Chapter 8

WATER MANAGEMENT

8.1 Water resources

Water resources are not equally distributed throughout Ukraine. Sufficient resources are found in the north and the north-west, while the south is poorly endowed. Average annual precipitation varies from east to west, with 300 mm in the semi-arid south-east Black Sea and Azov coastal zones to 1 500 mm in the Carpathians.

Surface water

The country's water network consists of the following main rivers: the Dnieper, the Dniester, the Siversky Donets and the Southern Bug. All drain south towards the Black Sea and the Sea of Azov. Other major rivers include the Zakhidny Bug, running north-west into Poland and the Baltic Sea; the Tisa, which flows into Hungary as a tributary of the Danube; and the Prut, another Danube tributary, flowing between Romania and the Republic of Moldova after leaving Ukraine. The largest of the three Danube branches which comprise the Danube Delta, the Kiliia, constitutes the border between Romania and Ukraine, although only a small portion of it drains directly from Ukrainian territory into the Danube.

Ukraine's main hydrological basin is the Dnieper catchment. The Dnieper is Europe's third largest river and runs for 2 200 km within Ukraine. Its average annual flow amounts to 53.5 billion m^3, draining almost half the country's surface area (293 000 km^2). There are six large reservoirs on the river, creating water reserves with a total volume of 43.8 billion m^3, for the industrial centres of Donbas and for irrigation purposes further downstream in Crimea and on the Black Sea coast. The respective capacities of these reservoirs are: 3.73 billion m^3 for the Kyiv reservoir, 2.50 for the Kaniv, 13.52 for the Kremenchug, 2.46 for the Dniprodzerzhink, 3.32 for the Dnieper and 18 for the Kahovske reservoir. At least 30 million people and the most important industrial areas depend on its water.

The Southern Bug drains 11 per cent of Ukraine's territory (63 700 km^2) and the Dniester 9 per cent (52 700 km^2). There are 950 small lakes, 4 lakes with a surface of 10-100 km^2 and 2 lakes of over 100 km^2. The inflow of transboundary rivers is estimated at 160 billion m^3 yearly, of which the river Danube contributes almost 80 per cent. Approximately 51 billion m^3 of water resources are formed annually on Ukraine's territory.

In 1997, 16.5 billion m^3 of surface water was abstracted from inland water bodies. Mostly due to a decline in industrial production, the abstraction of surface water was 34 per cent lower in 1997 than in 1994. Compared to 1991, the abstraction of surface water has decreased by 45 per cent.

Groundwater

Groundwater resources are available across Ukraine. The main groundwater reserves are located in the centre and the west; the south has the fewest reserves. As a result, the territorial pattern of available groundwater reserves and that of the most water-intensive activities do not match. The total resources of groundwater are estimated at 61.7 million m^3 per day.

Water abstraction from groundwater sources reached 3.7 billion m^3 in 1997, i.e. 16 per cent of available resources. Use of groundwater varies considerably by oblast. In the centre and the east of the country, 5 to 13 per cent of the groundwater resources are used, whereas in the southern oblasts water abstraction often exceeds 50 per cent of the available resources (Donetsk, Kirovograd, Mykolayiv, Odessa oblasts and Crimea). The decline in industrial production has entailed a reduction in groundwater abstraction: in 1997, abstraction was down 20 per cent on 1994, and 38 per cent on 1991.

Table 8.1: Water abstraction, 1991-1997

Million m³

	1991	1992	1993	1994	1995	1996	1997
Total	**34 905**	**32 461**	**29 709**	**29 499**	**25 852**	**23 477**	**21 091**
Surface water *	29 800	27 439	24 907	24 934	21 547	19 435	16 525
Groundwater	5 105	5 022	4 802	4 565	4 305	4 042	3 670
Water abstraction by activity							
of which:							
Energy production	9 388	8 290	7 430	7 122	6 701	6 097	5 155
Other industry	6 097	5 880	5 577	5 236	4 907	4 336	4 010
Irrigation	11 012	9 678	8 637	9 565	7 139	6 331	5 974
Agriculture	4 261	4 438	3 950	3 609	3 175	2 615	2 038
Households	3 887	3 922	3 884	3 801	3 765	3 962	3 839

Source: Annual statistical reports on water.

