Chapter 7

WATER MANAGEMENT

7.1 Water resources

Quantity of water resources

Surface waters

The water resources in Romania are limited to some 1,700 m^3/year/inhabitant or 2,680 m^3/year/habitant if including the Danube's resources, a value relatively small when compared with other European countries (average 4,000 m^3/year/inhabitant). Romania has 4,864 watercourses with a total length of about 78,900 km. The characteristics of the main rivers are shown in Figure 7.1 and Table 7.1.

Ninety-eight per cent of Romania lies within the Danube river basin. One thousand and seventy-five kilometres of the Danube river flow over Romanian territory, of which 220 km form the border between Romania and Yugoslavia, 480 km between Romania and Bulgaria, 0.3 km between Romania and the Republic of Moldova, and 133.8 km between Romania and Ukraine. The river is regulated over most of its course.

Table 7.1: Characteristics of main rivers

	Length		Catchment area		Annual mean flow
	Total	in Romania	in Romania	as % of total catchment	
	km		*km²*	*%*	*m³/s*
Danube	2,857	1,075	237,104	29	5,700.00
Tisa	962	61	3,237	2	-
Somes	427	376	15,740	99	125.00
Tur	98	68	1,144	90	9.58
Crasna	180	134	1,931	61	5.53
Crisul Repede	1,212	171	14,860	54	24.90
Crisul Negru		164			29.40
Crisul Alb		234			23.70
Barcau		134			6.02
Ier		100			2.93
Mures	789	766	27,890	94	178.00
Bega	252	178	2,362	66	17.50
Timis	364	244	5,673	66	50.00
Caras	107	79	1,280	76	7.00
Siret	698	571	42,890	96	269.00
Prut	917	742	10,990	39	94.70

Source: Compania Nationala "Apele Romane".

Figure 7.1. Romania hydrographic network and hydrographic basin boundaries

The Danube Delta, where the River flows into the Black Sea, is an ecological system unique in Europe. Its ecological value is inestimable. It covers an area of about 550,000 ha of Romanian territory, with a hydrological network including main branches, secondary branches, channels and lakes with a wide variety of species of plants, fish, and birds, most of them migratory. Because of this biodiversity the whole zone has been declared a protected area and a World Natural Heritage Site (see Chapter 9).

Only 12% of the potential water resources of the territory could have been used for continuous water supply if the natural flow regime had not been modified. That is why over 1,300 reservoirs with a total capacity of 14 billion m^3 have been built for storing water and redistributing it when needed (400 have a capacity of over 1 million m^3 each). Most of them are multipurpose reservoirs for flood protection, drinking and industrial water supply, irrigation and hydropower production.

Table 7.2: Largest artificial reservoirs

Location	Reservoirs	Total volume *Millions of m^3*	Main users
DANUBE Basin			
Danube	Portile de Fier I	2,900	hydropower
Danube	Portile de Fier II	1,000	hydropower
PRUT River Basin			
Prut	Stanca-Costesti	1,400	complex users
SIRET River Basin			
Bistrita	Izvorul-Muntelui	1,230	complex users
ARGES River Basin			
Arges	Vidraru	473	complex users
OLT River Basin			
Olt	Venetia	375	hydropower
Lotru	Vidra	340	complex users
DANUBE Basin			
Mostistea	Iezer	280	complex users
SOMES River Basin			
Somesul Cald	Fantanele	250	hydropower
MURES River Basin			
Raul Mare	Gura Apelor	227	hydropower

Source: Compania Nationala "Apele Romane".

Table 7.3: Main natural lakes

Location	Lakes	Total volume *Millions of m^3*
DANUBE Basin		
Danube	Razelm (Razim)	909.00
Danube	Sinoe	210.65
Danube	Golovita	184.80
Danube	Oltina	59.90
Danube	Dunareni	51.90
Danube	Zmeica	45.60
Danube	Bugeac	41.09
Danube	Dranov	21.70
LITTORAL Basin		
-	Babadag	42.00
-	Periteasca	20.92

Source: Compania Nationala "Apele Romane".

There are also 2,000 km of canals and galleries for inter-basin water diversions and the reallocation of water resources according to the needs of agricultural irrigation in dry periods and other demands for water. However, more than 70% of the inland watercourses are in their natural state (i.e. unregulated).

Romania also has 194 natural lakes totalling an area of 132,730 ha and a water volume of 2,265 million m^3. A number of natural lakes are used for therapeutic purposes and have an international reputation, such as Techirgohiol and Amara.

Groundwaters

The National Institute of Meteorology and Hydrology has estimated the total exploitable sources of groundwaters to be 190.1 m^3/s. The most important groundwater resources can be found in the following basins: Danube 32.4%, Siret 10.8%, Arges 9.4%, Olt 7.2%, Ialomita 7%, Mures 6.4% and the littoral area 5.2%.

Quality of water resources

Surface waters

Rivers. Depending on their quality, watercourses are categorized as follows:

- *Category I* - includes waters that can become drinkable to supply the centres of population or animal breeding units, the food industry, salmonid farms and bathing resorts (pools).
- *Category II* - includes surface waters that can be used for industry, pisciculture (for fish that all not as sensitive to pollution as trout), and for urban and recreational use.
- *Category III* - includes waters for irrigating agricultural land, electric power production in hydroelectric power plants, industrial cooling installations, cleaning units and other purposes.
- *Category D* - includes degraded waters improper for the development of aquatic fauna.

About 40 physical, chemical, biological and microbiological parameters (such as oxygen content, biological oxygen demand (BOD), chemical oxygen demand (COD), total dissolved solids (TDS), nutrients, organic pollutants, heavy metals) are used to categorize the waters. The limit values of the main pollutants depend on river categories (Table 7.4).

In 1999, the state of the rivers was as in Figure 7.2. Of the cadastered 78,900 km of rivers, 56,966 km are natural streams without any human influence and are classified first quality. The remaining 21,934 km, which are potentially affected by water users, are monitored. They are classified as follows:

- category I: 59% or 12,941 km
- category II: 26% or 5,703 km
- category III: 6% or 1,316 km
- category D (degraded): 9% or 1,974 km

Table 7.4: Quality standards for different river categories

River category	Pollution factor									
	BOD_5	COD	NO_3	NH_4	P t otal	Heavy metals				
						Pb, Cr	Cd	Cu	Fe	Zn
	mgO^2/dm^3		mg/dm^3							
I	5	10	10	1	0.10	0.05	0.00	0.05	0.30	0.03
II	7	20	30	3	0.10	0.05	0.00	0.05	1.00	0.03
III	12	30	-	10	0.10	0.05	0.00	0.05	1.00	0.03
D	>12	>30	>30	>10	>0.1	>0.05	>0.003	>0.05	>1	>0.03

Source: National standards STAS 4706 for surface waters, quality categories and conditions.

Note:

I - Very good/drinkable**; II -** Good**; III -** For industrial use**; D -** Degraded

The worst conditions, classified category "D", were encountered in the hydrographical basins of the Ialomita (37%), the Prut (about 20%) and the Vedea (12%). Nevertheless, overall surface water quality improved over the 1989-1999 period (Figure 7.3). This improvement is due mainly to the reduction in polluting activities, the enforcement of economic instruments (water use and water pollution charges) and also because measures have been taken to improve the treatment of waste water.

