Chapter 6

WATER MANAGEMENT, INCLUDING PROTECTION OF LAKES

6.1 Water resources

Climatic and geographic features

The country's topography is characterized by its mountain relief crossed by vast valleys and numerous long and narrow ravines. The country is under the combined influence of (i) a Mediterranean climate, (ii) a middle-European dry continental climate, and (iii) a mountain climate resulting from its mountainous (80 per cent of the territory) and high (up to 2700m) relief. Its climatic parameters, such as rainfall, temperature, atmospheric pressure, wind and moisture, vary greatly and all have a significant impact on its water regime.

Rainfall across the country is uneven and sporadic and small in quantity. Average annual rainfall is approximately 733 mm (i.e. 19 billion m^3). Dry and hot periods are long (summer-autumn) and cold periods short (winter). Rain is heavy from October to December, and lighter from March to May. Sudden short and intensive rainfall is also a characteristic of a Mediterranean climate. It produces intensive erosion and local floods that can destroy infrastructure and cause landslides.

The west receives heavy rain while dry spells sometimes lasting over 100 days mainly during the summer (July-September) are characteristic of the central part of the country. The smallest yearly rainfalls are registered in the centre and east of the country, in Gradsko (380 mm), Veles (470 mm), Kavadarci (489 mm) and Sveti Nikole (500 mm); the heaviest rain is registered in the west on the Shara and Baba Mountains (1400 mm and 1300 mm). The former Yugoslav Republic of Macedonia is classified as a semi-arid area. Its agriculture is limited by the availability of water.

Water reserves and availability

The country's yearly average water availability from surface resources is approximately 5.5 to 6.5 billion m^3 (4.5 for a medium dry year), of which 0.4 to 0.6 billion from springs. The yearly volume of groundwater is about 0.3-0.5 billion m^3, an estimate that is considered to be low (Figure 6.1). Most of these resources are found in the Vardar basin (72 per cent) and, to a lesser extent, in the Crni Drim (25 per cent) and Strumica basins (3 per cent).

According to 1995-1996 data, 1.5 to 1.7 billion m^3 are used per year, 84 per cent from surface water and 16 per cent from groundwater and natural springs. Therefore, about one third of the water resources are used, which is indicative of a country with rather scarce water resources.

6.2 Natural hydrographic network

Surface Waters

Rivers

There are four hydrographic catchment areas: Vardar, Crni Drim, Strumica and Juzna Morava. The key characteristics of the main rivers and their tributaries are shown in table 6.1.

- The River Vardar catchment area covers 20,661km^2, or 80.4 per cent of the country. It receives four major tributaries, the Treska, Pchinja, Bregalnica and Crna, and includes the Dojran Lake catchment area. It rises at 683 m above sea level (m.a.s.l.), and runs 301 km down to the Aegean Sea. The total yearly average of available water in this catchment area is about 4.6 billion m^3.

- The Crni Drim catchment area in the west covers the catchment areas of Lakes Prespa and Ohrid and that of the Crni Drim with its tributaries. The catchment area of the River Crni Drim covers 3,359 km^2, or 13.1 per cent of the former Yugoslav Republic of Macedonia. This region is the richest in water resources. The River Crni Drim flows from Lake Ohrid, at the town of Struga, at an altitude of 693 m.a.s.l and runs north along the Jablanica Mountains.

The total yearly average of available water in this catchment area is 1.64 billion m^3.

- The Strumica catchment area in the south-east extends over the catchment areas of the Strumitsa, Cironska and Lebnitca Rivers to the Bulgarian border. It covers 1,649 km^2, or 6.4 per cent of the country's territory. The main tributaries of the Strumica River are the Vodotcha, Touriya, Radovishka Reka and Podareshka Reka. This area is the poorest in water resources and the lack of water affects all segments of human activities: water supply to the population (especially in the rural areas), industry and irrigation. This also aggravates the water quality situation and flow rates are often below the biological minimum in the periods when the rivers dry up. The total yearly average of available water in this catchment area is approximately 132 million m^3.

- The catchment area of the Juzna Morava is on the territories of both Yugoslavia and the former Yugoslav Republic of Macedonia. In the latter, it covers an insignificant area of 44 km^2, and therefore it does not have a major impact on the water resources available in the country. The River Binacka Morava rises in the former Yugoslav Republic of Macedonia's territory and continues its flow into neighbouring Yugoslavia.

Lakes

The two biggest natural lakes in the former Yugoslav Republic of Macedonia are Ohrid and Prespa. They both belong to the Vardar catchment area.

- Lake Ohrid has endemic characteristics very similar to those of Lake Baykal and Lake Tanganyika. Its total volume is 50.68 billion m^3, with a water surface of 357 km^2, a maximum length of 29.5 km, a width of 14.7 km and a maximum depth of 269.8 m. The Lake surface is at an average altitude of 693 m.a.s.l. This Lake is transboundary with Albania. About 70 per cent of its surface area (i.e. 250 km^2) belongs to the former Yugoslav Republic of Macedonia. Of the total catchment area, 843km^2 belong to the former Yugoslav Republic of Macedonia and 308 km^2 to Albania. The Lake has been designated by UNESCO as a world natural heritage site for its crystal water and scenic beauty. It is a major tourist asset for the country.

- Lake Prespa has a total volume of 4.78 billion m^3, with a water surface of 328 km^2, a total length of 43.3 km, a width of 16.4 km, and maximum depth of 55.55 m. The former Yugoslav Republic of Macedonia shares the lake with Albania and Greece, so that 197 km^2 of its water surface belongs to the former Yugoslav Republic of Macedonia, 48.4 km^2 to Albania and 82.3 km^2 to Greece. Its catchment area is 1,046.25 km^2, of which 571 km^2 belong to the former Yugoslav Republic of Macedonia. During the past 15 years the Lake's water level has declined significantly.

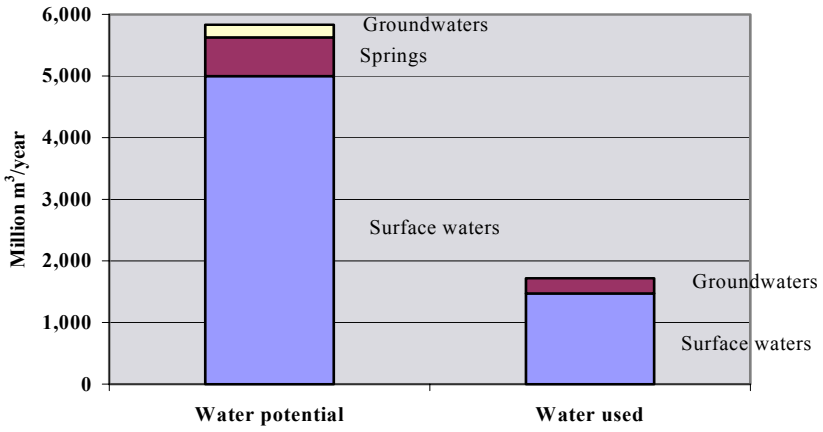
- Located in the south-east of the country, Lake Dojran, third in importance but the smallest natural lake in the former Yugoslav Republic of Macedonia, also belongs to the catchment area of the Vardar River. It, too, is shared with Greece. Its total water surface is 43 km^2, of which 25.62 km^2 belong to the former Yugoslav Republic of Macedonia and 17.07 km^2 to Greece. During the past 15 years its water table has fallen because of natural hydrologic phenomena, dry climate cycles and human uses. Lake Dojran is an isolated ecosystem with very specific flora and fauna, which are threatened. For a couple of years now the level of the Lake has risen, as a result of the improved hydrological situation, but it is still below its original level.

The Galitchica Mountain separates Lakes Prespa and Ohrid. A number of scientific observations show that the water from Lake Prespa situated at 854 m.a.s.l., or about 150 m above the Ohrid water table, runs off into Lake Ohrid through the karstic mountain grounds, and re-appears as surface springs at St Naum and as underground springs at the bottom of Lake Ohrid.

