Chapter 7

WATER RESOURCES MANAGEMENT AND WATER QUALITY ASPECTS

7.1 Water resources and use

Availability and ownership of water

Lithuania is located in the wet part of the world and is rich in freshwater resources. Rainfall during an average year amounts to 748 mm (from 570 mm to 902 mm). From a total average precipitation of 44.0 billion m^3/year, about 13.7 billion is river outflow (mainly to the Nemunas). The remaining 30.3 billion (or almost 69 per cent) evaporate and infiltrate groundwater.

The average density of the river network, including artificial water streams, is 1km/km^2. In recent decades, with the excavation of numerous land-reclamation canals, the total density of the hydrographic network has almost doubled. There are over 29 900 rivers, rivulets and canals longer than 250 m; 758 rivers longer than 10 km; 18 rivers longer than 100 km and 9 rivers longer than 200 km.

The characteristics of Lithuania's main rivers are described in Table 7.1. The length of the main water artery, the River Nemunas, is 937 km, of which 475 km flow through Lithuania. It rises in Belarus. The Nemunas is a tributary of Lithuania's largest inland water source, Kurónian Lagoon. 413 km^2 of that Lagoon (out of 1 610 km^2) are in Lithuania. The rest lies in the Kaliningrad region of the Russian Federation. It is separated from the Baltic Sea by the overgrown and picturesque Kurónian Spit. The total length of the second largest river - the Neris - is 510 km, of which 276 km flow through Belarus. The river Òventoji runs entirely through Lithuania and is 249 km long. The total annual river flow in Lithuania (including transit flow) is 26.1 billion m³. Over 75 per cent of rivers and rivulets have been regulated by land reclamation. Of the 63 700 km of natural rivers only 17 000 have remained unregulated, including the 9 largest rivers.

Table 7.1: Characteristics of the main rivers

	Flow	Length in km		Catchment area, km^2		Measurement point number
	m^3/s	Total	In Lithuania	Total	In Lithuania	
Nemunas	665	937	475	97 928	46 692	9
Neris	178	510	234	24 942	13 850	6
Šventoji	51	246	246	6 889	6 801	4
Nevezis	36	209	209	6 140	6 140	5
Musa (Lielupe)	125	284	146	17 600	8 716	3
Dubysa	15	139	139	2 033	2 033	1
Jura	41	172	172	3 994	3 994	2
Venta	95	346	161	11 800	5 140	3
Bartuva	22	101	55	2 020	748	2
Minija	40	202	202	2 942	2 942	4
Akmena-Dane	7	63	63	580	580	4
Sesupe	33	298	209	6 105	4 899	4
Merkys	34	203	190	4 416	4 333	2
Zeimena	22	80	80	2 793	2 793	4

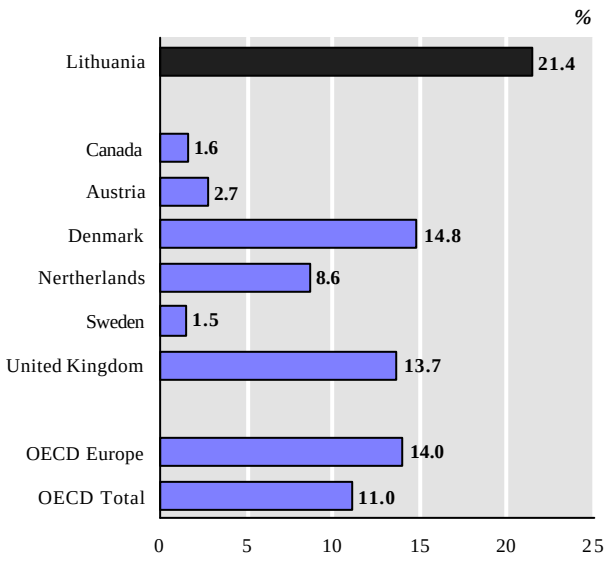
Source: Ministry of the Environment.

There are over 2800 lakes in Lithuania which are over 0.5 ha and their total area accounts for 880 km², or 1.5 per cent of the country's territory. The Ignalina NPP is located near the largest lake, Drãkóiai (45 km²). With a depth of 60 metres, Tauragnai is the deepest lake. About 400 reservoirs (ponds) of not less than 5 ha have been created. There are more than 10 000 smaller ponds. The Kaunas Lagoon is the largest reservoir (63.5 km²). It was formed by damming the Nemunas River after the construction of a hydroelectric power plant.