The Danube River carries a significant load of nitrates and phosphates from the countries upstream of Romania. The share of nutrient pollution from abroad (at Bazias) is 84.9% for nitrogen and 70% for phosphorous. Fifteen per cent of nitrogen and 30% of phosphorous pollution originate downstream from Bazias. In the country, nutrient pollution results from the discharge of waste water into the Danube's tributaries such as the Jiu, the Olt and the Argeş rivers, and the Ialomita, the Siret and the Prut rivers. There are also direct discharges of urban waste water from the towns on the Romanian bank of the Danube, such as Drobeta-Turnu Severin, Braila, and Tulcea, which do not have waste-water treatment plants. A number of industries (Romag Tr.Severin, Celrom Tr. Severin. Siderca Calaraşi, Comceh Calaraşi, Celohart Braila, Alum Tulcea, Comsuin Ulmeni) also discharge their insufficiently treated waste water directly into the Danube.

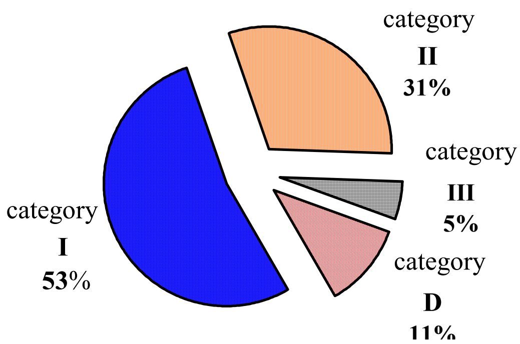
In 1999, breaches of category II limits (reaching category III) were recorded for some parameters in the following areas: Baziaş for P, N, Zn, Cr, Cd; Chiciu - Silistra for Zn and oil products; Giurgeni for P; Grindu - Reni for Fe and oil products; and Vilkov - Periprava for Fe and Zn. In 1999, because of the war in Yugoslavia, some parameters, in particular regarding heavy metals, exceeded the Romanian and international maximum allowable limits.

Lakes

Water quality in the lakes is generally adequate. In most cases, monitoring campaigns determined the trophic degree by following physical, chemical and biological indicators as well as the water temperature, its transparency, the oxygen regime, the nutrition regime, and the evolution of the bioceonoses.

Figure 7.2: Quality of river water, 1999

As % of total length of monitored rivers



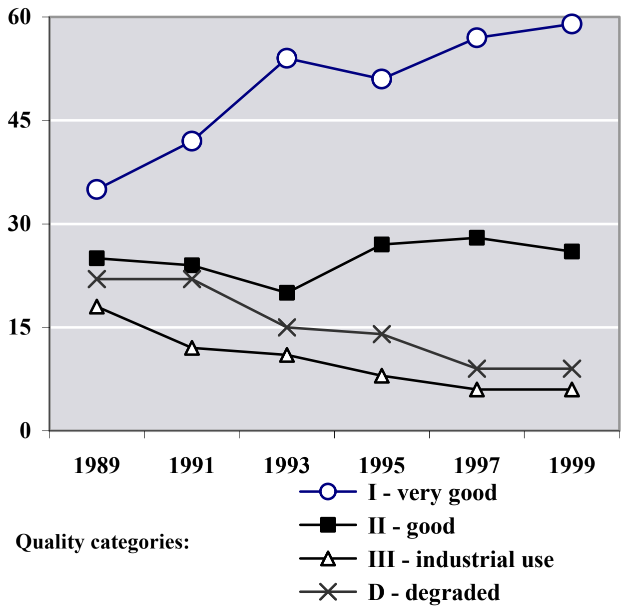
Source: Ministry of Waters, Forests and Environment Protection, Environmental State in Romania - Report for 1999, May 2000.

Note:

I - Very good/drinkable; **II** - Good; **III** - For industrial use; **D** - Degraded

Figure 7.3: Trends in river water quality, 1989-1999

As % of total length of monitored rivers



Source: Ministry of Waters, Forests and Environment Protection, Environmental State in Romania - Report for 1999, May 2000.

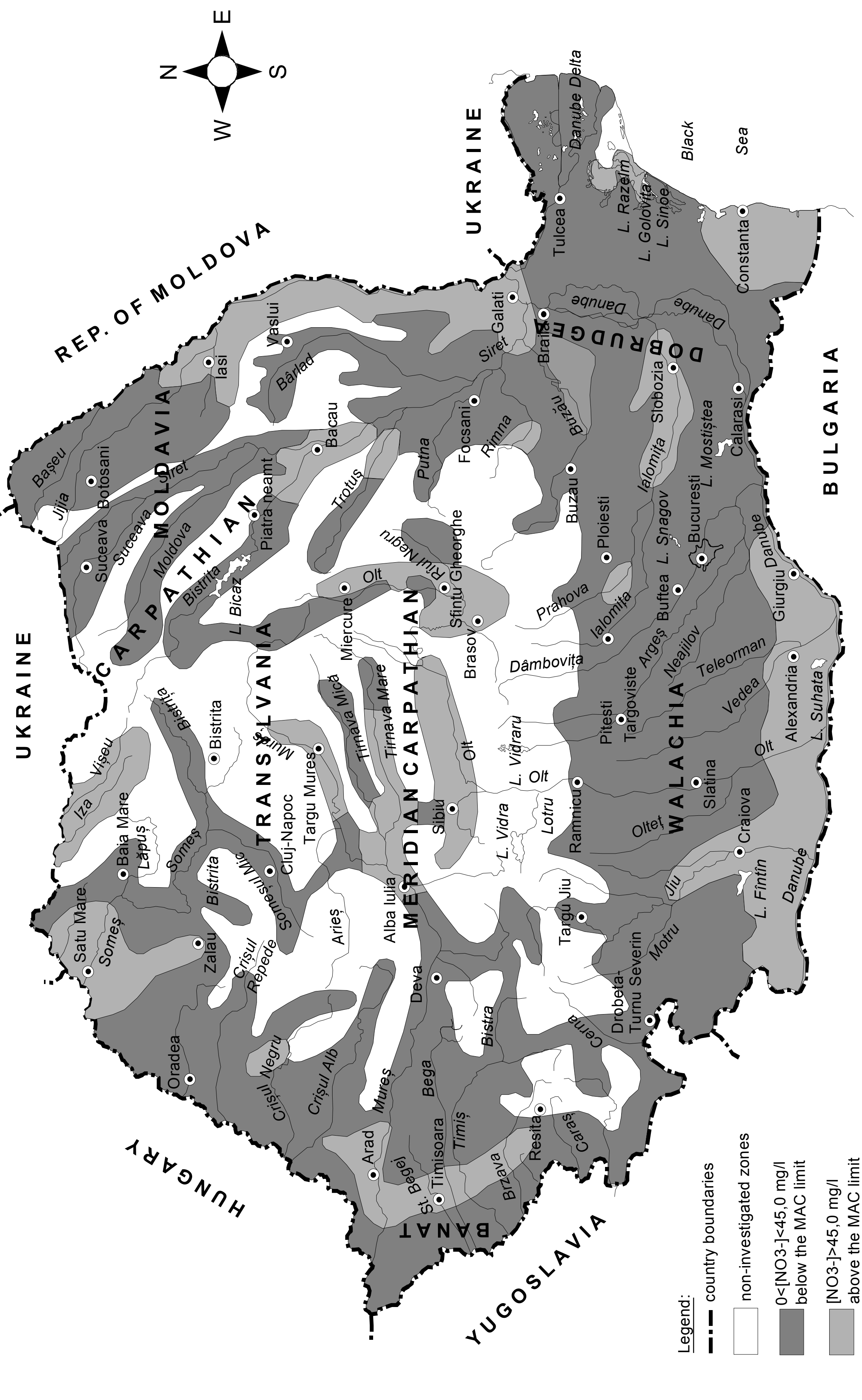
Table 7.5: Quality of water in main lakes and reservoirs, 1999

Hydrographical basin	Total number of monitored lakes and reservoirs	Category of water quality							
		I		II		III		Degraded	
		Number	*%*	*Number*	*%*	*Number*	*%*	*Number*	*%*
Total	**92**	**64**	**70**	**13**	**14**	**13**	**14**	**2**	**2**
Tisa	1	1	100	-	-	-	-	-	-
Someş	4	4	100	-	-	-	-	-	-
Mureş	6	6	100	-	-	-	-	-	-
Bega-Timiş	4	4	100	-	-	-	-	-	-
Nera-Cerna	3	3	100	-	-	-	-	-	-
Jiu	2	2	100	-	-	-	-	-	-
Olt	11	7	64	3	27	1	9	-	-
Agreş	12	10	83	2	17	-	-	-	-
Lalomita	6	3	60	2	40	-	-	-	-
Siret	18	13	72	3	17	-	-	2	11
Prut	9	2	22	2	22	5	56	-	-
Dunare	10	9	90	-	-	1	10	-	-
Litoral	6	-	-	-	-	6	100	-	-

Source: Ministry of Waters, Forests and Environment Protection, Environmental State in Romania - Report for 1999, May 2000.