Underground waters and springs

The underground waters are primarily located under the main river valleys. There are not sufficient data on the quality and quantity of available underground waters. Some, albeit limited, information is available about the underground water level fluctuations in the Polog Valley, Skopje Valley, Ovche Pole, Kotchani Valley, Strumica Pole, the Bitola part of Pelagonija and the Struga Pole.

Figure 6.1: Water resources



Source: Integrated Water resources Development and Management Master Plan, May 1999.

Table 6.1: Characteristics of the main rivers

River	River catchment	Catchment area (km^2)	River length (km)	Average annual flow (m^3/s)	Average annual volume (billion m^3)	Specific run-off ($l/s/km^2$)
Vardar	Vardar	20,661	301	63-145 (a)	4.600	7.0
Treska	Vardar	2,068	139	24.2 (b)	0.764	12.9
Lepenets	Vardar	770	75	8.7	0.271	11.2
Pchinja	Vardar	2,841	137	12.6 (c)	0.400	4.6
Bregalnitca	Vardar	4,344	..	12.2 (d)	..	4.1
Csrna Reka	Vardar	4,985	228	29.3	..	5.1
Boshava	Vardar	468	52	23.4 (e)	..	..
Crni Drim	Crni Drim	3,359	45	52.0 (f)	1.640	12.3
Radika	Crni Drim	..	..	19.3	..	..
Strumica	Strumica	1,649	..	4.2 (g)	0.132	3.1
Binacka Morava	Juzna Morava	44	..	..	..	..

Source : Protection and utilization of water and water economy infrastructure, 1998.
Notes :
(a) 63 in Skopje; 145 in Gergelija
(b) at its confluence with the River Vardar
(c) at Katlanovska Banja
(d) in Shtip
(e) at Rasimbegov Most
(f) at Shpilje hydro power station
(g) at Novo Selo

The registered number of springs totals 4,414, of which 58 have a capacity of 100 litres per second or more. A specific feature of the spring waters is their fluctuating outflow during the year. They reach their maximum during May-June and after heavy autumn rainfall. The total flow of these springs is estimated at over 20 m^3/s.

Of these springs, three are located in the middle course of the River Vardar, while the others are in the western regions. In the Treska catchment area, there are 18 springs; in the River Vardar catchment area, there are 19, of which the most important is the Rashche spring with an average capacity of 3.5 m^3/s (its maximum is over 6.0 m^3/s). This spring is

very important as it supplies the city of Skopje and its surroundings (over 600,000 inhabitants and industry). In the catchment area of the River Crna Reka there are four springs, seven in the catchment area of the Crni Drim, including Lake Ohrid, of which the biggest is St. Naum, with a capacity exceeding 10 m^3/s.

The main geothermal zones with thermal waters are located in the regions of Volkovo-Skopje-Katlanovo, Kumanovo-Kratovo, Istibanja-Kotchani-Shtip, Strunitsa, Smokvitsa-Hegorci-Gevgelija and Kosovrasti-Debar-Banishte. Because they are few and their chemical composition particular, their use is limited to very specific purposes. Their waters are mainly used for balneological and spa therapy, and for bottled mineral drinking water, while some small quantities, as in Kochani for example, are used for heating greenhouses and other buildings.

Water Quality and Trends

Water resources, i.e. ground and surface waters, are relatively clean in their upper course, and rapidly worsen along their middle and lower courses. This situation is the result of unpurified waste water discharged chiefly by human settlements, but also by industry and agriculture. In some places, for instance downstream of Skopje and Veles on the Vardar River, water quality even breaches the maximum limits for class IV. Often, the water bodies do not comply with the quality class objectives set for them.

The major polluters of surface and groundwaters are the municipal sewerage systems that collect household and industrial waste water (in many settlements rainfall drainage, too) and the industrial sewerage systems. In the agricultural northeast, there is significant pollution from livestock waste, farms, slaughterhouses, milk processing, meat and canned food industries. In general, polluted waters are directly discharged into receiving water bodies without any treatment. Some rivers are actually turned into collectors of waste water (dead rivers) by enormous pollution discharges. This is the case of the Vardar in Skopje after the urban waste-water discharges, in Veles after the waste-water discharge from the smelter plant and the fertilizer plant; and also with the Dragor near Bitola and the Kumanovka near Kumanovo. The water quality of the Vardar, Crna Reka, Strumesnica and Bregalnica rivers, after receiving household and industrial waste waters from the towns of Tetovo, Skopje, Veles (Vardar), Prilep, Bitola (Crna Reka), Kocani, Stip (Bregalnica) and Strumica (Strumesnica), is below regulation standard and in poor hydrobiological condition. In recent years the situation has somewhat improved because of the industrial decline. (see Chapter Introduction)

Surface waters

The surface water quality situation in 1997 is represented in Figure 6.2. It reflects the quality classes as defined in the Decree on the Categorization of Waters (Official Gazette, No. 18/99) shown in Table 6.2 (a) and (b). There are no more recent comprehensive data available about surface water quality.

Surface water quality is unsatisfactory in the former Yugoslav Republic of Macedonia. A series of components indicates pollution from both households and agriculture. For instance, the content of nitrites has increased dramatically since the period 1978-1997 - especially in Bregalnica and Crna Reka. The same is true of the BOD_5 content in the same waterways. The level of dissolved oxygen is very low in Crna Reka at the Novaci and Skocivir measuring points, as well as in the Kumanovska and Dragor rivers after the waste-water discharges from Kumanovo and Bitola respectively. The nitrates in the waterways examined are within regulation limits.

Other elements indicating pollution from industrial sources are detected in a few specific places. Lead, zinc and cadmium are recorded in the River Vardar downstream of the smelter facility in the town of Veles. Cadmium is also present in concentrations above the norms in the measuring points of the upper course of the Bregalnica River and in Lake Tikves, which belongs to the Crna Reka basin. Chromium is found in the Vardar River after the Jugohrom production site upstream of the city of Skopje, although the standard value is not exceeded. Phosphorus and nitrates are present in the Vardar downstream of the fertilizer production facility of Veles. However, while the amount of these elements discharged by industrial facilities is high, there is no regular monitoring indicating exact levels.

Box 6.1: Lake Ohrid Conservation Project

Lake Ohrid is a transboundary lake in the southwest of the former Yugoslav Republic of Macedonia and is transboundary with Albania on its western bank. It covers 349 km^2, of which 230 km^2 (66 per cent) belong to the former Yugoslav Republic of Macedonia. UNESCO classified it as a world natural heritage site in 1979. It is a natural, cultural and historical monument and the cradle of very ancient civilizations (Neolithic). The Lake is one of the oldest in Europe. Because of its oligotrophic state, it is one of the largest biological reserves in Europe, sheltering unique flora and fauna that are extinct elsewhere. Due to its age, many of Lake Ohrid's aquatic species are endemic, including 10 of its 17 fish species. The quality and hydrological conditions of Lake Ohrid are tied to those of Lake Prespa, as half of Lake Ohrid's water comes from Lake Prespa through an underground aquifer and natural siphon mechanism.

Lake Ohrid is an important cultural and tourist asset for the former Yugoslav Republic of Macedonia as the country has no access to the sea. For some time, the development of human settlements and tourist infrastructures have been putting a strain on the Lake. At present, more than 100,000 people live and work along its banks, and exert environmental pressure (domestic activities; tourism; textile, metal, electrical industries; and agriculture and fishing). A sewage collection ring has been built to collect discharges from Elsani to Struga (one third of the lake shore) and bring the waste water to treatment plants in Ohrid and Struga. However, a few villages and industrial facilities are not yet connected to it and pollution from agriculture is still uncontrolled. An additional pollution surplus is generated by tourism during the high season. Different pieces of legislation specific to the Lake aim at controlling the human activities that could endanger it, such as fishing, the use of phosphate-containing detergent, the introduction of allochtonous fish species. However, there is no harmonization in the objectives and legislation regarding the Lake and its management between the two border countries. This seriously impairs its sustainable management.

In 1996, in an attempt to protect the Lake from anthropogenic pressures, both border countries adopted the Lake Ohrid Conservation Project financed by GEF and implemented by the World Bank. The three-year project started in 1998 at a total cost of US$ 4.4 million, of which 2.4 million for the former Yugoslav Republic of Macedonia. Its main objectives are to:

- Develop a basis for the joint management and protection of the Lake by the two border countries,
- Create conditions for promoting environmentally friendly solutions for the management of natural resources and the economic development of the watershed.