Note:
* Including about 3 to 5% of sea water.

Table 8.2: Water use, 1991-1997

Million m³

	1991	1992	1993	1994	1995	1996	1997
Total	**27 116**	**25 895**	**23 574**	**22 575**	**19 474**	**17 799**	**14 729**
Surface water	23 066	21 931	19 842	19 063	16 256	14 841	12 147
Groundwater	4 050	3 964	3 732	3 499	3 201	2 948	2 574
Water use by activity							
of which:							
Energy production	8 791	7 731	6 879	6 559	6 182	5 602	4 570
Other industry	4 011	3 778	3 387	2 969	2 652	2 314	1 979
Irrigation	6 289	6 197	5 419	5 516	3 469	3 381	2 444
Agriculture	3 913	4 071	3 755	3 483	3 154	2 598	2 007
Households	3 667	3 607	3 758	3 822	3 813	3 721	3 572

Sources: Annual statistical reports on water;
Statistical Yearbook on Environmental Protection and Use of Natural Resource, 1998, State Statistics Committee.

Water supply and use

Water supply is heavily influenced by seasonal variations in precipitation and river flow. The most heavily cultivated agricultural areas, as well as the most water-intensive industries, are situated in the south-eastern, dry regions.

In 1997, 20.2 billion m^3 of fresh water was abstracted from surface and groundwater. Of this, 14.7 billion m^3 was used for household, industrial and agricultural purposes. This is 73 per cent of the yearly freshwater abstraction. In 1997, the total abstraction of groundwater and surface water dropped 42 per cent, compared to 1991. In 1997, industry used almost half the water abstracted.

Surface water is the main source of supply of drinking water. Approximately 60 per cent of the population is supplied from the Dnieper river, 15 per cent from other surface waters and 25 per cent from groundwater (particularly in rural areas). Industry and agriculture also use more surface water than groundwater.

The data on water use in Table 8.2 indicate a general downward trend in different sectors of the national economy. By contrast, household use has remained stable. In 1996, drinking water use totalled 3.6 billion m^3, and consumption per head stood at 71.4 m^3 per year, i.e. around 200 litres/day.

Table 8.3: Water losses during transport

Million m³

	1991	1992	1993	1994	1995	1996	1997
Water losses	2 274	2 288	2 290	2 302	1 946	2 179	1 934

Source: Annual statistical reports on water.

In some oblasts, consumption per head exceeds 400 litres/day (among others Kyiv, Lugansk, Crimea).

Statistical data on water supply indicate high losses of water along the supply network (Table 8.3). The extent and physical distribution of these losses are not fully described, since no operational arrangements are in place for monitoring and controlling leakage.

8.2 Water quality and waste-water treatment

Water-quality monitoring

Surface water quality is monitored in 112 rivers, 15 reservoirs, 7 lakes, 1 canal and 1 estuary. Groundwater is monitored at about 7 500 boreholes. The following authorities are involved in State water monitoring and control:

- Ministry of Environmental Protection and Nuclear Safety
- Ministry of Agriculture and Food Production
- State sanitary and epidemiological service (Ministry of Health Protection)
- Committee on Water Resources
- Committee on Geology and Mineral Resources
- Committee for Hydrometeorology
- State Committee for Building, Architecture and Housing Policy

The situation in water resource management and control was confusing and there was no clear delineation of the responsibilities between the various entities. Resolution No. 391 of 30 March 1998 was meant to improve the coordination of monitoring activities. It regulates the responsibilities of the authorities involved and entrusts the Ministry of Environmental Protection and Nuclear Safety with the overall coordination. The effect this resolution has on the workings of the monitoring system is not yet clear. Further restructuring and responsibility sharing schemes are being discussed but have not been adopted so far (see Chapter 1, section 1.3).

Each institution involved in water monitoring uses its own software and data bank. As a result, the monitoring data are distributed over various sources, unintegrated, and not comparable. There is no harmonized methodology for monitoring.

Surface water quality

Surface water is classified into five quality classes, class I is the highest quality and class V the lowest. According to this system, most rivers in Crimea could be considered as satisfactory (class III). Almost all other river basins in Ukraine are classified as polluted (class IV) or very polluted (class V). It is expected that a new classification of the quality of surface waters and estuaries will replace the existing classification system in the course of 1999. The new methodology will aim at approximating the relevant EU legislation and practices.