Note:
I - Very good/drinkable**; II -** Good**; III -** For industrial use**; D -** Degraded

Figure 7.4 Pollution of groundwaters by nitrates



The state of the lakes and reservoirs was good in the hydrographical basins of the Tisa, Sorneş, Mureş, Bega-Timiş, Nera-Cerna and Jiu; it was inadequate in the basins of the Prut (category III: 56%) and in the littoral area (category D for some parameters and category III for others) and in Lake Amara (meso-eutrophic status). In the Siret hydrographical basin, the Jirlau and Amara lakes had high physico-chemical parameter values, which determined their inclusion in category D.

As regards the trophic degree of lakes and reservoirs, the following general aspects should be mentioned: 35 (38.1%) are oligotrophic; 6 (6.5%) are oligo-mesotrophic; 30 (32.6%) are mesotrophic; 1 (1.1%) are meso-eutrophic and 20 (21.7%) are eutrophic. In 1999, lakes Snagov and Caldaruşani (in the Ialomița hydrographic basin), Rogojeşti, Bucecea, Jirlau and Amara (in the Siret hydrographic basin), Negreni, Mileanca, Catamareşti, Dracşani, Halceni (in the Prut hydrographic basin), Razelm, Sinoe, Mariuța, Fundulea, Gurbaneşti, Frasinet, Iezer, Mangalia and Corbul (Danube – littoral zone) were eutrophic, and required ecological rehabilitation to reduce their degree of eutrophication.

Groundwaters

Groundwater quality was characterized in 1999 taking into account the results of (1) general parameters referring mainly to natural phreatic water loading and (2) specific parameters set according to the nature of pollution sources existing in that area.

The following main pollution types were recorded according to the groundwater pollution factors and taking into consideration the data available for every hydrographical basin:

- pollution by oil products and phenol compounds of the phreatic water in Prahova Teleajen alluvial cone, over a surface of about 70 km^2 due to the Petrobrazi, Astra and Petrotel Ploieşti refineries;
- pollution by oil and petroleum products due to accidental or deliberate oil pipe breakages (for theft);
- pollution by various noxious compounds resulting from industrial activities (Victoria - Fagaraş, Codlea, Tohanu Vechi, Zarneşti, Bod, Işalnița - Craiova, etc.);
- pollution by fertilizers and pesticides either during production (Azomureş, Archim Arad, Doljchim Craiova, Oltchim Rm. Valcea, Azochim Roznov, etc.) or in fields through inappropriate use;
- pollution due to unsuitable application of manure on the land;
- chemical and bacteriological pollution underneath big cities (Piteşti, Oradea, Bucureşti, Cluj, Suceava, etc.) and animal breeding complexes (Carei, Palota, Cefa, Halciu, Bontida, Baileşti, Beregsau);
- pollution generated by industrial and urban waste dumps because of a lack of environmental protection measures.

Consequently, a number of rural communities are not able to drink this water. Figure 7.5 presents the areas where groundwater was polluted by nitrates.

Black Sea

The Romanian seashore (247 km) is subject to some intense morphological changes and to pollution pressures. Pollution results from pollutants carried by the Danube, direct discharges of untreated or insufficiently treated waste water, and harbour activities. The major pollution sources are the Navodari Industrial Platform (fertilizer production), insufficiently treated industrial and household waste water from Constanta and Mangalia and maritime shipping.

The sediment quantity brought into the delta by the Danube flows has diminished by about 20% since reservoirs were built on the Danube and its tributaries. Consequently, the Black Sea ecosystems have undergone certain changes over the past two decades. The structure and the primary, secondary and tertiary biomass ratio have changed, the migration of certain prey fish from the Marmara Sea has diminished, while the populations of sturgeons and dolphins have declined. Due to the alluvium shortage the beaches are subject to steady erosion. Work to secure beach protection has to be permanent.

Romania's Black Sea coast is, however, a particularly attractive place. Together with the lakes in this area, including Lake Techirghiol, with a said healing potential, Romania's seaside can rival the most appreciated similar areas in Europe. However, significant levels of the main bacteriological strains (entero-bacteria such as total coliforms, faecal coliforms, faecal streptococcus that indicate household waste-water pollution) have been noticed in the southern Romanian littoral waters. In 1999, the highest number of total coliforms was recorded in the Constanta North and Cap Midia monitoring stations. This was due to the conjunction of insufficiently treated industrial and household waste-water discharges (Constanta North, Constanta South, Mangalia) and the increased number of people during summer periods. The other monitoring stations showed values within Romanian standard limits (STAS 12585/87) for natural swimming areas.

According to the amended European Community Directive on Drinking Water (91/692/EEC) only faecal coliforms and faecal streptococcus were above the limit values. The total coliforms exceeded the limits during summer periods only. The presence of faecal coliforms and faecal streptococcus in bathing sea water represented a risk for human health.

The Black Sea Programme, which is currently implemented under the Black Sea Convention, aims at rehabilitating the marine ecosystem by combining all the efforts of the riparian countries.

7.2 Water use and water protection

Protection against floods

In general, the water regime of the rivers in Romania is high in spring with floods and low the rest of the year. Frequent and intense floods are one of the characteristic hydrological phenomena of Romania's rivers. During the past decade, floods were recorded every year causing human casualties and huge material damage, especially in the central, western and northern part of the country.

The worst damage recorded was from the 1970 floods, when the Olt, Crisuri, Mures, Somes, Siret, Prut and Dunare rivers flooded more than 1 million ha of lands, damaging 85,500 houses, 294 industrial facilities, 934 km of railways, 2,843 km of roads and 3,547 bridges and footbridges.

More recently, in spring 2000, heavy floods hit some 465 localities (7 fatalities; 9,502 houses damaged), flooding 88,000 ha of land, 575 bridges, and over 170 roads. The floods also washed away tons of tailing deposits from mines at Cristiotu de Sus (upper Crisul Negru river). In the mountains, stormy summer rainfalls may create heavy floods in specific catchments too. The plains in the south, however, are confronted with severe drought as was the case in summer 2000.

To diminish possible flood damage, large hydro-technical protection works were built: 1,848 embankments, with a total length of about 9,430 km; about 12,400 river banks and bank consolidation, with a total length of about 3,000 km; 4,000 km of regulated watercourses; 1,316 important reservoirs, with a total volume of 14 billion m^3 including buffer capacities of about 2.15 billion m^3. A major problem remains the risks that these hydro-technical works pose to communities and the social and economic infrastructure in the event of an accident.