The first step consisted in developing a participatory watershed management approach. The project has involved all the local stakeholders, including many NGOs. A water management committee was set up, which is a good example for the establishment of river basin management committees in the rest of the country. A memorandum of understanding has been concluded between the two countries for harmonizing the Lake's monitoring programme. Still under debate is the sustainable management and control of fish stocks. Pilot projects in forestry, tourism, spatial planning, sewage, waste management and the use of phosphate-free detergents are being developed in cooperation with NGOs. Since GEF support will come to an end in 2003, the success of the project may be jeopardized unless the Government mobilizes all its efforts and political will to consolidate this transboundary watershed management approach.

Underground waters

Underground waters from karstic springs and from aquifers (over 80 per cent of the waters used for the settlements' water supply) have their watersheds (wide protection zone) usually in high mountain areas, where there are no industrial polluters and few people. The potential bacterial pollution can come only from extensive cattle breeding in the summer. While these waters have not been regularly monitored since 1981, spot checks show that most are quality class I or II. (see table 6.3)

For the underground waters used for drinking water and that are monitored by the Ministry of Health, the indicators of pollution of organic origin, such as COD, BOD, nitrogen compounds (ammonia, nitrates, nitrites) do not indicate any potential sanitary-hygienic problem, except for a small number of water-supply facilities in a few villages. (see Chapter 14 on Human health and the environment)

6.3 Built infrastructure for waterflow management

Flood Control

Because of its geomorphology and climate, the former Yugoslav Republic of Macedonia is very prone to flood damage. Recent examples of the destructive effects of such short-lasting rainfall were the floods in Negotino, Kavadarci, Valandovo and Strumitsa in 1995. For some time, waterflow regulation has been a basic water management activity. Measures have been taken in the river basins and in the riverbeds to improve their water flow and protect their immediate surroundings. The flood control systems include:

- The local regulation of riverbeds in urban areas;
- The systematic regulation of rivers over longer sections; and
- Control embankments and dikes.

The regulation of the Vardar River in Skopje dates back to after the big floods of 1895 and 1897. Since then, quay walls and control embankments were constructed and continuously expanded, in particular after the 1935 floods and during the 1950s. At the same time, the "Skopje Pole" drainage system of the city surroundings was also built up.

The 1950s and 1960s marked the construction of large hydro irrigation schemes (see below): extensive regulation works were undertaken to drain the Pelagonija region through the regulation of the rivers Tsrna, Dragor, Shemnitca, Blato and of a great number of streams; the Strumica region through the regulation of the River Strumica, the Monospitov Canal and some small streams; the Struga region through the melioration of the River Crni Drim and many small streams. Overall, outstanding regulation works have been undertaken on the River Vardar (in Gostivar, Tetovo, Skopje, Veles, Negotino, Kavadarci and Bogdanci), on the Treska (in Kichevo and Makedonski Brod), on the Pchinja (in Kriva Palanka and Kratovo), on the Bregalnica (in Berovo, Delchevo, Vinica, Kochani, Shtip), on the Tsrna Reka (in Prilep, Bitola and the Pelagonija system) and on the Crni Drim (in Resen, Tzarev Dvor, Struga, Sateska).

Dams and Reservoirs

The uneven distribution of the surface waters in location, time and quality largely prevents the optimized use of water resources. Therefore, the construction of dams and the creation of reservoirs that modify the water regime and make it more manageable were essential. These infrastructures enable a full and efficient use of waters both in the water management (electricity production, irrigation, water supply) and the protection of the human environment from water harmful effects. The former Yugoslav Republic of Macedonia has two types of dams.

Large dams together with their auxiliary facilities enable the multipurpose use of water resources. The stored water is used for the water supply for the population, industry, irrigation, the production of electric power, flood control, for maintaining the biological minimum water flow, and for sports, recreation and tourism. Started in 1938, construction became more active in the late 1950s and especially in the 1960s, resulting today in about 20 large dams. Thirteen big dams were built in the Vardar catchment area, three in the Strumica and three in the Crni Drim catchment areas. Most (13) of the dams were built as embankment dams with local material: clay, sand, gravel and crushed rock, for instance in Tikvesh (113.5 m) and Shpilje (112 m). The others are concrete arches and dams. At present, two high dams are under construction: the Kozjak Dam on the River Treska and the Lisitche Dam on the River Topolka. Total water storage capacity is 1.85 billion m^3 and 1.11 billion m^3 available capacity (compared to the capacity of Lakes Dojran of 0.43 billion m^3, Prespa 4.78 billion m^3 and Ohrid 50.68 billion m^3).

Over 120 small dams and reservoirs provide water for the irrigation of smaller areas, the water supply of rural settlements and local industries, and fish farming. The level of the small dams ranges from a few metres to 28 metres, while the volume of stored waters varies from 10,000 to 1 million m^3 depending on the dam. Total capacity is 10 million m^3. The total area that can potentially be irrigated from these small dams is approximately 58 thousand hectares, of which 42 thousand hectares were actually irrigated in 2000. A large part of the corresponding irrigation network has not been built owing to a lack of funds. Plans for building new reservoirs and completing the existing irrigation network of small reservoirs do exist and would aim at a more efficient use of the water from the small rivers. The construction of dams would have the usual environmental impacts: modification of the hydrological regime of rivers, modifications of river and terrestrial ecosystems, relocation of human settlements and human activities.

Irrigation schemes and the drainage network

The climate and pedological conditions of the country are suitable for intensive and effective agricultural production, but only if water is efficiently provided through irrigation. The arable agricultural area totals approximately 667 thousand hectares, essentially located in valleys. Potentially, 400,000 hectares, i.e. 60 per cent of the total arable land, could be irrigated. A wide network of irrigation schemes has existed for some time in the country. About 160 smaller and bigger irrigation schemes have been built, covering an area of 163,692 hectares of fertile arable land, i.e. 40.9 per cent of the area that can be irrigated.