The quality standards applied are the most stringent 'fish production standards', which are in some cases stricter than those applied in EU countries. The most frequently and heavily violated are those for biochemical oxygen demand (BOD_{total}), nitrogen compounds, oil products, phenols and heavy metals (in particular copper, zinc and manganese). The standard of 3 mg/l for BOD_{total} was a case in point, but was modified to 15 mg/l in March 1999. Other Ukrainian standards, like those for heavy metals, seem to be comparable with or less strict than those of the EU.

Observations of the Committee on Hydrometeorology for 1997 indicate that the Dnieper is particularly polluted with heavy metals and phenols. The water-quality standards for copper, zinc, manganese, chromium 6+ and phenols are not met. The Kyiv and Kaniv water reservoirs are polluted mostly with oil products, nitrite, phenols, copper, zinc, manganese and chromium 6+. Since 1996, the level of pollution with copper, zinc and manganese has to some extent increased in these reservoirs.

The Dniester is mainly polluted with ammonia, oil products, chromium 6+, copper, zinc and magnesia. The chromium and ammonia content is increasing.

In the river Siverskiy Donets water-quality standards are exceeded for oxygen-consuming substances, oil, phenols, ammonia, nitrite, copper, zinc, manganese and chromium 6+. Since 1996, particularly the copper concentration has increased. In comparison with previous years, the concentration of chromium 6+ has increased.

The Southern Bug is polluted with ammonia, nitrite, oxygen-consuming substances, copper, zinc, manganese and chromium 6+. Since 1996, the nitrite content has increased.

In general, the smaller tributaries are more heavily polluted than the main rivers mentioned above. The highest concentrations of pollutants are likely to be found in small rivers and brooks, due to their low water flow and dilution capacity during long periods. The pollution is chiefly due to agricultural activities. However, there are also many unspoiled water bodies in Ukraine, particularly in the mountainous areas.

Mining and processing generate pollution at different processing stages: mine drainage, ore beneficiation and mineral separation. Numerous heavy metals and other harmful substances are discharged, such as iron, cadmium, lithium, titanium, manganese, radionuclides, phosphorus, or sulphides. Some of them raise the salinity or acidity of the receiving water bodies (see Chapter 10 for details). Other industrial activities also release important volumes of waste water, although the industrial recession has implied a reduction of waste-water generation in general. The introduction of cleaner technologies is too slow to sustain hopes for a fundamental improvement of the potential for waste-water generation (see Chapter 5). Similarly, despite the drastic reduction in the use of pesticides and fertilizers in agriculture, nitrate concentrations in water remain high. Cattle-breeding and the household sector are the main sources of organic pollution – together with ineffective waste-water treatment.

Groundwater

In some places the drinking water of groundwater origin does not meet the freshwater quality standards. This is due to hydro-geological conditions, but also to the bad state of the pipe distribution network (losses are commonly 30%) and the inefficiency of purifying facilities. Organic pollution comes from agriculture and city run-off; and water salinization originates from irrigation.

The groundwater monitoring stations are primarily intended to assess groundwater levels (availability) and natural geochemistry (see Chapter 10 for a more detailed description of the monitoring activities of the Committee on Geology and Mineral Resources). There is no extensive monitoring and assessment of anthropogenic impacts on groundwater, although some occasional monitoring has been carried out since 1989 on heavy metals and pesticides. There are major gaps in the data on local groundwater quality, reflecting the lack of advanced monitoring and laboratory equipment, as well as the lack of monitoring requirements for landfills, waste impoundments and industrial sites.

Neither do the available data provide a comprehensive picture of the quality of the country's groundwater. Recent information seems to be available only on local and regional levels. An updated national overview of groundwater quality is expected to be published in the year 2000.

In 1990, the USSR Ministry of Geology estimated that nearly 4 per cent of Ukraine's groundwater resources were polluted. It is estimated that this percentage has since risen sharply, particularly in the upper aquifers. Major sources of groundwater pollution are industry, mining and agriculture, causing pollution with heavy metals, pesticides and nitrogen (NO_3, NH_4).