Water supply

Table 7.6: Available and usable water resources

	Available resources	
	Total	for abstraction
	Billion m^3 / year	
Total	**216**	**26**
Inland surface waters	38	13
Danube	170-200	10
Groundwaters	8	3

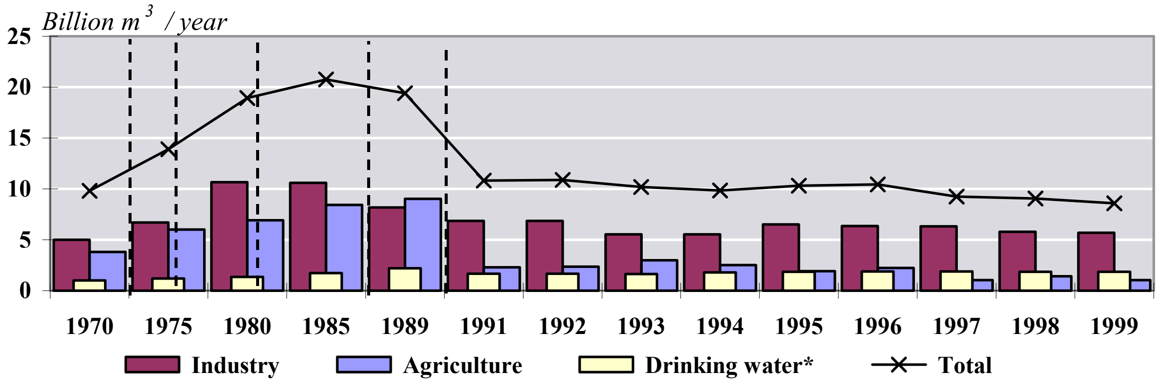
Sources: Ministry of Waters, Forests and Environment Protection; Environment Protection Strategy, Bucharest 1996; Compania Nationale "Apele Romane".

Surface water is the main source of water supply in Romania, see available water resources in Table 7.6. In 1999 water abstracted totalled 8.57 billion m^3: 7.44 billion m^3 was abstracted from surface water (5.0 billion m^3 from inland watercourses and 2.44 billion m^3 from the Danube), and 1.13 billion m^3 was abstracted from groundwater. The quantities of water used by the main consumers are presented in Figure 7.5.

In industry and agriculture water consumption grew steadily until 1989 (to respectively 8.17 and 9.03 billion m^3/year). After 1989, water consumption in these sectors drastically diminished (5.70 and 1.03 respectively in 1999) while household consumption remained rather stable (2.2 billion m^3 in 1989, 1.84 billion m^3 in 1999).

The drop in industrial water demand has been caused mainly by the economic recession and lack of markets for heavy industry products. The reduction in water consumption by agriculture has been brought about by the collapse of agricultural water-supply schemes. Land privatization led to the dismantling of water-supply schemes, an absence

Figure 7.5: Trends in water use, 1970-1999



Source: Compania Nationale "Apele Romane".
* Population and industry

Table 7.7: Public water supply, 1999

Hydrographical basin	Total water abstraction by municipal water supply systems		Supply of industry	Domestic water supply	Public consumption and losses of water (without wastage)
	Million m^3/year	*l/inhabitant/day*	*as % of total abstraction per inhabitant per day*		
Total	**1,840**	**492**	**14.9**	**49.2**	**36.0**
Bucharest	536.2	734	20.4	32.2	47.4
Arad	36.9	550	31.1	51.0	18.9
Bacau	39.3	511	8.6	53.8	37.6
Brasov	95.3	828	-	46.5	53.5
Cluj	90.4	742	-	49.0	51.0
Constanta	107.0	857	8.9	32.8	58.3
Craiova	48.7	420	22.7	55.5	24.6
Iasi	79.2	622	20.2	52.7	29.1
Tg. Mures	30.9	515	6.7	53.1	40.2
Ploiesti	82.2	895	12.3	51.3	36.4
Timisoara	70.0	592	18.3	66.0	15.7

Source: Romanian Water Association, National Report Regarding the Water Supply and Sewerage Systems in Romania, Bucharest, September 2000.

of maintenance of the irrigation infrastructures and a drastic decrease in the use of irrigation water as agriculture activities were handed back to a huge number of inexperienced private owners. The very high prices of energy for water distribution have also caused a dramatic shrinking in agricultural water demand. Because of the resulting shortages of water supply in the agricultural sector, crops now depend on weather conditions and have decreased substantially due to droughts.

The quantity of water abstracted for drinking water supply has remained unchanged, i.e. 500-800 litres per capita per day (Table 7.7). 11.3 million urban dwellers (91.8%) and 3.4 million of the rural population (33.5%) receive drinking water from public supply networks. All the 263 towns and municipalities have centralized water-supply systems as opposed to only 17% of the villages and rural settlements (2,648 out of 15,779); 71% of the population is supplied with drinking water originating from surface water and 29% from groundwater.

Excessive water demand created water shortages in a number of municipalities: in 1995, 36.3% of the population experienced water supply cuts of under 8 hours a day, 7.5% of between 8 and 18 hours a day and 8.3% of more than 18 hours a day. Since then the problem has eased slightly; for example, due to a loan from the World Bank there is no longer any interruption of water supply in Bucharest. The huge numbers of breakdowns in water-supply networks, the lack of water metering, very low water tariffs, a discontinuous water supply, inadequate centralized hot-water-supply systems and inefficient use of water by consumers explain such excessive water demands, water losses and water wastage.

Water consumption in industry and agriculture is higher than in other countries due to obsolete technology and techniques, excessive water losses along the distribution networks and water wastage both in household and industrial installations. The specific consumption in certain industries such as the iron and steel industry, energy, chemicals and textiles also exceed consumption in the economically advanced countries by 1.5-2.0. Water used effectively in the irrigation systems represents only 40-50% of the total water pumped.

Waste water and other sources of pollution

Waste-water disposal and treatment

In 1999, a statistical analysis of the main waste-water sources indicated that:

- About 6,014 million m^3/year are discharged, of which about 3,033 million m^3, i.e. 50%, need to be treated;
- Of the 3,033 million m^3/year of waste water requiring treatment, about 18% is treated adequately. Of the remaining 82%, 32% is untreated and 50% is insufficiently treated;
- Municipalities discharge 71% of the waste water that needs to be treated, the chemical industry 9% and the metal-processing and machine-construction industry about 5%;
- The highest amount of untreated waste water is generated by the same entities: municipalities (urban waste water, 837 million m^3/year or about 85%), chemical industry (42 million m^3/year or about 4%), metal-processing and machine-construction industry (28 million m^3/year or about 3%);
- Over 69% of the insufficiently treated waste water is from municipalities, about 8% from the chemical industry and 6% from the extraction industry;
- Of the 1,326 waste-water treatment plants which were investigated in 1999, 45% were working properly, and the remaining 55% ineffectively;
- Average waste-water flows discharged an overall annual load of 21,200 tons of nitrogen, 5,900 tons of phosphorus, and 111,900 tons of BOD_5. In Romania there are no waste-water treatment plants with a tertiary purification step for nitrogen and phosphorus removal.
- As for urban waste-water disposal and treatment, 262 urban areas and 374 rural areas have sewerage. The data regarding waste water in 1998 indicated that:
  - 47 (17.9%) towns out of 263 have either no waste-water treatment plants or they are not operating; among them: Bucharest, Craiova, Galati, Braila, Drobeta-Turnu, Severin, Tulcea;
  - of the 15,779 rural settlements only 53 have waste-water treatment plants;
  - 77% of houses connected to a public water-supply system are also connected to an urban sewerage system.