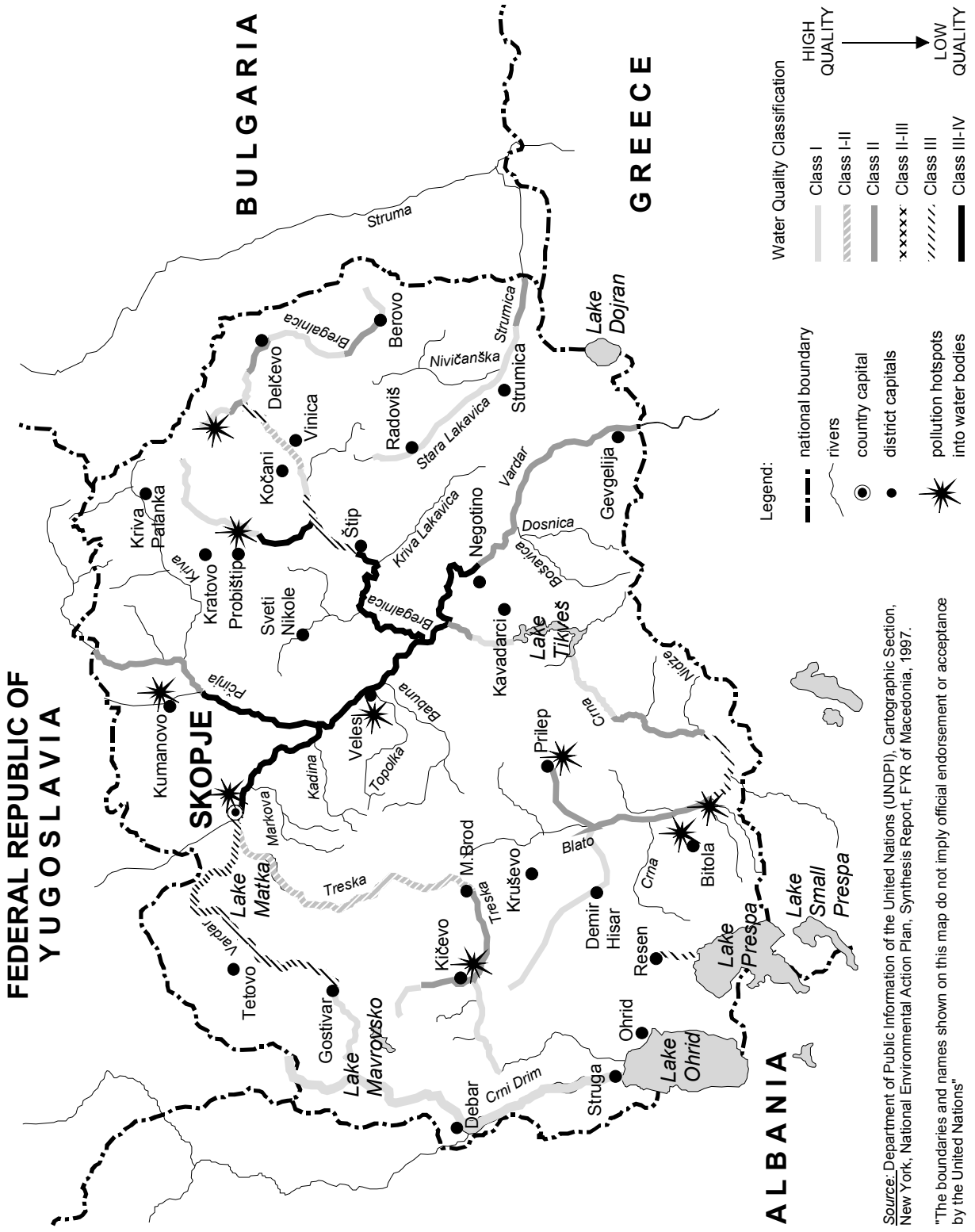


Figure 6.2: Surface waters

Source: Department of Public Information of the United Nations (UNDPI), Cartographic Section, New York, National Environmental Action Plan, Synthesis Report, FYR of Macedonia, 1997.

"The boundaries and names shown on this map do not imply official endorsement or acceptance by the United Nations"

Table 6.2: (a): Ambient standards for global parameters in the different classes of water quality

Substances	Unit	Maximum allowable concentration (MAC)	
		Class I*	Class III*
Dissolved oxygen	mg O_2/l	8	4
Saturation in oxygen	%	90-105	50-75
Biological oxygen demand (BOD)	mg O_2/l	2	7
Chemical oxygen demand (COD)	mg O_2/l	10	20
Total suspended matter	mg/l	10	80
Total dissolved matter	mg/l	350	1500
pH	pH units	6.8-8.5	6.0-9.0
Total coliforms	bacteria	200	200,000

Source : The former Yugoslav Republic of Macedonia. Official Gazette No. 4/84.
Note: Based on the old classification system.

Table 6.2: (b) Ambient standards for specific parameters in the different classes of water quality

Dangerous substances	Unit	Classes I and II*	Classes III and IV*
Ammonia	MgN/l	0.10	0.5
Ammonium	MgN/l	1.00	10.0
Nitrate	MgN/l	1.00	15.0
Nitrite	MgN/l	0.05	0.5
Hydrogen sulphide	mg/l	..	0.1
Arsenic	mg/l	0.05	0.05
Antimony	mg/l	0.05	0.05
Copper	mg/l	0.10	0.1
Iron	mg/l	0.30	1.0
Mercury	mg/l	0.001	0.001
Cadmium	mg/l	0.005	0.01
Cobalt	mg/l	0.20	2.0
Molybden	mg/l	0.50	0.5
Nickel	mg/l	0.05	0.1
Lead	mg/l	0.05	0.1
Silver	mg/l	0.01	0.02
Chromium Cr-III	mg/l	0.10	0.5
Chromium Cr-VI	mg/l	0.05	0.1
Zinc	mg/l	0.2	1.0
Phenols	mg/l	0.001	0.3
Cyanide	mg/l	0.01	0.1

Source : The former Yugoslav Republic of Macedonia. Official Gazette No. 7/87.
Note: Based on the old classification system.

Table 6.3: Pollution load from waste waters discharged into rivers, 1996

Unit	**Waste-water volume** *m^3/day*	**Suspended matter** *kg/day*	**BOD5** *kg/day*	**Nitrogen** *kg/day*	**Phosphorus** *kg/day*
Total	**293,394**	**218,309**	**62,048**	**14,702**	**2,642**
of which					
Vardar	265,557	193,974	55,130	13,064	2,347
Strumica	10,616	9,168	2,606	618	111
Crni Drim	17,221	15,167	4,312	1,022	184

Source : REC. Final Country Report, Macedonia. June 2000.

Because the irrigation infrastructure has not been regularly maintained, is unequally managed, and is not complete, only 77 per cent, or 126 thousand hectares, are properly irrigated. Of this area, 61 per cent is irrigated by sprinklers and 39 per cent with other types of surface irrigation. The total water quantity required for the irrigated area is approximately 900 million m^3, which represents 25 per cent of the total water quantity available from the river network during an average dry year (one sixth in a normal year). Irrigation is seen as a basis for the restoration of the country's agricultural potential. (see Chapter 10 on Nature and biodiversity management) To maximize the economic effects in the future, priority is currently being given to the rehabilitation and reconstruction of the obsolete infrastructure. (figure 6.3)

Drainage systems cover a total area of 82,195 hectares. This extensive drainage system was started in the 1930s to drain the frequent floods, and its construction continued till the 1960s. Drainage was necessary in many areas (or 'poles'), such as the Skopje Pole (6,600 hectares drained), Pelagonija (54,150 total), the Struga Pole (2,680 hectares), the Strumica Pole (9 thousand hectares), the Kochani Pole, the Bregalnica Pole (6 thousand hectares) the Ovche Pole (6 thousand hectares) and the Prespa Pole (1,900 hectares). Today, the existing drainage systems need to be maintained, reconstructed and rehabilitated, and the construction of the detailed drainage network has to be completed.

Currently, 40 thousand hectares of irrigation systems are being rehabilitated in three regions, Tikveš, Bregalnica and Polog. The project will cost $32.5 million, of which $12.5 million is a credit and loan from the World Bank, $12 million a grant from the Netherlands Government and $8 million from the country itself. The project is conducted through the Ministry of Agriculture, Forestry and Water Economy. The biggest part of the resources is allocated to investments in infrastructures (71.5 per cent of total investment) and a smaller part for institutional development, i.e. finding ways to use and manage the irrigation systems more efficiently through pilot programmes, and research.

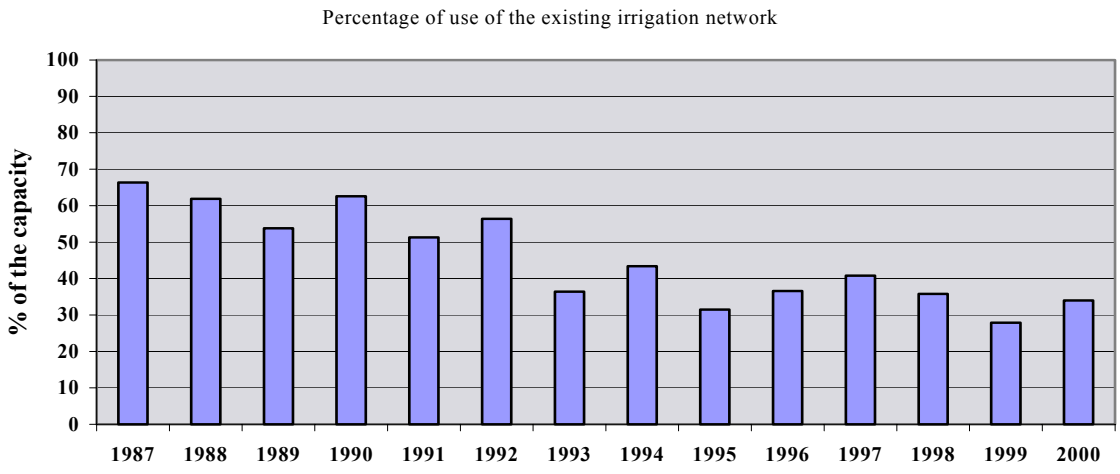
6.4 Pressures on water resources

Overview of water consumption and discharges

The most recent data on water consumption are from 1996. They certainly do not accurately reflect the present situation. Although both irrigation and the needs of the population were comparable between 1996 and 2000, industrial consumption might have decreased due to the economic crisis. In 1996, overall annual water consumption was about 1.72 million m^3, of which 82 per cent for irrigation, 11 per cent for the public and 7 per cent for industry.