Drinking water

Drinking water increasingly fails to meet the State standards on drinking water, breaching the chemical, bacteriological and the sanitary standards. The reasons for this are the poor quality of water supply sources, the poor condition of the sewage systems and local water supply systems (up to 30 per cent of water may be lost there), frequent accidents, treatment installations not functioning properly and lack of disinfection. Pesticide pollution is prevalent due to leakage from unofficial pesticide dumps, and salinization and mineralization of groundwater in areas of agricultural irrigation pose a major threat to public health.

The water supply treatment plants can produce about 9.4 billion m^3 of drinking water a year, of which 8.8 billion m^3 a year are supplied in a

centralized way. The water is distributed through a water-pipe network of more than 175 000 km.

In 1997, 6 per cent of centrally supplied drinking water failed to meet the hygiene standards, as did 15 per cent of the water supplied by municipal pipes and 22 per cent of water supplied by pipes belonging to other bodies. In all, 260 settlements consume drinking water that does not meet the standards. Water supply in rural areas is especially alarming, due to the widespread chemical and bacterial pollution of local water resources. About 70 per cent of the population is connected to the centralized water supply, but only 4 per cent of rural households are connected to piped water systems. About 3.7 million people in rural areas enjoy piped water supply for household and drinking purposes (24 per cent of the rural population).

Waste-water treatment

Waste-water treatment is a major problem in Ukraine. First of all, there is a geographical imbalance in collection and treatment installations. In 1997, the country had a sewage network of 46 000 km, of which 30 300 km in cities and urban areas. The major problem in rural areas is that most waste water is discharged untreated. The urban problem, however, is the poor quality and inefficiency of waste-water and sludge treatment due to the technical state and capacity of existing installations. Insufficiently trained personnel is a more general problem: specific training in plant operation, process control and instrument operation would improve treatment performance.

Over 60 per cent of the population is connected to municipal waste-water treatment plants via the collection network, but a majority of the villages discharge their waste water without treatment. The total installed capacity for waste-water treatment is about 5.7 billion m^3 a year. Most waste-water treatment plants have the following basic treatment technology: mechanical screening, primary sedimentation in round tanks with mechanical scrapers and biological treatment using the activated sludge process. The effluents that the plants discharge are insufficiently purified. Sludge disposal is not really provided for in Ukraine: in general, sludge is disposed of in landfills, without biological stabilization.

At the moment many treatment installations do not work properly. Due to poor maintenance and the bad technical state of the other installations (22 per cent of the collection network is in a critical condition, 46 per cent of the pump units need replacing and 25 per cent of the installations have exceeded their technical lifetime), the situation can be expected to deteriorate even further in the near future.

In particular, the poor state of maintenance of waste-treatment installations in populated areas is a cause of concern. The main reason is the inappropriate use of available treatment installations, which have become overloaded and have even broken down completely in some regions. Purification plants in Kirovogradska, Zhytomirska, Mykolayivska, Luganska and Odessa districts and in the Autonomous Republic of Crimea are in poor condition. At the same time, the construction of new purification plants and the reconstruction or extension of existing plants is unsatisfactory or has been completely abandoned.

8.3 Environmental management of water resources

Policy objectives and legislation

The 'Principal Directions of State policy of Ukraine in environmental protection, use of natural resources and ensuring ecological safety' identify the following two priorities that are relevant to freshwater management:

- environmental regeneration of freshwater bodies and improvement of drinking-water quality;
- (re)construction of communal and industrial waste-water treatment plants.

Three implementation stages are foreseen. The first phase (1997-2000) is focused on implementing urgent measures to reduce the most harmful impacts on the environment. The main tasks include improving the legal basis for water protection, developing and introducing economic mechanisms for environmental protection and the efficient use of natural resources.

In the second stage (10-15 years), comprehensive programmes focusing on general environmental regeneration are expected to start, in order to achieve a balance between the impact on the environment and its ability to recover. Part of this phase is the development and introduction of a system of State monitoring of the environment.

The aim of the third phase is to create a system of sustainable management of the natural resources. Fragmentary implementation of these measures started in 1996, and wider introduction depends on the pace of the country's economic stabilization.