Diffuse pollution

The decrease in diffuse pollution due to the use of fertilizers, pesticides and herbicides in agriculture is noticeable. Recent data showed that at the hydrographic basin level average concentrations of these substances which entered the watercourses were below the maximum permissible concentration. After 1989 the use of fertilizers in agriculture decreased by 50%, N and P fertilizer consumption having shrunk from 38 kg N/ha (the normal average) to 20 kg N/ha and from 18 kg P/ha to 10 kg P/ha.

Accidental pollution

60 cases of accidental pollution of surface water occurred in 1999 caused mainly by spills, leaks and road accidents. The number of spills has halved since 1995. Environmental pollution was caused by different hazardous substances:

- petrol in 40 accidents
- chemical products in 12
- slurry from metallurgical mining in 5
- others in 3.

Some of them had transboundary effects (e.g. Box 7.1).

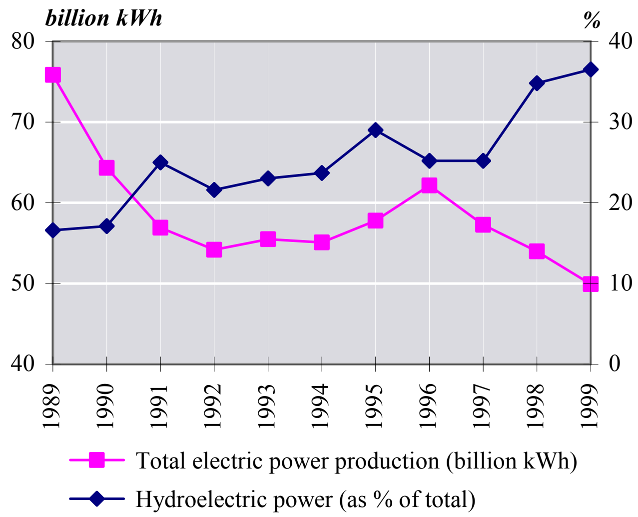
Box 7.1: The Baia Mare Accidental Spill

A serious accidental spill from a waste pool happened on 30 January 2000 near Baia Mare in the Maramures region in northern Romania. The Baia Mare Task Force (Box 5.1, Chapter 5) has identified the inappropriate design of the tailing pond, the acceptance of such a design by the permitting authorities and inadequate monitoring and dam construction, operation and maintenance as causes for the accident. These factors were triggered by severe weather conditions, which could and should have been foreseen. Some 100,000 m^3 of cyanide-contaminated water flowed into the Somes River and down to the Tisza River in Hungary and Yugoslavia and via the Danube to the Black Sea. A number of water intakes from the Tisza and Danube Rivers stopped their operation for a couple of days, among them the Tulcea (Danube Delta region) municipal water intake. There were no human casualties. But the accident has led to a modification of aquatic life (fauna and flora have reappeared but species are different from what they were).

The Aurul Company operates and maintains the mine-tailing pond. An environmental impact assessment was produced for this tailing ponds and its operation. It stated that there would be no danger of overflowing tailing pond in case of heavy rainfall. The company received 15 permits before obtaining an environmental agreement to operate the plant. Permits were provided by a range of national and local authorities. Both EIA and the licensing process took seven years. In early 2001, the plant had not yet been given official permission to resume operations, but the dam for the slurry pit has been repaired and it is foreseen that the production facility will restart soon.

Recent studies (1994-1999) of the Institute of Geography in Bucharest on mining activities and the quality of the environment in Maramura county and the inventory of the Environmental Protection Inspectorate in Baia Mare showed that 38 hot spots and 19 tailing ponds in this area need immediate and long-term rehabilitation. The same problem exists in other industrial areas: in the Ialomita River catchment, and around the Siret and Prut.

Figure 7.6: Electric power production, 1989-1999



Sources: Ministry of Waters, Forests and Environment Protection; Environment Protection Strategy, Bucharest 1996; Compania Nationale "Apele Romane".

Other water uses

Pig breeding

While large pig farms are facing economic difficulties due to market restructuring, the manure discharges from the huge existing pig-breeding facilities (up to 500,000 pigs for some of them before 1989) and other large animal farms (poultry, cattle) are point sources of severe pollution of surface waters (See more details in Chapter 11). In many cases, the river quality is retrograded to category “D” downstream from the breeding facilities.

Hydroelectric power

The country's hydroenergetic potential is 38 billion kWh/year, of which 26% from the Danube (See more details in Chapter 13). Figure 7.6 shows the share of hydraulic energy production over various years as against the total production. An increase in hydroelectric power production, which has been observed in the past few years, may cause shortages in the water supply to municipalities, industry and agriculture in dry seasons.

Transport

The Danube represents the main means of transport among Europe's inland waterways. Two seas are connected through the main Danube and Rhine canals, i.e. the North Sea and the Black Sea, thus creating promising prospects for goods traffic from and to Romania.

7.3 Water policy objectives and management

Priorities for water policy

After a period during which privatization of water assets was pushed through, the new 2001 Government Programme puts special emphasis on the social aspects of water management such as water supply and flood protection, and on more ecological aspects such as water quality protection through approximation to the EU Directives on water quality.

The general objective of the 1995 Water Strategy, which is still valid today, is the rational use of water resources for the benefit of present and future generations. The priorities for water policy have been defined as follows:

- Reducing the water consumption growth rate in all branches of the economy;
- Ensuring the drinking water supply to the population and public sanitation;
- Rationally using and saving water within the different utilities, in order to reduce water demand;
- Protecting water resources and managing them in order to avoid shortage and pollution, having chiefly in view drinking water supply, food production and aquatic ecosystem conservation;
- Efficiently operating and using the existing facilities;
- Efficiently preventing any disasters such as floods and accidental pollution;
- Improving legislation and management;
- Involving the public in the management of water resources.

The policy has to be implemented taking into consideration a number of principles:

- The river basin is the natural physical entity for water management;
- Water quantity and quality management are closely related; therefore they must be tackled jointly by integrated and cost-effective/efficient solutions;
- Water management should be based on the principle of human common interest through close, all-level collaboration and cooperation of public administrations, water users, representatives of the local communities, in order to obtain maximum social benefit;
- The polluter pays principle should apply;
- Water is not an economic good like any other, but rather a precious heritage that must be defended, protected and treated as such.

The strategic objectives for a sustainable development of the water resources are also expressed in the updated NEAP. They include the following priorities:

(a) Ensure a drinking water supply to the population and public sanitation;
(b) Improve surface and groundwater quality;
(c) Restore the ecological state of rivers;
(d) Prevent and control floods, droughts and any other dangerous hydro-meteorological phenomena;
(e) Set up river basin committees.

Another major objective is improvement in the treatment of waste water. For instance, the priority defined in item (b) above is strictly linked to Romania's obligations under the Convention on Cooperation for the Protection and Sustainable Use of the Danube River. The Joint Action Environmental Programme for the Danube River Basin, January 2001-December 2005, has identified as key priorities for implementation 10 hot spots in municipal waste-water treatment (one of which is in Bucharest), 7 hot spots in industrial effluent control, 3 hot spots in agricultural pollution, and a number of hot spots related to pollution and potential accidental pollution caused by waste deposit sites and tailing ponds.

The 1994 Danube Strategic Action Plan under the Convention also contains provisions to protect the Black Sea and the Danube Delta against pollution by nutrient and hazardous substances, and is much concerned with transboundary issues. Under this Programme, a series of projects were proposed to GEF for financing. While in line with the projects contained in the NEAP, these projects focus more on nutrient pollution as it has a strong eutrophying effect on the Danube Delta and the Black Sea. The Bucharest waste-water treatment plant is the first project that will be implemented under this Programme.