In general, domestic and industrial waste waters are directly discharged into water bodies. Only 6 per cent are treated first. Table 6.3 shows the pollution loads discharged by point sources into the rivers; nothing is known about diffuse emission sources.

Figure 6.3: Trends in actual use of the installed irrigation network



Source : Public Water Management Enterprise. 2002.
Note : Nominal capacity of the irrigation system = 163 thousand ha.

Domestic use

Some 0.2 billion m3 of water is abstracted annually for the population's needs (see Figure 6.4). Some 60 per cent of the inhabitants receive water from karstic springs, 20 per cent from wells and 20 per cent from surface waters. Surface water is also supplied from storage reservoirs such as the Streževo, Glaznja and Lipkovo, Turija, Ratevska Reka (River Ratevska), Gradče, Mantovo and Mavrovica reservoirs. Water consumption averages 250 to 350 litres per capita per day. That is higher than in Western countries, which have a water consumption average of 180 to 200 litres per capita per day. In most households the water is not metered for billing, which does not encourage water saving.

About 70 per cent of the population is connected to municipal water supply facilities (all urban settlements, including villages attached to them, i.e. 1,440,000 inhabitants), while the remaining 31 per cent rural population has local or individual water supply systems. In 2000, an analysis of the data on the water supply to 30 urban settlements with a total of 1.2 million inhabitants showed that the sanitary conditions of the facilities and the hygienic quality of the analysed water samples were generally satisfactory, i.e. ranged within the WHO drinking water standard limits. The most frequent reason for negative results was the lack of residual chlorine, and a certain number of parameters of organoleptic importance (manganese, iron, and sediment). The situation is not as good in rural areas. According to a similar analysis of rural settlements connected to a public water supply or to local facilities (individual wells, pumps, village fountains, springs), a relatively high number of samples (over 5 per cent) fail to meet the quality limits. In holiday resorts, hotels, catering and tourist facilities with their own water supply systems, water is not disinfected, or it is disinfected irregularly and unevenly, and the maintenance of these systems is insufficient and not professional. The same investigation into 108 enterprises shows similar results. The main reason for the poor quality of drinking water at source is the pollution of water bodies by untreated waste-water discharges and the absence of sanitary protection perimeters around the water wells, even though they are mandatory (Regulations on Sanitary Protection Zones, Official Gazette No. 17/83).

A key problem is the seasonal drinking-water shortages experienced by many cities and villages all over the country during the dry season (of which Skopje, Kumanovo, Prilep, Kratova, Prila Palanka, Kichevo are the best known), during the cold season (Tetovo) or even all year around (Veles). A recent example is the city of Prilep in the summer of 2001, when hospitals, schools and kindergartens were not supplied with water and drinking water was distributed by tankers. In general the reason is the lack of sufficient water-storing capacity (reservoirs) and the poor management of supply equipment. It seems also that, although the Law on Waters explicitly spells out priorities for water users during a water shortage (population supply is the first priority), economic interests still prevail too often.

Regarding domestic waste-water discharges, only a few towns, namely Ohrid, Struga, Resen and Dojran, have a sewage system with a waste-water treatment plant. Elsewhere, domestic waste water is simply discharged without treatment into the rivers, with an adverse impact on the water quality downstream (Figure 6.2). There are projects for building waste-water treatment plants in Skopje, Bitola, Strumica and Prilep, but due to a lack of funds they are still just blueprints.

Agriculture

Agriculture is the main water consumer. Climatic conditions are favourable to agriculture, but irrigation is necessary (see Chapter 9 on Agriculture and forest management). Higher yields can be obtained by irrigation, for instance gardening yields can be increased threefold, vine and fruit plants eightfold, rice threefold, cereal cultures threefold, sugar beet two-and-a-half to threefold, alfalfa fivefold. As mentioned above, huge irrigation facilities have long existed, but they are not currently used to their full potential (Figure 6.3). According to the Agricultural Development Strategy (2001), by 2020, this irrigated area should be at least doubled and eventually tripled, with a corresponding increase in irrigation water. It is estimated that 50 per cent of the water could be saved if it were used in a more sustainable way and losses were avoided (irrigation systems properly maintained). The reduction in losses would preserve enormous quantifies of water, which could then be used for the irrigation of new surfaces.

Agriculture is also a significant water polluter. Big industrial cattle-breeding farms in the north (Kumanovo region), especially industrial pig farms, discharge their effluents into water bodies. They are the major polluter of the Vardar and its tributaries upstream of Skopje. Slaughterhouses and meat-

canning factories in the same area are also big water polluters.

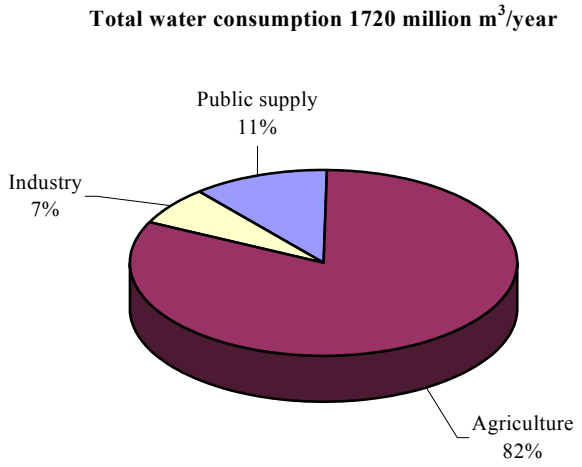
Mining and Industry

In spite of the economic recession of the past years, industry certainly remains the main polluter as far as toxic and eutrophic components are concerned. The chemical industry, leather manufacturing, food production, the meta- processing industry, lead and zinc smelting companies are the main industrial polluting branches (Chapter 11 on Industry, energy and the environment). Only a small number of industrial facilities (about 20) are equipped with waste-water pre-treatment stations on their premises, and few of them are operating at present. Depending on their size and location, industries discharge their waste waters either into municipal collectors or directly into surface waters. According to the UNEP Post Conflict Environmental Assessment (2000), the major potential water polluters are the copper mine in Radovis (Buchim S.C.) releasing copper; the metal resurfacing factory in Kicevo (Tane Caleski) releasing heavy metals, oils and other components; the copper-ore flotation plant in Bucim; the ferro-alloy plant releasing chromium in Jegunovce (HEK Jugohrom); the lead-zinc smelter in Veles releasing lead, zinc and cadmium; the lead-zinc mines in Kamenica, Probistip and Toranica discharging cyanide, cadmium and other heavy metals; the organic chemicals plant releasing HCH isomers in Skopje (OHIS A.D.); the thermopower plant (REK Bitola) in Bitola discharging oils and heavy metals; the fertilizer factory in Veles (MHK Zletovo) discharging huge quantities of phosphate (4.6 million population equivalent) and nitrogen (0.4 million population equivalent); and many other sources of less importance (Figure 6.2). The Environment Inspectorate has drawn up a list (cadastre) of the most important polluters. However, at present, this list has not been completed with detailed environmental information. (see also Chapter 11 on Industry, energy and the environment)

Hydroenergy

In 2000, 18 per cent of the electricity was from hydropower. The annual hydroelectric potential of the rivers is vast (according to various reports, it could range from 5500 to 6500 GWh) and only exploited at 20 per cent of its capacity. The rehabilitation of old dams and projects for new dams are being considered (see above the description of existing infrastructure and the strategy for the future in Chapter 11 on Industry, energy and the environment)

Figure 6.4: Water use, 1996



Source : Integrated Water Resources Development and Management Master Plan, May 1999.