The list of Nationally Significant Bodies of Water was approved by Government decision No. 2 on 10 January 1998. Groundwaters are the exclusive property of the State. Surface bodies of water can become private property if they are sold or returned to their previous owners. The 1997 Law on Water and other relevant legislation provide that only small surface bodies of water can be sold to private owners. Restitution to previous owners is the main process leading to privately owned bodies of water. This process is still under way, so that it is impossible to say at this time how important private ownership will be.

Water abstraction and use

Figure 7.1: Water resources - intensity of use, 1980-1995a/



Source: OECD, Environmental data, Compendium 1997.
a/ Long-term annual average.

Annual water abstraction (including cooling water) per capita is 1508 m³. This is still relatively high compared to other European countries, as is the intensity of use (Figure 7.1). In 1996, total water abstraction amounted to 20.5 per cent of all water resources. This amount includes water used for cooling in power plants and to produce electricity in hydroelectric power plants. However, if the water used in the energy sector is excluded, water abstraction amounts to 1.2 per cent of all water resources. In 1996, 5.1 per cent of water was abstracted from groundwater and 94.9 per cent from surface waters. About 94 per cent of water is used for energy needs.

Water abstraction during recent years is shown in Table 7.2. The abstraction of surface water increased by some 30 per cent between 1992 and 1997. This rise was caused by an increase in water use at the Ignalina Nuclear Power Plant and the Kruonis Hydroelectric Station. Surface water is the dominant source of cooling water in electricity generation. In 1996 the Ignalina Nuclear Power Plant abstracted more than 5 billion m^3 from Drãkóiai Lake for cooling. However, the abstraction of groundwater decreased by more than 51 per cent between 1992 and 1997. Groundwater is the major source for the public water supply.

Table 7.2: Water abstraction, 1992-1997

Million m^3/year

	1992	1993	1994	1995	1996	1997
Total abstract	**3 984**	**4 388**	**3 997**	**4 582**	**5 696**	**4 786**
Surface water	3 504	3 972	3 632	4 278	5 407	4 552
Groundwater	480	416	365	305	289	234

Source: Ministry of the Environment.

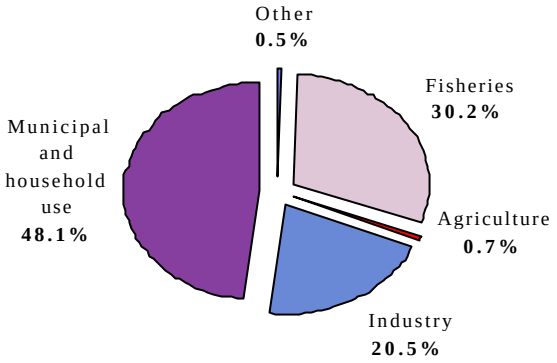
The withdrawal of groundwater has affected groundwater levels practically throughout the country. A brief analysis prepared by the Geological Survey of Lithuania states that groundwater extraction in most well-fields in 1993 was lower than in previous years. The data on well-field operation in 1994 show a slight increase in 26 well-fields and stabilization in 14. In 1994, the total volume of groundwater withdrawal in all the well-fields was about 707 000 m³/day, or some 18 per cent less than in 1990. The withdrawals at many well-fields amounted to about 35-40 per cent of the groundwater resources.

The reason for this decrease in groundwater withdrawal was the general decline in the Lithuanian economy and the concurrent increase in the prices of drinking water. There was a vigorous

campaign to install water meters in many blocks of flats in town. The volume of groundwater withdrawal is still decreasing in Vilnius, Panev•ñys, Mañeikiai and Marijampol•. Since 1995, groundwater withdrawal in the Kaunas, Klaipeda, Alytus and Jonava well-fields has been increasing. This may indicate that the economic situation in these towns is improving.

The data presented in Table 7.3 show that due to economic reform, from 1992 to 1997 the consumption of water for industry (except energy needs), municipal and household, agricultural, fishery and other needs fell in the range from 25 per cent (other) to 75 per cent (agriculture). Figure 7.2 shows the water use structure in 1997 (excluding cooling water). More than 48 per cent of water is for municipal and household needs and less than 1 per cent for agriculture. The water data for agriculture are considered accurate. In 1989 water use in agriculture stood at some 15.9 million m^3, but after Lithuania's economic restructuring it dropped to its present 2.3 million m^3. No water is used for irrigation. Only those water users that withdraw more than 10 m^3 of water per day are included in the statistics. A natural resource tax for the abstraction of surface and groundwater was introduced in 1995. The 1998 rates are the following: groundwater for domestic needs (0.037 Litas per m^3), groundwater for industry (0.087 Litas per m^3), surface water for energy (0.0012 Litas per m^3), surface water for fisheries (0.0006 Litas per m^3), surface water for agriculture (0.006 Litas per m^3). Prices for the supply of treated water to households and industrial plants are set by municipalities and take into consideration the cost of water treatment and distribution. Prices for households range from 1.7 to 3.0 Litas per m^3.