Legislation

The Water Law (Law No. 107 of 25 September 1996) is the fundamental legal act on water management in Romania. It covers all water bodies save mineral and geothermal waters. The Water Law states that the waters are an integral part of the public heritage. The protection, restoration and sustainable development of the water resources are actions in the public interest.

The Water Law established the ownership of water (art. 3), keeping the major water assets in the public domain. The Law has the following objectives (art. 2):

(a) the conservation, development and protection of water resources, as well as ensuring free water flow,
(b) protection against any form of pollution and modification of the characteristics of water resources, of their banks and beds or basins,
(c) the restoration of both surface and groundwater quality,
(d) the conservation and protection of aquatic ecosystems,
(e) ensuring a drinking water supply to the population and public sanitation,
(f) the complex valuation of waters as an economic resource and the rational and balanced distribution of this resource,
(g) the prevention and control of floods and of any other dangerous hydro-meteorological phenomena,
(h) ensuring the water requirements for agriculture, industry, power generation, transport, aquaculture, tourism, recreation and water sports as well as other human activities.

The 1996 Water Law also established the river basin concept for the management of water resources, both surface and groundwater. Any water use requires a licence or permit. A licence is needed also for discharging waste water and for draining water from mines and deposits into water bodies. The Law also states that the water supply for the population has priority over the use of water for other purposes. The Law provides for protected zones if needed.

The Water Law also laid down (art. 4) that the Ministry in charge of water management had to establish the water resource use regime and that the administration of public domain waters was the responsibility of "Apele Romane" (the Romanian Water Authority), which should set up (art. 84) a water fund. The details of "the water resource use regime", standards and norms figure in governmental or ministerial regulations (orders). However, a number of such regulations, which are still in force, were issued before 1996 under the former law. The most important of these secondary laws introduced before 1996 are:

- national standard STAS 1342 for drinking water quality, in line with WHO though not with EU standards;
- national standard STAS 1343 for standard water needs;
- national standard STAS 4706 for surface waters, quality categories and conditions, different from the new EU standards on surface waters;
- national standard STAS 9450 for irrigation water;
- norm NTPA-001 on the limit values of polluting substances discharged into receiving waters was approved by government decision; and norm NTPA-002 on the limit values of polluting substances discharged into sewerage systems by Ministerial Order No. 654/1997;
- waste-water discharges must be licensed and controlled by the competent national authorities also approved by government order;
- Government Regulation No. 981/98 on the status of Apele Romane (a joint-stock company) and on water and waste-water charges.

At present, Romania has to transpose EU legislation, including the Water Quality Directives. The Directives are at a different stage of transposition. In July 2000, about 35% of the water directives had been transposed (Chapter 1, Figure 1.1). The most advanced are the directives on dangerous substances 76/464/EEC (62%) and on drinking water measurement 80/778/EEC (55%) and the waste-water directive 91/271/EEC; the less advanced are the water framework directive (12%) and the fish directive. Only 4 of the 16 directives have an expected date of implementation. A key problem is to obtain grace periods for those directives that call for "heavy investments". Compliance costs related to the urban waste-water directive (representing over 90% of investment in the whole water sector) were estimated at € 8-12 billion.

Institutional arrangements

Romania's water management system was established by the 1996 Water Law and the 1995 Law on Environmental Protection. Three main institutions compose this system:

- the Ministry of Water and Environmental Protection (MWEP),
- the National Water Authority "Apele Romane", which has river basin branches and provincial offices,
- the local Environmental Protection Inspectorates (EPIs).

Other ministries have also some responsibilities. For instance, the Ministry of Health and the Family monitors drinking water quality. The Ministry of Public Works, Transport and Housing regulates navigation and navigation-related activities.

MWEP draws up the national strategy and policies in water resources management and protection. The specific functions of the Ministry include:

- strategic planning, including the drawing up of national water management and development programmes,
- preparing legislation and policy,
- allocating and managing national budget resources for water management and infrastructure development,
- setting standards and controlling and monitoring compliance with them,
- preparing the administrative process for the regulated use of water resources through a licence and permit system,
- international cooperation and cooperation on transboundary water bodies.

Within MEWP, the State Water Inspectorate is responsible for the inspection and control of implementation of the legal provisions. The local Environmental Protection Inspectorates are responsible for issuing licences and permits as well as for inspection and control of water quality and emissions into water bodies.

Apele Romane is in charge of the implementation of the national water management strategy. Apele Romane is a joint-stock company that is 100% owned by the State through the Ministry of Waters and Environmental Protection. The company undertakes management tasks with its 11 river basin branches (Figure 7.1) and local offices. Apele Romane is self-sufficient. The costs of its operation are covered by the water charges paid by water users. The company:

- administers and maintains the surface watercourses, lakes and inland sea and groundwater bodies,
- promotes the optimum allocation of the water resources to the water users, their rational use and protection against their the overuse and depletion,
- protects water quality against deterioration and pollution and prevents and controls accidental pollution,
- protects against floods and droughts, coordinates reservoir operations and development of the water system,
- monitors the quantity and quality of the aquatic environment and of the water used,
- distributes the budget funds to basins and redistributes income from water and waste-water charges.

The branches of Apele Romane acting within the river basins (Figure 7.1) and their provincial offices have special responsibilities for:

- the preparation of plans for river basin management, flood and drought control;
- agreements on water abstraction and use with water users and with waste-water dischargers which are based on the licences and permits issued by the local Environmental Protection Inspectorates;
- monitoring such agreements and respect for the provisions of the licences and permits, as well as collecting water and waste-water charges;
- the operation of monitoring networks for hydrological information and water quality;
- the maintenance of water management works and operation of hydraulic structures, reservoirs, channels and other diversions, which are entrusted to Apele Romane, among them 260 reservoirs of the 400 with over 1 million m^3 of capacity (the other 140 are under the Ministry of Industry and Mineral Resources);
- the preparation of technical reports to EPIs in view of the delivery of licences and permits.

Responsibility for drinking water supply, waste-water disposal and treatment lies with the local authorities. The water users (municipalities and industries) are obliged to prepare, and apply if necessary, their own plans for the prevention and control of accidental pollution that might occur as a result of their activity.

7.4 Instruments for implementation and enforcement

Monitoring

Apele Romane monitors the *quality of rivers* in 22,000 km out of 78,900 km, using 318 gauging stations. When flows are high, water quality data are transmitted daily from 65 control stations. When flows are low, surface waters are monitored (immission monitoring) in the 318 stations once a month. About 40 physical, biological and microbiological parameters are measured.

There are water quality standards, necessary for the interpretation of the analysis results and the assessment of water quality. The assessments are carried out according to standard STAS 4706/1988 on the classification of surface water. There are also standards for the analytical methods used for determining each kind of parameter. The spatial density of the monitoring network for surface waters is one control section every 745 km^2, and is in compliance with the EUROWATERNET European Network.

Apele Romane monitors *water quantity* in 1,016 hydrometric stations by measuring the flows. About 40% of the water quality monitoring stations also monitor quantity. For the other stations discharge information is transmitted from the nearest hydrometric station.

The water quality of the Danube River is monitored by Apele Romane in cooperation with ICIM. The location of measuring points, the monitored pollutants, and all information on sampling are correlated all along the River and among the different riparian countries. In each country there is a centre for early warning of accidental pollution, connected by satellite. In Romania, the centre is located in the MWEP and is technically supported by ICIM.