6.5 Framework for water management

Policies and strategies

Because of the scarce water resources and their variability in time and space, the policy for water management has been geared toward a multipurpose use of water resources. Priority has been given to flood protection, managing the water to produce hydroenergy, building irrigation infrastructure for agriculture and supplying water to the population. The protection of the quality of the water bodies has never been tackled seriously. Moreover, most of the water bodies have a transboundary character and impact on the countries downstream. The country has water use and protection obligations toward its neighbours, an issue now sensitive since most of the bilateral agreements were concluded before the former Yugoslav Republic of Macedonia became independent. Whether these agreements are up to date in the present geopolitical situation is questionable. It is therefore important that they should be reviewed and updated. (see Chapter 5 on International cooperation and recommendation 5.3).

This complex use of water demands clear water management strategies, as has long been recognised. But since too many key players are involved in water management, it has proved difficult to agree on a strategy. This can be seen in the fact that several strategies have been drawn up but never implemented. In the meantime, the measures and actions taken do not cover water management in an integrated manner. Among the different projects, the following are the most important:

- The Water Management Plan of the Ministry of Agriculture, Forestry and Water Economy represents a long-term plan for the management and development of water resources. It has been implemented since 1975 and is to be replaced in 2004 by a new water master plan that is currently being prepared by the Water Fund for the Ministry of Agriculture, Forestry and Water Economy with the help of Germany (GTZ) and PHARE. It seems that so far the accent is to be placed much more on water supply than on water quality protection.

- In 1990, an initial programme for the integrated development of the Vardar Valley was adopted by Parliament. In 1994, this programme was updated and the importance of the valley as a main axis of communication (all means including waterways) within the framework of the European spatial planning forecast by the European Council was highlighted. The building of hydropower plants, including a number of new dams (17) and storage reservoirs, is the backbone of the project. It opens up the possibility of increasing electricity production, of irrigating 70,000 ha more, of improving the water supply to municipalities and industry and flood and erosion protection, and of developing fishing and tourism. A first dam in Koziak on the Treska is under construction. The programme is at a standstill because of economic difficulties. Through the Public Investment Programme (2001-2003), the country is trying to find international financial institutions to co-finance these infrastructures (estimated at US$ 501.5 million).

- The 1996 NEAP recommended improving the management of water resources in particular by developing a water resources plan; improving water resources and effluent discharge monitoring; introducing standards for industrial effluent discharges, and introducing and enforcing the corresponding permits; improving the management of irrigation systems; improving the protection of the three big lakes; and building the necessary waste-water treatment facilities for municipalities and industry.

- Also, a draft national strategy for waste-water and solid waste management was completed in 1999 as part of a PHARE transboundary cooperation programme. The beneficiaries are the Ministry of Environment and Physical Planning and the Ministry of Transport and Communications. The strategy includes a prioritized national plan with actions for each watershed and a cost estimate. Investment would be €360 million, mostly in sewerage and treatment plants for municipal waste water and the protection of the aquifer supplying Skopje (Rasce Springs). The strategy has not yet been adopted by the Government.

In addition, various studies and plans have been carried out under the auspices of different ministries with external support (e.g. Integrated Management of the Quality of Water Resources, 1997, with support from France; Integrated Water Resources Development and Management Master Plan, 1999, with the support of the Japan International Cooperation Agency). It is extremely difficult to have a clear idea of what instruments

have actually been adopted, which are binding and which are being implemented. The coordination among the different projects and ministries with relevant responsibility seems non-existent.

Legislation

The main pieces of legislation on water are summarized in Box 6.2. There is a Law on Waters. It defines the conditions and the methods for the use of waters, for protection from their harmful effects (floods), for their protection from contamination, for their management, and how to finance water management activities. The implementation of this Law is the task of the Ministry of Agriculture, Forestry and Water Economy.

The 1998 Law on Waters introduced new important features such as the creation of a water fund to cover expenses for water resources development and works of public interest; the establishment of a public water management enterprise (PWME) and of water users' associations, the introduction of waste-water standards and pollution charges; and the appointment of water management inspectors. Only a few of these instruments or institutions have been set up, and those that have been set up are finding it difficult to operate (e.g. Water Fund set up but under-financed, PWME in a critical financial situation, pollution charges not introduced).

Among the modern provisions of water legislation, permission is required for water abstraction and waste-water discharges. The Law also obliges the polluter to build waste-water treatment facilities. But all these obligations are badly enforced. For example, the user-pays principle exists but payments are increasingly neglected and there is no law obliging users to pay. There is a classification of water quality for rivers and lakes, but there are no quality standards or objectives to be met. The hydrographic basin management approach is not contained in the legislation, while a project for the transboundary water management of the Lake Ohrid catchment area was successfully developed a few years ago thanks to GEF financing (see more details in Box 6.1). According to a review of the legislation by EU PHARE in 2000, the approximation of the Law on Waters with the EU body of law still needs significant improvements and the Law on Waters is not fully efficient, due to the absence of a series of implementing ordinances.

A new law on water communities, requested by the World Bank for further cooperation in water management, is before Parliament. The law proposes that water users should establish separate legal entities – water communities – responsible for irrigation and drainage. The water user communities would be granted the management and maintenance of the corresponding infrastructures. In this way it is expected that water users will become more interested in irrigation management, and that the collection of water charges will improve concomitantly.

Institutions

The current complex institutional arrangements for water management are the result of a long history and of frequent ministerial restructuring and reallocation of responsibilities over the past ten years. Five ministries share the management of water:

- The Ministry of Agriculture, Forestry and Water Economy manages water abstraction for all uses (including irrigation, public and industry supply) and is responsible for actions in the public interest such as flood control and drainage. The Ministry is responsible for the management of quantity and quality of surface and groundwater. It issues water abstraction and discharge permits;
- The Ministry of Environment and Physical Planning, with its inspectorate, is responsible for protecting water bodies against pollution;
- The Ministry of Health controls drinking and bathing water quality;
- The Ministry of Transport and Communications is in charge of public water supply and waste-water treatment infrastructures for municipalities. It also issues authorizations for building and operating industrial facilities and checks that these facilities have the necessary water-protection installations;
- The Ministry of the Economy is responsible for the construction of dams and hydroenergy production plants.

The Ministry of Agriculture, Forestry and Water Economy, through its Water Administration, is entrusted with the implementation of the Law on Waters. At present, it is the main actor in water management. The dispersion of responsibilities among five ministries is not compensated by close relationships and good cooperation among them all. This is reflected in the many fruitless attempts to set up water strategies.

Box 6.2: Legislation on water

Law on Waters, Official Gazette, No. 4/98, amended 19/2000
Water Management Base, Skopje, 1977
By-law on the Quality and Safety of Drinking Water, Official Gazette, No. 5/84
By-law on the Sampling and Methods of Laboratory Analysis of Drinking Water, Official Gazette, No. 33/87
By-law on the Safety of Drinking Water, Official Gazette, Nos. 33/87 and 13/91
By-law on Determining and Maintaining Protection Zones Around Springs of Drinking Water, Official Gazette, No. 17/83
Decision on Maximum Permitted Concentrations of Radionuclides and Hazardous Substances in Inter-republic Water Currents, Inter-republic Waters and Waters of the Adriatic Coast of Yugoslavia, Official Gazette, No. 8/78
Decree on the Classification of Waters, Official Gazette, No. 18/99
Decree on the Classificiation of Water Currents, Lakes, Reservoirs and Underground Waters, Official Gazette, No.18/99
By-law on Natural Mineral Water Quality, Official Gazette of SFRY, No. 58/78.
Law on the Protection of Lakes Ohrid, Prespa and Dojran, Official Gazette, No. 45/77, and the Programme for the Protection of Lakes Ohrid, Prespa and Dojran, Official Gazette, No. 7/87.

Two types of public water enterprises see to the technical side of water management:

- Municipal Public Enterprises manage drinking water supply, sewage systems and waste-water treatment facilities in cities and villages. They abstract water (permits issued by the Water Administration of the Ministry of Agriculture, Forestry and Water Economy), disinfect it (chlorination), distribute it to the city users and maintain and operate the infrastructure network. They fix the water price in cooperation with the Association of Municipal Public Enterprises and their local governments. They also collect the water charges that are their only source of revenue, but over the past few years economic difficulties have led to the collection rate dropping dramatically, from 90 per cent in 1996 to 58 per cent in 2001 in Skopje. In such conditions, the enterprises can afford water disinfection, supply and maintenance but not big repairs such as renovating the distributing pipes or the sewage collectors. The draft law on water management enterprises before Parliament will open the way to a system of concessions.