In addition to the environmental strategies included in the 'Principal Directions', the Government considers the regeneration of the Dnieper of great importance. In 1997, the Rada adopted a national programme for improving the ecological state of the Dnieper river basin and the quality of drinking water. Its main goals are the permanent restoration of the Dnieper's ecological system, high-quality water supply, ecologically safe conditions for the population of the basin and their economic activities, and protection of the water resources from pollution and depletion. The cost of implementing the programme is estimated at 4 190 million hryvnias, which represents annually 500 million hryvnias by the year 2000. However, in 1997, only 90 million hryvnias were spent on the programme, and in 1998 only 113 million. Due to the lack of clear priorities, the few available funds have been divided over the measures to be taken, so that no single measure could be fully implemented. For instance, among the large number of water facilities under reconstruction, only few are completed.

The Ministry of Environmental Protection and Nuclear Safety has developed similar programmes for the Dniester and the Siversky Donets. For lack of funds, the programmes have not been approved by the Cabinet of Ministers. Their implementation will therefore have to be financed by regional and local authorities. No information is available on the progress achieved. Although generally part of the "Principal Directions", no similar programmes exist for the regeneration of other rivers or for the (re)construction of communal and industrial waste-water treatment plants.

The legislative framework for water management contains, among others, the Law on Environmental Protection and the Water Code of Ukraine. The Law on Environmental Protection (1991) lays down the basic principles of nature protection and, in particular, the principle that users must pay for the use of water resources as well as for the discharge of pollutants into water. The Water Code (1995) provides the basic framework for Ukraine's water legislation. The tasks foreseen in the Water Code are:

- management of legal relations to ensure water protection
- rational use of water for the population and businesses
- restoration of water resources
- protection of waters from pollution, littering and depletion
- prevention of accidental water pollution and floods and elimination of their consequences
- improving the condition of water bodies
- protection of rights of enterprises, institutions, organizations and citizens.

The Water Code specifies the ownership of groundwater and surface waters and regulates the management, conservation and use of the water resources. All the water resources belong to the people of Ukraine and are allocated for use. Furthermore, the Water Code regulates the competencies of the Verkhovna Rada of Ukraine, of local radas of people's deputies, and of central bodies with executive power for the management, control of use and renewal of water resources. Amendments to the Water Code have recently been proposed to the Parliament (Verkhovna Rada).

Institutional arrangements

Water management is shared by a number of State institutions: the Ministry of Environmental Protection and Nuclear Safety, the Ministry of Health Protection, the Committee on Water Resources, the Committee on Geology, the Committee for Hydrometeorology and the State Committee for Building, Architecture and Housing Policy. In April 1999, the structure of the Government was reviewed to subordinate some Committees for water (water management, geology and mineral resources, hydrometeorology) to the MEPNS (see Chapter 1).

The Ministry of Environmental Protection and Nuclear Safety carries out complex management of water resource protection, develops new legislation and regulations, conducts State environmental impact assessment, issues permits for special water use, conducts State monitoring of water resources and enforces the various water regulations. Moreover, it is entrusted with the overall coordination of monitoring activities.

The Ministry of Health Protection operates 'sanitary epidemiological' stations. It – rather – infrequently monitors drinking water and

recreational water sites along rivers, reservoirs and seashores. Its emphasis on the health impact of water quality is reflected in the importance of biological parameters in its monitoring programme. Furthermore, the Ministry is responsible for setting quality standards for drinking water.

The Committee on Water Resources assesses the permissibility of water abstractions in the framework of the permitting system for special water use. Furthermore, it maintains more than 200 monitoring stations for surface water. The Committee on Geology protects and monitors the geological sphere, including groundwater, whenever economic activities have an external effect. It operates an extensive monitoring network for groundwater and gives advice on groundwater abstractions in the context of the permits for special water use. The Committee for Hydrometeorology operates the most extensive water-quality monitoring network. The State Committee for Building, Architecture and Housing Policy is responsible for a set of construction norms and regulations for, among other things, the construction of sewage treatment plants and waste-water collection systems.

Regulatory instruments

As elsewhere, the current water management in Ukraine is a combination of command-and-control (standards, norms, environmental impact assessment, permits for water use and discharge, State inspection) and economic instruments (charges for water use and pollution discharge, fines).

At present, the former USSR water standards are still in force for:

- water used for drinking, communal, recreational and other economic needs of the population
- water used for fish farming.