Figure 7.2: Water use structure*, 1997



Source: Ministry of the Environment.

Note:
* Excluding cooling water.

7.2 Water quality and major quality determinants

Waste-water generation and treatment

Pollution from urbanized areas along rivers is especially severe. The discharges from the seven biggest cities, or 44 per cent of the population, make up about 67 per cent of all discharges. In terms of BOD_7, this is 74 per cent, nitrogen discharges are 64 per cent of the national total and phosphorus discharges 60 per cent. Pollution

Table 7.3: Water use patterns, 1992-1997

Million m^3/year

	1992	1993	1994	1995	1996	1997	% change 1992-1997
Cooling water	2 969.0	3 755.0	3 374.0	4 099.0	5 271.0	4 411.0	48.6
Municipal and household use	297.0	260.0	251.0	196.0	167.0	148.0	-50.2
Industry	145.0	102.0	76.0	49.0	47.0	63.0	-56.6
Agriculture	8.0	6.0	4.0	4.0	3.0	2.0	-75.0
Fisheries	157.0	107.0	124.0	116.0	102.0	93.0	-40.8
Other	2.0	2.0	2.0	1.0	1.0	1.5	-25.0
Total water consumption	**3 578.0**	**4 232.0**	**3 831.0**	**4 465.0**	**5 591.0**	**4 718.0**	**31.9**
Water consumption m^3 per capita	956.3	1 134.5	1 029.6	1 202.0	1 507.2	1 271.9	33.0

Sources: Ministry of the Environment;
Statistical Yearbook of Lithuania 1997.

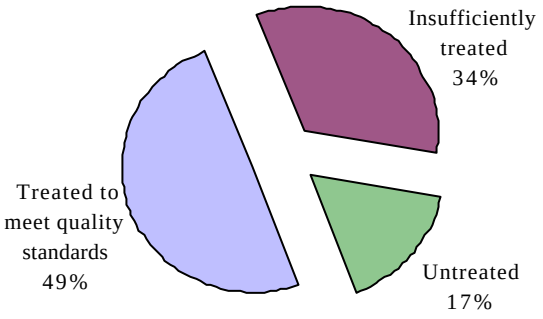
caused by industry has decreased over recent years, partly as a result of reduced economic activity in certain key sectors. Trends in waste-water discharge are shown in Table 7.4. The discharge meeting quality standards without treatment (primarily cooling water from the energy sector) increased by about 69 per cent between 1992 and 1996, but shrank to 41 per cent in 1997. In 1996 and 1997, it amounted to some 95 per cent of the total waste-water discharge. This waste water from the energy sector is discharged into Drãkóiai Lake and Kaunas Reservoir and to the Nemunas River. The remaining 5 per cent of waste water discharged to surface water bodies has to be treated. The amount of waste water requiring treatment decreased by 36.5 per cent between 1992 and 1997.

Figure 7.3 shows the structure of waste water requiring treatment. In 1997, the total amount of waste water requiring treatment was 233 million m^3. Of this amount 115 million m^3, i.e. 49 per cent, were treated to meet Lithuania's effluent standards. A slightly smaller amount of waste water (79 million m^3, i.e. 43 per cent) was discharged into surface waters without sufficient treatment (mechanical treatment only or cleaned in ineffective biological treatment facilities). Some 39 million m^3, i.e. 17 per cent, were discharged into surface waters without treatment.

In 1997, there were 787 waste-water treatment plants in Lithuania. 49 are equipped with mechanical treatment technology only, and 668 with biological treatment technology. The average capacity of village treatment plants is about 100 m^3 per day.

Six towns (Kelm•, Lazdijai, Òilal•, Raseiniai, Pakruojis, Mol•tai) remove both phosphorus and nitrogen in their treatment plants. The same facilities are being installed in Vilnius, where they are expected to go into operation at the end of 1998. The capacity of the plants in the six cities mentioned above amounts to 5.6 million m^3 a year. Treatment efficiencies in the major cities in terms of BOD removal vary between 93 per cent and 97 per cent in biological treatment installations (Vilnius, Òiauliai, Panev•ñys, Alytus, Marijampol•), and reach 42 per cent at the

Figure 7.3: Waste-water treatment structure*, 1997



Source: Ministry of the Environment.
Note:
* Excluding water meeting quality standards without treatment.