- The Public Water Management Enterprise (PWME) was created in 1998 with 24 local branches. They supply irrigation water to farmers. They also supply water resources to municipalities and industries from their water storage reservoirs, and are responsible for flood protection infrastructure, measures against water erosion and drainage. They have two sources of finance: (1) a regular State budget line for the management of works of public interest (flood protection, erosion protection and drainage), which has been merely symbolic for years; and (2) water user charges that vary according to the local branch and the user. The great economic difficulties of the past decade mean that most of the clients do not pay their bills. So the local infrastructures cannot be properly maintained, the staff of the local PWME are rarely paid and the enterprise itself has accumulated a considerable debt over time. Overall, this debt totals about $10 million today. At present, the PWME is being restructured, and its 24 local branches will become autonomous authorities. The PWME will stay as the regulatory body for these authorities. Those that cover the same river sub-catchment area may be merged. The restructuring will become effective in early 2003, when each autonomous authority will be headed by a council made up of representatives of the different stakeholders, including users. These water authorities will have the same responsibilities that they have now. They will be financed by the State budget for all tasks of public general interest (i.e. flood protection, erosion, drainage) and by the user for the water they supply. The secondary water supply infrastructure will be managed by water users' associations (WUAs), each responsible for collecting the money in its own territorial jurisdiction. If costumers fail to pay up, supply will simply be cut off, a measure that is not legal at present.

The draft law on water enterprises includes provisions for actions such as cutting off water when payments are not made. In recent years, the World Bank, through its Irrigation Rehabilitation and Restructuring Programme, has been working on the restructuring and rehabilitation of three of these irrigation schemes, and, through this programme, it has been pushing for a restructuring of the water enterprises and the creation of water users' associations.

Standards

Water standards are incorporated in the legal regulations listed in box 6.2. There are environmental quality standards (ambient standards) for different kinds of water bodies but no emission limits for the pollution discharged into water bodies. The standards on drinking-water quality comply with WHO guidelines, and in some cases are even stricter.

Rivers are classified according to the quality of their water (from class I to class V). Harmonization of the ambient standards for surface water quality with EU norms was completed in 1999. In theory, their implementation is controlled by the Water Management Inspection of the Ministry of Agriculture, Forestry and Water Economy, the Health Inspectorate of the Ministry of Health, the Inspectorate of the Ministry of Environment and local inspectorates.

Monitoring

According to the Law on Waters, the monitoring of all kinds of water is the responsibility of the Ministry of Agriculture, Forestry and Water Economy and is carried out by the Hydrometeorological Institute (table 6.4). The Institute monitors the quality of surface water in 60 measurement stations around the country. The Ministry of Environment and Physical Planning introduced more sophisticated monitoring equipment to measure the quality of the Vardar River (2 automatic stations giving online information – financed by PHARE) and other rivers in the country (18 automatic stations – financed by Switzerland). The Institute depends on the Ministry of Agriculture, Forestry and Water Economy. There is no biological monitoring of water ecosystems, except in Lakes Ohrid and Prespa by the Hydrobiological Institute. Because of financial constraints, the Hydrometeorological Institute stopped monitoring groundwaters in 1981, and now monitors only the water table. The Hydrometeorological Institute is also responsible for drawing up the water polluter cadaster. By law, the Institute is obliged to submit data to other relevant ministries, in particular the Ministry of Environment.

Monitoring the quality of drinking water and bathing water is the task of the Public Health Institute. It also investigates water contamination at the source or along the supply system, and checks the protection perimeters around the abstraction points. All municipal water enterprises have their laboratories, as they must control the quality of the water they supply to the users and adjust disinfection accordingly.

Permits

Water abstraction permits are issued by the Ministry of Agriculture, Forestry and Water Economy and are required for any kind of water use and discharge. Each local branch of PWME puts in a request for the amount of water it requires with its headquarters and the Ministry for approval. The priority ranking for water use and allocation is defined in the Law on Waters as follows: (1) municipal use, (2) agriculture, (3) industry, (4) hydropower generation and (5) other uses. This rule is not strictly followed: in 2001, the city of Prilep faced a severe water shortage while water was being used for the cooling system of the Oslomej thermal power plant, a facility that produces electricity for 200,000 people. Checking that facilities comply with the permit is the task of the inspectorate of the Ministry of Agriculture, Forestry and Water Economy.

Building permits are issued by the Ministry of Transport and Communications on the basis of an application that briefly describes the proposed activity. The Ministry requires documentation for facilities that are likely to have an impact on the environment and submits this documentation to the Environment Office. Operating permits require an opinion from the State Environment Inspectorate, which can lay down conditions for the proposed activities. There is no time limit for the permit. The State Communal Inspectorate verifies whether the facilities operate according to the law.

Regarding compliance, environmental inspections are based on standards. However, the regulations stipulating maximum allowable concentrations are outdated and inadequate. When regulatory levels are exceeded, environment inspectors may impose fines, lower production levels or require the installation of pollution control equipment (waste-water treatment systems). In extreme cases, facilities can be closed, a measure taken only exceptionally (for instance the zinc smelter factory in Veles in January 2001). Inspectors do not give technological advice, but rather push for end-of-pipe approaches.

Table 6.4: Authorities that monitor water quality

Monitoring of:	Monitoring institution	Responsible agency
Rivers	Hydrometeorological Institute	Ministry of Agriculture, Forestry and Water Resource Management
Groundwater	Hydrometeorological Institute	Ministry of Agriculture, Forestry and Water Resource Management
Lakes	Hydrobiological Institute	
Pollution from industry	Inspection laboratory	Ministry of Environment
Domestic waste-water discharges	Municipal Water Enterprises	Municipalities
Monitoring of drinking water	Public Health Institute, Municipal Lab.	Ministry of Health, Municipalities (water enterprises)
Monitoring of bathing water	Public Health Institute	Ministry of Health

Source : Ministry of Environment and Physical Planning, 2002.

Water pricing

The Law on Waters regulates the price of water (i.e. sets a ceiling). Municipal water enterprises have two different prices for drinking water: one for households and another for enterprises. The water price is made up of a part for water supply and a part for sewage collection. Prices differ from one city to another, e.g. from \$0.53/m^3 for households in Veles to 0.14 \$/m^3 in Kavadardi. Enterprises pay about twice this price. In Skopje, it is \$0.22/m^3 for households and \$0.49/m^3 for enterprises. Today (2002), about 50 per cent of individual users and 60 per cent of other users (in particular institutions, such as hospitals and municipalities) cannot afford to pay.

The 1998 Law on Waters provides that public water enterprises should be paid for the raw water they supply to users (hydroelectricity, irrigation, municipalities and industry). However at present, few users pay.

Financing water management

On the basis of the Law on Waters, the Water Fund was established in 1999 to participate in the financing of activities to ensure protection from the harmful effects of waters, water protection from pollution, construction, reconstruction and maintenance of irrigation and drainage systems and the preparation of water studies. The Water Fund proposes an annual activity programme to the Ministry of Agriculture, Forestry and Water Economy. The financial sources for carrying out this programme are set in the Law on Waters: a tax levied on the incomes of the public enterprises and governmental institutions, a tax on hydropower generation (0.5 per cent per kW), 1 per cent of the water user price from municipalities and industries, 3 per cent of the fish price from fish farms, 1 per cent on gravel extraction, a part of water pollution charges; and a regular State budget line for works of general public interest.