A new, additional standard for water used for healing, recreational and other purposes is under development.

The standards for water used for fishing are currently the most stringent. There is one environmental standard: maximum allowable concentrations (MACs). They are given for a fixed time period, on the basis of zero human health damage. There are MACs for more than a thousand different substances.

The number and, in some cases, the strictness of MACs are impractical. The resulting complexity of the system undermines enforcement and also overwhelms understaffed and underequipped regulatory authorities. The question of revising environmental standards and monitoring parameters is currently being addressed in the framework of harmonizing Ukraine's environmental legislation.

According to the Water Code, groundwater and surface water use (for both abstraction and discharge) requires a permit. The licensing procedure depends on whether the water resources are of national or local significance. Water bodies of State significance include, among others, sea water, surface waters located on the territory of more than one oblast and groundwater used for centralized water supply. The permits for water resources of national significance are granted by the Ministry of Environmental Protection and Nuclear Safety, while abstraction from and discharges into local water resources are permitted by local authorities. The permit determines the volume of raw water that can be taken and used and also the amount of pollutants that can be discharged (concentration as well as load). Ambient standards are used to set effluent limits, via algorithms or modelling exercises that try to calculate the contribution to ambient pollution of an individual source.

The permit also defines the rate of the two fees (abstraction and pollution charges) that the user has to pay. If operating above the permissible limits, the polluter has to pay five times more. The licensing procedure provides for cooperation with the Committee on Water Resources (abstraction of surface water), the Committee on Geology (abstraction of groundwater) or the Ministry of Health Protection (abstraction of water for medical purpose and health resorts). The permit may be granted for a short- (up to 3 years) or a long-term period (from 3 to 25 years).

The State Ecological Inspectorate reviews compliance. If regulations or permit provisions are violated, it is authorized to temporarily close down the polluting activity and to fine and sue the polluter (enterprise or person). However, the complexity of the permits and the lack of staff hinder enforcement of permit provisions. For

details regarding the permitting system, see also Chapter 2.

Economic instruments

In Ukraine, the population does not pay for the water resource itself; it only bears the treatment cost. The cost for the preparation and supply of water is approximately 0.30 hryvnia per cubic metre. Some population groups (war casualties, Chernobyl casualties, the unemployed) pay only 50% of total cost for drinking-water supply. Enterprises, organizations and institutions pay for the resource according to the water supply source. Charges apply only to operational costs and maintenance costs. Metering of piped water is rare.

The water permits establish two environmental charges: an abstraction charge and a pollution charge. The charges for abstraction differ for each river basin. The charges, laid down in Resolution 164 of 1997 of the Cabinet of Ministers, range approximately from 0.01 to 0.09 hryvnia per cubic metre for surface water and from 0.03 to 0.09 hryvnia per cubic metre for groundwater. The charge on the use of waters of local significance goes to the local budgets, while 80 per cent of the charge on use of waters of State significance goes to the State budget and 20 per cent to the local budget. When the quality of the drinking water supplied infringes hygiene standards, the responsible local authorities (municipalities or concessionaires) are fined up to 10% of the charges collected for water supply.

No information was available on the pollution charges or on charges for the collection of waste water, except for the city of Kyiv. There, the charge for domestic discharges is 0.2 hryvnia and for industrial discharges 0.4 hryvnia per m^3.

A budget line for investment in water protection works used to exist, but it has been suppressed. The gap is currently huge between the available funds and what is needed. This is partly the reason why Ukraine is considering a basin management approach. Today, the policy focuses on measures that are not too expensive. The basin approach, which is worked out for the Dnieper basin with the assistance of France, will try to optimize the mechanisms for water payment collection. The first objective will be to spend the funds on combating pollution from point sources, as the funds collected will not be sufficient to start to resolve all issues at once.

8.4 Conclusions and recommendations

Ukraine has strengthened its water management efforts in recent years and is continuing to do so. The Government outlined its important objectives for water management in the 'Principal Directions of State policy of Ukraine in environmental protection, use of natural resources and ensuring ecological safety'. Much attention is given to the reformulation and extension of the legislative and regulatory framework, i.e. charges for water use and coordination of State monitoring. Furthermore, problem-oriented programmes and projects for their implementation are being developed (e.g. National Programme for sanitation of the Dnieper river basin and improvement of drinking-water supply). However, despite all regulations and programmes, only few concrete measures have so far been taken to reach the water management objectives.