Groundwater is monitored by Apele Romane in 3,695 hydrological stations, of which 1,434 take qualitative measurements. In addition there are some 12,000 survey points situated in the vicinity of pollution sources, drillings and water wells for water supply, mainly in rural areas. Eighteen general physico-chemical parameters (temperature, pH, conductivity, total dissolved solids, oxygen regime, nutrients, etc.) are measured in groundwater. For the drinking water supply, bacteriological parameters are measured too. For the boreholes that might cause pollution (oil exploration), specific parameters are measured depending on the potential pollutants. Sampling frequency is between 2 and 4 times a year. There are standards for the analytical methods for each type of parameter analysed. The analysis results are validated by comparison with the water quality requirements of STAS 1342/1991 – drinking water.

Black Sea water quality is monitored by Apele Romane and the Marine Research Institute every year at 13 sampling stations. Between Navodari and Vama Veche the sampling from March to October is monthly and between Sulina and Midia seasonal. Twenty-eight physico-chemical parameters are monitored (oxygen regime, TDS, nutrients, organic pollutants, heavy metals, etc.), three biological parameters (phytoplankton, zooplankton, zoobenthos) and four microbiological parameters (mesophil bacteria, total coliforms, faecal coliforms, faecal streptococci). For their interpretation, the results are compared to standard 4706/88 values for Black Sea surface water.

The monitoring of waste-water discharges (emission monitoring) of about 2,100 point pollution sources is performed by Apele Romane. EPI laboratories can perform environmental audits or inspections. EPI laboratories can also perform water analyses on a commercial basis.

The accreditation process, according to international standards (ISO 9000), has just started in Romania. At present the quality assurance system consists mainly of parallel sampling and analysing (inter-calibration) between the laboratories of Apele Romane and foreign laboratories, followed by a spatial analysis of the results. Ten of the forty-one "Apele Romane" provincial laboratories are very close to accreditation at national level, by RINAR, the national accreditation body.

Licences and permits

According to the Water Law, the rights to use surface and groundwaters are established through water management licences. Such rights also include waste-water discharges to surface waters, drainage, mining and other discharges (art. 9). The Water Law also seeks to ensure that discharges to waters meet the pollutant limits and loads defined in the licences and permits based on norms NTPA-001 and NTPA-002. According to the Law on Environmental Protection and the Water Law, the licences and permits are issued by the local EPIs in close collaboration with the river basin and provincial offices of Apele Romane. There is a close relationship and collaboration between EPIs and Apele Romane.

Licences and permits are issued for no more than 5 years. Pollution limits are set in the licences and permits. These limits are water quality standards and not emission limits: they are defined for each pollutant, fixing a maximum concentration in the receiving water body according to its quality class. Compliance with the permit is verified by EPIs from 1 to 24 times a year, depending on the importance of the discharge. Self-monitoring, which is unevenly carried out by the polluters or subcontracted to local EPIs or Apele Romane laboratories, is not used to assess compliance with permit conditions.

Economic mechanisms

In Romania, economic instruments for water management and protection include *service charges (drinking water treatment and distribution, and sewage network and waste-water treatment), various water charges, taxes, penalties* and *allowances* (bonus) (more in Chapter 3). They aim at a rational and economical management of waters to ensure that users respect the quality limits for water discharges, to prevent the depletion of the water resources and to avoid quality damage. *Water extraction charges* are the same all over Romania, but differ according to the source of water (inland rivers, Danube, groundwater) and the category of user (industry, household, power plant, agriculture, fisheries). In August 2000, the prices of raw water (water charges) were approved by the Office of Competition at a level of 0.09 lei/m^3 for electricity production and 71.2 lei/m^3 for municipal water supply up to 153.6 lei/m^3 for industrial water abstracted from groundwaters. The pollution charges are levied on a set of pollutants and aimed at reducing their content in the rivers to within the limits set by the law. If the limits are exceeded, fines or penalties are levied. Penalties are levied for non-compliance with the permits or contracts, for both water intakes and discharges of waste water. The purpose is to reduce the environmentally harmful impact of certain activities and oblige users to respect the permits. The penalties are used as income for the Water Fund.

The income from all water charges is used to cover Apele Romane's operating costs. It does not include any financial resources for the development of water infrastructures. To improve the economic mechanisms for water resources, the level of service prices and water charges has been updated recently in line with the inflation rate; the fines for violations have also been updated.

Drinking water that is supplied to the population by municipal water supply systems is paid for by its consumers, but the price charged is well below the real cost of water. The tariffs for water supply and sewerage services differ according to the municipality, depending on the type of infrastructures used. In July 2000, the tariff fluctuated from 3,780 lei/m^3 (or US\$ 0.18/m^3 in Ploiesti) and 4,670 lei/m^3 (or US\$ 0.23/m^3 in Bucharest) to 9,904 lei/m^3 (or US\$ 0.48/m^3 in Petrosani).

Expenditure

Expenditure on investments in water management in the different branches of the economy in 1997-2000 is presented in Table 7.8. In 2000, this expenditure is expected to reach 0.61% of GNP. Because of the very low GNP, the amount of financial resources for water management investments is very low. Due to this shortage, many very important investments in diversion channels, flood-control reservoirs and waste-water treatment plants have been stopped. For example, 31 waste-water treatment plants just under construction cannot be completed for lack of finance; only one of them in Constanta receives financial support from PHARE.

The need for new investments in the water sector is very high. For example, work on hot spots identified under the Joint Action Programme for the Danube River Basin is prioritized for implementation, and has been retained for financing under ISPA. The financial resources needed to control the 10 municipal discharge "hot spots" have been estimated at € 393 million, while the State budget for 2000 on investments in water management stands at € 25 million. Another € 30 million is needed to solve the problems of industrial and agricultural "hot spots".

Most of the 286 projects retained in the 1999 NEAP concern water facilities. ISPA is recognized as the key funding source for those projects. In the short term, ISPA will spend € 1,053 million on waste-water treatment and water management over a period of 7 years. Water and waste-water priority projects proposed for financing by ISPA are listed in Table 7.9. The minimum domestic contribution

Table 7.8: Financial resources allocated to investment in water management, 1997-2000

Activity	Financial sources	1997		1998		1999		2000	
		billion lei	*as % of GNP*	*billion lei*	*as % of GNP*	*billion lei*	*as % of GNP*	*billion lei*	*as % of GNP*
Total general		**114.4**	**0.045**	**194.2**	**0.052**	**425.8**	**0.081**	**797.1**	**0.102**
of which:	State budget	114.4	0.045	194.2	0.052	318.7	0.061	482.3	0.062
	External credits	-	-	-	-	107.1	0.020	314.8	0.040
Sources for water supply (reservoirs)	State budget	54.8	0.022	100.5	0.027	115.6	0.022	138.2	0.018
Flood control works	State budget	59.6	0.023	93.7	0.025	203.1	0.039	344.1	0.044
	External credits	-	-	-	-	107.1	0.020	314.8	0.040

Source: Ministry of Waters and Environment Protection.

to any project co-financed by ISPA is 25%, an amount that Romania will find difficult to afford in the present circumstances.

7.5 Conclusions and recommendations

Romania's water system is broadly developed. Quantitatively, its water resources are sufficient to cover its water demand. In particular, hydrostructures have spare capacity and are generally sufficient to manage floods and droughts. a period of 7 years. Water and waste-water priority

In some places, however, water resources are badly affected by pollution. About 9% of the river stretches that are monitored are excessively polluted. The degradation of river water quality has been caused mainly by untreated waste-water discharges from municipalities: only 18% of municipal waste water is treated properly. The capital city, Bucharest, still has no waste-water treatment plant. The degradation of groundwater is caused by heavy farming practices, in particular incorrect manure spreading and overfertilizing of the fields (pollution by nitrates). Accidental pollution from industrial tailing ponds is also a serious problem.