In fact, the Water Fund is far from being the powerful instrument it could be if it collected all the above-mentioned taxes. Water pollution charges have not been created and other incomes are not paid as they should be. The State contribution has never been paid. Actually, the Fund receives one eighth or one tenth of what it requires for its annual programme. In 2000, 2001 and 2002 (forecast), the Fund's total resources amounted to about 100 million denars per year (i.e. \$1.5 million), far below what it would have been if it had collected all its dues. Of this sum, only 70 per cent was paid up, as part of the Fund is put to one side at the source for certain enterprises (Elektostopanstvo na Makedonija, public utility enterprises, users of industrial water, Public Water Management Enterprises). The Fund cannot grant credit since it cannot give guarantees to the banks, and the State does not guarantee the Fund's credit. For this reason the Fund cannot be an active player in infrastructure development. Currently, the Water Fund is drawing up the new water management plan developed under the auspices of the Ministry of Agriculture, Forestry and Water Economy.

The Environment Fund is also financing projects to protect water from pollution and prevent pollution. (see Chapter 3 on Economic instruments and privatization) Most of these projects concern waste water and some drinking water. In the portfolio, about 80 projects concern waste-water treatment plants for small and medium-size municipalities (under 15,000 population equivalent), 10 for industrial waste water, and 6 for waste water from pig farms. About \$1 million has been spent on such projects as of early 2002, from funds received mostly from abroad.

Projects

At present, because of economic, social and political problems, the country cannot afford to invest in water management and related infrastructures. Over the past five years a variety of projects have been carried out, always with foreign partners. Most of them stopped shortly after the feasibility study either for political reasons and competition between different ministries, or because the country could not afford its share of the investments. Projects on monitoring (EU, Switzerland), policy and strategy development (France, Germany, Japan, EU, EBRD), protection of lakes, underground and surface waters quality (Denmark, Germany, Italy, Switzerland, Stability Pact, EU, GEF, World Bank), improvement of drinking-water supply and waste-water infrastructure (Japan, United States, World Bank, UNDP), improvement of irrigation infrastructures (Netherlands, World Bank), dams and reservoirs (France), have been or are being developed to the tune of a hundred thousand to a hundred million dollars.

6.6 Conclusions and Recommendations

Because of economic difficulties, the country has not been in a position to carry out most of the large projects that were started or envisaged in the development plan. These projects, in particular reservoirs, dams, irrigation schemes and flood protection works, may have an important impact on the environment, which should be prevented or mitigated. For this reason, it is urgent that a full-fledged environmental impact assessment (EIA) procedure should be set up with public participation, to alleviate this impact as far as possible.

The future water management plan is currently being prepared by the Ministry of Agriculture, Forestry and Water Economy, and does not involve any other key stakeholders. There is a strong need for better cooperation among the water managing institutions, in particular the five principal ones, i.e. the Ministry of Agriculture, Forestry and Water Economy, the Ministry of Environment and Physical Planning, the Ministry of Health, the Ministry of Transport and Communications and the Ministry of the Economy. Together, they should set up an inter-ministerial working group to participate in the current preparation of the integrated water management plan. The plan should cover water use and supply, water quality protection and conservation, and water flow management. This inter-ministerial working group should be seen as a first step toward the creation of a water agency that would unite all the main responsibilities for the management and protection of water resources.

Recommendation 6.1:
The Government should urgently set up an inter-ministerial working group consisting of the five key administrations in water management, i.e. the Ministry of Agriculture, Forestry and Water Economy, the Ministry of Environment and Physical Planning, the Ministry of Health, the Ministry of Transport and Communications and the Ministry of the Economy, together with their associated specialized institutions. This inter-ministerial group should be responsible for the further preparation of the upcoming integrated water management plan. The plan should cover water use and supply, water quality protection and conservation, and water flow management.

The water situation in the former Yugoslav Republic of Macedonia is difficult, because water resources are scarce, unevenly distributed, used by a wide range of users and not managed in an integrated manner. Many cities face drinking-water shortages in the dry period, while simultaneously water resources are diverted to less vital uses. Till now, not enough attention has been paid and no real political will displayed to solve the problem.

At present, water management competencies are too dispersed among different ministries, thus preventing an integrated approach. Protecting water resources, guaranteeing that they are used in a sustainable way and alleviating their adverse impact (floods and droughts) is the task of the environmental protection authorities. Overall coordination of the management of water, including monitoring, licences and permits, should be the responsibility of the Ministry of Environment.

Recommendation 6.2:
The Government should propose to Parliament that the Ministry of Environment and Physical Planning be the responsible authority for water resource management and protection. The Ministry of Environment should be entrusted with the implementation of the water management plan, including water monitoring, and it should be given the task of issuing licences and permits for water use and water discharges, and implementing the user-pays and polluter-pays principles.

Experience in other countries as well as in the Lake Ohrid Conservation Project has largely proved that

the management of water is most effective when the local population and users are closely involved in it and when it is seen in a territorially integrated manner. As joining the EU is one of its ambitions, the former Yugoslav Republic of Macedonia should move toward an integrated river basin management approach as required by EU Water Directive 2000/60/EC. A first step would be to identify river basins and sub-basins, and work out water management plans for each catchment and sub-catchment area. In line with the national water management plan, these plans would take into account water needs and the impact of human activities on water bodies, and would set objectives for water quality and quantity. The drawing-up of these plans should involve the participation of the main stakeholders. It should chiefly involve the local branch of the Public Water Management Enterprise and Municipal Public Water Enterprises and benefit from their long experience.

The Lake Ohrid Conservation Project has helped build capacity through a learning-by-doing approach. Not only has it helped inform the different national and local water entities and bring them together, but it has also shown how to manage when transboundary catchment areas are at stake and cooperation has to be established. This useful experience should not stop short simply because funds are lacking at the moment or political will is not strong enough. The project will be interrupted soon as its financing by international institutions and donors comes to an end. All efforts should be made to keep this "pilot experience" alive.

Recommendation 6.3:
The Government, after designating the Ministry of Environment and Physical Planning as the responsible authority for water resource management and protection, should create an appropriate structure to assist the Ministry in implementing its enlarged tasks. These tasks should include the introduction of a river basin management planning approach working on the experience gained through the Lake Ohrid Conservation Project. Twinning arrangements with countries having experience in river basin management should be sought, together with their technical, financial and political support, to assist the country in its task.

Recommendation 6.4:
The Government should show its support for the Lake Ohrid watershed management by:

- *Updating the legislation giving official status to the watershed management and related management objectives and institutions;*
- *Calling for the development of a management plan for the Lake;*
- *Giving official status to and reinforcing the present management board for the protection of Lakes Ohrid and Prespa;*
- *Mobilizing the international community and partner countries to help consolidate the integrated management approach of the transboundary Lake Ohrid catchment area.*

At the moment, neither the Municipal Public Enterprises nor the Public Water Management Enterprises have sufficient money to maintain and improve the infrastructure for which they are responsible. A major reason is that users are not paying their water bills and the water enterprises are not legally empowered to do anything about this. Legislation should give the water enterprises a real power to levy the water charges: they should be given the ability to suspend their services if they are not paid. The Government should work out special social measures or compensation for those citizens and public institutions that cannot afford to pay, so that the public water enterprises can be in a good position to compete with concessionaires, if the market were opened to concessions in the near future.

Recommendation 6.5:
The Government should take measures to enforce the principle that all users should pay for the water they use. For those people who cannot afford to pay, the Government, together with the municipalities, should work out a system of social compensation.

There can be no progress in the protection of water quality as long as polluters are not motivated to reduce their pollution load. While the Law on Waters makes it obligatory to treat waste water before it is released, command-and-control measures are not effective enough and are difficult

to execute at the moment. They should be supplemented by economic instruments, starting with the step-by-step introduction of the polluter-pays principle. This should be combined with incentives to motivate polluters to decrease their pollution load and invest in cleaner production processes and abatement techniques. At the beginning, the pollution charges could target only a few major pollutants and toxic elements, and could be mostly applied to the key polluters on the State Environment Inspectorate's lists. Managing the user charges and the polluter charges, working out incentives to reduce pollution, and providing subsidies to help users and polluters improve water management and protection should be among the tasks of the water agency.

Recommendation 6.6:
The Government should prepare legislation to implement the polluter-pays principle according to the provisions of the Law on the Environment and Nature Protection and Promotion and the Law on Waters. Pollution charges should be introduced and in a first step implemented only according to few parameters, i.e. major pollutants and toxic elements. Collected pollution charges should be redistributed to stimulate the reduction of pollution discharges. (see also recommendation 3.1)