At least three ministries and four State committees share water management tasks. The split of responsibilities together with poor communication between these authorities sometimes cause 'gaps' in the activities to be undertaken, duplication of activities or even contradictory actions. It should be possible to overcome this problem, possibly by concentrating the mandates in fewer institutions and entrusting explicit responsibilities for coordination. To better harmonize actions and streamline standards among the different institutions, one institution should be responsible.

Recommendation 8.1:
The institutional responsibilities for water management and standard-setting should be streamlined. Clear responsibility for coordination should be assigned and a coordination mechanism should be created.

Recommendation 8.2:
The establishment of a national agency responsible for unifying the standard system and methods, i.e. a standardization agency, should be considered. See also Recommendation 1.5.

To improve the management of water resources, the river basin approach should be further implemented. National action plans have already been developed for some river basins, e.g. the Dnieper. In developing the National Programme for sanitation of the Dnieper river basin and improvement of drinking-water supply, the role of regional and local authorities was restricted to providing information on (stretches of) the Dnieper

to the national authorities. Obviously, measures taken (or not taken) upstream will affect the measures to be taken downstream. It is surprising that, within a river basin, no formal consultation between national, regional and local authorities takes place. Such cooperation would help general cooperation between these authorities, and would certainly also provide for a more coherent integrated water management approach in the basin concerned. This suggestion should be taken into account in the new (April 1999) proposal of the MEPNS to establish a basin council for the implementation of the National Programme for sanitation of the Dnieper river basin and improvement of drinking-water supply. The corresponding draft resolution of the Cabinet of Ministers has been submitted to all interested national and regional authorities and scientific and environmental organizations.

According to the Water Code, revenues from water abstraction from and discharges of waste water into waters of local significance are paid into the local budgets. Revenues from water abstraction from waters of State significance benefit the national budget (80 per cent) and the regional budgets (20 per cent). As most of the population is supplied from waters of State significance (the Dnieper alone supplies 60 per cent of the population), most revenues will benefit the State budgets, whereas the investment, operation and maintenance costs of water supply, sewerage and treatment are to be ensured at the local level. A more balanced decentralization of both responsibilities and budgets would seem to be a prerequisite for more effective water management.

Recommendation 8.3:
Basin (or catchment) structures and committees should be created for each significant river basin, and integrated water management principles introduced at basin level. All affected national, regional and local authorities should participate, possibly together with international partners (i.e. the Republic of Moldova in the case of the Dniester). The institutional responsibilities of the basin structure should be matched by sufficient funding provisions, so that the (local) water management objectives can be achieved, in particular with regard to waste water. Financial resources from water charges collected at the basin level should be reallocated to improving the water management situation on the same territory. See also Recommendation 9.6.

A number of monitoring networks have been set up under various ministries and committees. The monitoring networks are intended to meet the particular purposes of these various authorities and mostly operate independently. Duplication of work is very likely, especially in the monitoring of chemical and bacterial parameters.

The monitoring of surface waters is quite good and complete, except regarding diffuse pollution sources. The monitoring of groundwaters is less satisfactory. The various monitoring networks generate a large volume of data, which are stored in different data banks, using different software. Consequently, it is very difficult to compare the monitoring data of different networks. Furthermore, many of the monitoring data do not serve regulatory objectives, and in some cases data do not even seem to be available to the regulatory authorities. Often, monitoring data are collected and stored by regional offices and not made available to the State level for decision-making.

Under Regulation No. 391 of 1998, the Ministry of Environmental Protection and Nuclear Safety is authorized to take responsibility for coordinating these monitoring activities to ensure their better integration and quality control. The implementation of this provision would not only save substantial costs and make the monitoring data obtained from different programmes more consistent, it would also allow for the full use of monitoring results in decision-making at all levels.

Recommendation 8.4:
The Ministry of Environmental Protection and Nuclear Safety should coordinate monitoring activities as foreseen in Resolution No. 391 of 1998. See also Recommendations 1.5 and 9.5.

Ukraine has a large number of, in some cases, very strict water-quality standards (e.g. BOD_5). This results in a very complex system of permits. It undermines enforcement and overwhelms understaffed regulatory authorities.