Excessive per capita water consumption is a big problem in Romania. Because of the recession and the collapse of irrigation systems, water consumption by industry and agriculture has fallen considerably over the past ten years. Nevertheless, industry (including energy production) is still responsible for 60% of water demand. An effort should be made to reduce this consumption firstly by closing cooling loop systems.

Even worse is the demand for drinking water for household purposes. It has stabilized at a very high level with an average consumption of 500 litres/inhabitant/day. This is, in fact, due to water losses in the obsolete distribution networks, and very largely to water wastage by the consumers. The lack of individual water meters, the very bad state of household plumbing, the cuts in water supply and the irrational consumption by the people themselves are all causes of this over-consumption. The consequence is a correspondingly excessive volume of waste water generated by the users, leading to a need for a correspondingly oversized sewage network and waste-water treatment facilities, and unnecessary investment.

Recommendation 7.1:
The reduction of excessive drinking-water use caused by water wastage and losses should be a priority in the rationalization of water use in Romania. To solve this problem, it is necessary to:

- *rehabilitate the water supply system and ensure continuous supply of drinking water and hot water where centralized hot water supply systems exist. This implies the rehabilitation, upgrading and automation of hot water supply systems and household installations;*
- *install individual cold and hot water metering;*
- *increase drinking-water and waste-water tariffs so as to cover the full cost of water supply and waste-water disposal and treatment, incorporating the cost of renovation investments;*

Table 7.9: Proposed priority investment projects in the water sector for ISPA financing

Million Euro

Approved projects		Estimated project value	ISPA commitment
Total		**308.8**	**134.0**
ISPA 2000			
Constanta	Waste water	98.0	44.3
Iasi	Waste water	51.7	23.8
Craiova	Waste water	70.6	38.3
Jiu Valley	Waste water	9.7	5.8
ISPA 2001			
Arad	Waste water	18.0	8.1
Braila	Waste water	60.8	13.7
Stand by projects		**Estimated project value**	**Requested to ISPA**
Total		**258.4**	**193.7**
Brasov	Waste water	67.1	50.3
Timisoara	Waste water	62.0	46.5
Cluj-Napoca	Waste water	64.5	48.4
Pascani	Waste water	27.2	20.4
Oradea	Waste water	23.9	17.9
Focsani	Waste water	13.7	10.2
Technical assistance projects			**TA requested to ISPA**
Total			**4.929**
Bucharest	Waste water		1.350
Dobreta Turnu Severin	Water management		0.750
Botosani	Water management		0.525
Galati	Waste water		0.675
Baia Mare	Water management		0.570
Buzau	Waste water		0.225
Mures Valley (Hunedoara County)	Waste water		0.590
Focsani	Waste water/ tender documentation		0.244

Source: Ministry of Waters and Environmental Protection, ISPA Implementation Unit, 2001.

- *develop economic incentives to encourage owners of buildings and flats to repair their water infrastructures.* See also Recommendation 14.1

An adequate framework legislation for water management is provided in the 1995 Law on Environmental Protection and the 1996 Water Law. While the Water Law now needs some adjustments and amendments, the ongoing transposition of European Union water quality legislation will solve this task. However, the implementing legislation is obsolete, dating mostly from before 1996, i.e. not adjusted to the new laws. Laws now chiefly need to be effectively implemented.

Recommendation 7.2:
The Ministry of Waters and Environmental Protection should urgently update the implementing regulations for water legislation, and implement them effectively. Implementation should be accompanied by an action programme for hot spots, in particular industrial sites discharging hazardous substances directly into waters further used for drinking-water supply.

Romania's water management institutions have been shaped and developed with a view to achieving and implementing the river basin management concept. Today Apele Romane has 11 offices at river basin level, which almost fulfil the role of river basin authorities (or agencies).

However, their management system is too centralized: many decisions are made at the top by Apele Romane at headquarters or by MWEP. In a river basin management concept, as developed in the EU, the river basin authorities are self-sufficient and self-managed institutions with responsibility for water management in specific basin areas. They should be assisted by river basin management committees, in which the major stakeholders (individual users, municipalities, industry, agriculture, etc.) are represented and can voice their concerns and interests. The financial resources to cover the costs of the operation, management and development of river basins, and help finance the related investments, should come from water and waste-water charges.

Although already geographically delineated, Romania's river basins do not function according to this scheme. The existing 11 river branch offices of Apele Romane should become self-sufficient and self-managed river basin authorities. The financial resources, which will cover the costs of operating, managing and developing river basins, have to come from water and waste-water charges. Compared to the situation today (see above the section on institutional arrangements), the river basin authorities' tasks will generally be similar to the current tasks of the branches of Apele Romane, except that the river basin authorities will also collect and redistribute the financial resources within their jurisdiction. In this context, the Apele Romane Headquarters would have only administrative power on behalf of MWEP to supervise the functioning of water management systems and the river basin authorities. Apele Romane's cost of operation would be covered by the State budget.

Recommendation 7.3:
River basin authorities should be brought into line with the EU concept as self-sufficient and self-managed institutions entrusted with managing the water and protecting the surface and groundwater in their respective basin areas. Apele Romane Headquarters should be seen as a water agency entrusted with administrative power by the MWEP to supervise the functioning of water management systems and the river basin authorities.

A number of enforcement instruments – water licensing, water charges and water monitoring – are in place but implemented loosely. Water and waste-water charges paid by water users to Apele Romane basin management offices are used to cover the cost of operating and maintaining the water system and the functioning of Apele Romane itself. But these charges are too low to provide for any new investment or the complete overhaul of obsolete networks. The tight State and local-authority budgets make it impossible to implement the construction programme for new water management facilities and waste-water treatment plants. Available foreign aid is not even sufficient to solve the problems of identified hot spots, and demand an additional domestic contribution that Romania is unable to afford. In such a situation, it is necessary to reconsider the nature of the economic instruments (see Chapter 3) and the level of the water and waste-water charges.

Development of the national and local water systems can be financed only through an increase in water charges to promote new investments in public water supply and waste-water treatment. The existing water and waste-water charges hardly cover the cost of operating and maintaining surface and groundwater bodies and are not adjusted to the inflation rate. The river basin committees and councils and the river basin authorities with the agreement of the MWEP and the Ministry of Finance should set new charges adapted to the needs of managed river basins and the capacity to pay of the water users, i.e. households, industry and agriculture.

Recommendation 7.4:
On the initiative of the Ministry of Waters and Environmental Protection, Apele Romane and municipalities should reconsider drinking-water and waste-water charges and pricing, increasing them and differentiating them according to the type of use and taking social aspects into account. This income should be used together with other sources of funds for financing the development of national and local water systems and new investments in water infrastructures. New investments, especially in municipal water supply and waste-water treatment plants, should take into account the likely drop in water consumption which should be brought about by an improvement of the water supply network, water metering and pricing system.

While indicated in the permit, self-monitoring to measure whether the discharges meet licence and permit requirements is very unevenly carried out by the polluters. When it is, the adequacy of the methodology and analytical procedures and the reliability of the results are questionable. Often, measuring is subcontracted to Apele Romane or to a local EPI laboratory, possibly leading either to a duplication of information or no information. This way of acting is due to a lack of clarity as to the way pollution monitoring should be carried out and who is responsible for it.

Recommendation 7.5:
The self-monitoring of waste-water discharges and pollution loads should be regulated by law and carried out by accredited laboratories. The monitoring of emissions and immissions performed by the local Environmental Protection Inspectorates (EPIs) and Apele Romane should be harmonized. The quality of measurements by Apele Romane and EPIs should be improved by strengthening the laboratory accreditation process.

For transboundary water problems, see Chapter 5 and Recommendations 5.3 and 5.4.