waste-water treatment should be dealt with as a priority.

Recommendation 5.10:
The Ministry of Environmental Protection and Spatial Planning, in cooperation with its Ministry of Tourism, should prepare a coastal zone management plan integrating all sectoral plans including documents for infrastructure, environmental and landscape protection, as well as municipal services development.

Recommendation 5.11:
The Ministry of Environmental Protection and Spatial Planning, in cooperation with the Ministry of Tourism, should assess the waste-water treatment improvements for the coastal cities that are currently under way through private-public partnerships in Montenegro.