Recommendation 8.5:
The number of water-quality standards should be reduced and they should be set at realistic levels, making enforcement possible. See also Recommendation 2.2.

Ambient water standards are used to calculate

maximum allowable discharges of pollutants into water bodies. Although provided for in the Water Code, best available technologies (not entailing excessive costs) are not established so far. The rationale underlying technology-based standards is to try to reduce, with available technology, such discharges to the extent possible. By contrast, Ukraine's current practice consists in asking industry to discharge waters that reach the ambient standard targets of the receiving streams. This does not encourage it to reduce water consumption, as the ambient standard targets can be achieved by diluting the waste water. Moreover, as the permit is a single-medium permit, it could be tempting to divert pollution from water into another environment compartment such as air or solid waste. That is why the introduction of an integrated permitting system in industry should also be seriously considered (see Chapter 1 and Recommendation 1.4). The current Europe-wide introduction of technology-based emission standards is thus beneficial to environmental protection.

Recommendation 8.6:
The best available technologies not entailing excessive costs and/or technology-based emission standards should be at the heart of abatement strategies. See also Recommendations 5.5 and 10.1.

Water consumption is too high in Ukraine, which parallels the fact that water prices for households and industry are relatively low. That is not surprising, since Ukrainian legislation prescribes that waters are the exclusive property of the people of Ukraine and that the use of water is free of charge. Only the distribution of drinking water and the collection and treatment of waste water are moderately charged. These charges do not fully cover all costs, including investments. A big effort should be made to recover the cost of investing, operating and maintaining water facilities. Increases in user and discharge rates are important steps to promote adequate funding of infrastructure, e.g. (re)construction of sewage treatment plants. Putting a price on water that fully covers the cost of its treatment and metering water in order to charge for what has really be consumed would certainly bring in considerable water savings. At the same time, the users' bills would not be particularly affected, as they would consume less water, although they would pay more for it. This would also improve the functioning of water-supply facilities and waste-water treatment units, as they will have less water to treat.

Recommendation 8.7:
The cost of water should be transparent and realistic. Metering should be introduced for all users and payments made proportional to the water quantity really consumed. Water prices should cover the full cost of investing, operating and maintaining the water and waste-water infrastructure. Provisions should be made for those people who cannot afford it. See also Recommendation 2.1.

Most towns in Ukraine appear to be connected to treatment facilities for municipal and industrial waste water. Due to the capacity and the technical state of the existing facilities, the quality and efficiency of waste-water treatment should be improved. In particular, a reduction in water consumption would entail better conditions for operating treatment facilities. It would reduce the load to treat and therefore improve the performances of the facilities. This remark is valid for supply plants as well as for waste-water treatment plants. Also, the current practice of treating sewage sludge is far from satisfactory and should be rationalized. This sludge should on no condition be discharged back to the river. The preferred option would be to use it as fertilizer if it does not contain an excess of heavy metals. This means that some industrial waste water should be pretreated to eliminate the toxic elements or diverted away from the waste-water treatment plant. Treatment plants should therefore be managed by capable people. Insufficiently trained personnel is a more general problem: specific training in plant operation, process control and instrument operation will improve treatment performance.

Recommendation 8.8:
To improve the efficiency of waste-water treatment, the staff should be trained further in plant operation, process control and instrument operation.

Recommendation 8.9:
There must be clear responsibility for the urban waste-water management and sewage sludge disposal. The preferred use of the sludge should be as fertilizer. The European Directives on urban waste water and on use of sludge in agriculture should serve as guidance.

Finally, the quality of surface water is in general insufficient for drinking purposes. This is the consequence of municipal and industrial waste-water discharges, and diffuse pollution from

agriculture and air pollution deposition. This problem is not likely to be solved in the near future. Groundwaters are less vulnerable. Therefore turning as much as possible to groundwater for drinking water is certainly a reasonable and sustainable objective.

Recommendation 8.10:
Supplying the population with sufficient quantities of drinking water that meets hygiene standards should be seen as a priority. The public should have access to information on the quality of drinking water. The use of suitable groundwater sources should be increased and drinking-water resources should be protected accordingly. See also Recommendation 14.1.