Table 7.4: Discharge of waste water into surface waters, 1992–1997

Million m^3/year

	1992	1993	1994	1995	1996	1997	% change 1992-1997
Total amount discharged	**3 537**	**3 338**	**3 779**	**4 493**	**5 598**	**4 709**	**33.1**
standards							
without treatment	3 170	2 993	3 443	4 189	5 346	4 476	41.2
Waste waters including:	367	345	336	304	252	233	-36.5
- Untreated	*70*	*78*	*68*	*54*	*42*	*39*	*-44.3*
- Insufficiently treated	*201*	*178*	*183*	*172*	*110*	*79*	*-60.7*
- Treated to meet quality sta	*96*	*89*	*85*	*78*	*100*	*115*	*19.8*

Source: Ministry of the Environment.

Table 7.5: Pollutants discharged into surface water, 1992-1997

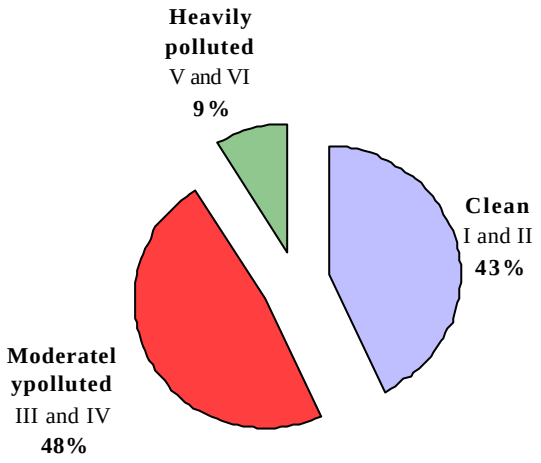
t/year

	1992	1993	1994	1995	1996	1997
BOD_5	31 900	27 920	34 500	21 000	16 600 a/	15 000 a/
Suspended solids	36 900	30 430	38 500	26 000	17 900	15 000
Oil products	340	270	280	220	160	150
Phosphorus	1 438	1 535	1 502	1 184	960	879
Nitrogen	10 601	10 209	10 773	7 663	6 446	5 401
Iron (Fe)	173	101	166	72	30	10
Copper (Cu)	16	18	9	7	5	5
Zinc (Zn)	50	53	51	33	29	27
Nickel (Ni)	11	9	9	6	4	5
Chrome (Cr)	22	13	12	9	7	5
Manganese (Mn)	8	3	9	4	3	4
Lead (Pb)	2	1	3	0	0	0

Source: Ministry of the Environment.

a/ BOD_7.

Figure 7.4: Water quality classification of Lithuania's rivers, 1996



Source: Ministry of the Environment.

Klaip•da mechanical treatment plant. Between 62 per cent and 80 per cent of nitrogen and 37 per cent and 80 per cent of phosphorus are removed. Sludge management is hampered by a lack of dewatering technology, while its disposal and reuse of heavy metals. Most sludge is dried in land-intensive facilities that are not lined or monitored and are then disposed of in landfills or abandoned gravel pits. This practice presents a major risk of groundwater contamination.

Surface water quality

Surface water quality is monitored in 47 rivers and 9 lakes, at the points which most characteristically reflect the impact of municipal, industrial and agricultural activities. The set of parameters, about 70, is quite extensive. Natural background concentrations are observed in the 6 smaller rivers least affected by economic activity. Forty-three per cent of rivers are classified as being clean (Figure 7.4), 48 per cent as moderately polluted and 9 per cent as heavily polluted. In the heavily polluted rivers – Sidabra, Kulp•, Obel•, Tatula, Laukup• – concentrations of organic matters exceed standard limits 10-fold, those of nitrates 13-fold and ammonium and phosphates up to 26-fold.

The water quality of the main river Nemunas varies along the course of the river. In the uppermost reaches it is excellent or good, downstream from the main cities it is polluted. There have been no significant changes in recent years in the water quality of the Nemunas. It is estimated that one third of organic and total nitrogen loads of the river are discharged from sources in the Kaliningrad region. The poorest water quality is observed in the Òiauliai region. The main problem in Lithuania's rivers is heavy loading of organic matter. In many cases phosphorus and nitrogen

concentrations as well as hygiene parameters indicate serious pollution.

The only significant trend in the water quality of Lithuania's lakes is the increase in nitrate concentration in almost all the lakes and increasing BOD in two lakes. Lithuania's lakes have a high buffer capacity and thus acidification is not a problem. Assessing the likely future development of the lakes is difficult, since no information is available on the activities affecting them.

Groundwater and drinking-water quality

Groundwater monitoring consists of three programmes:

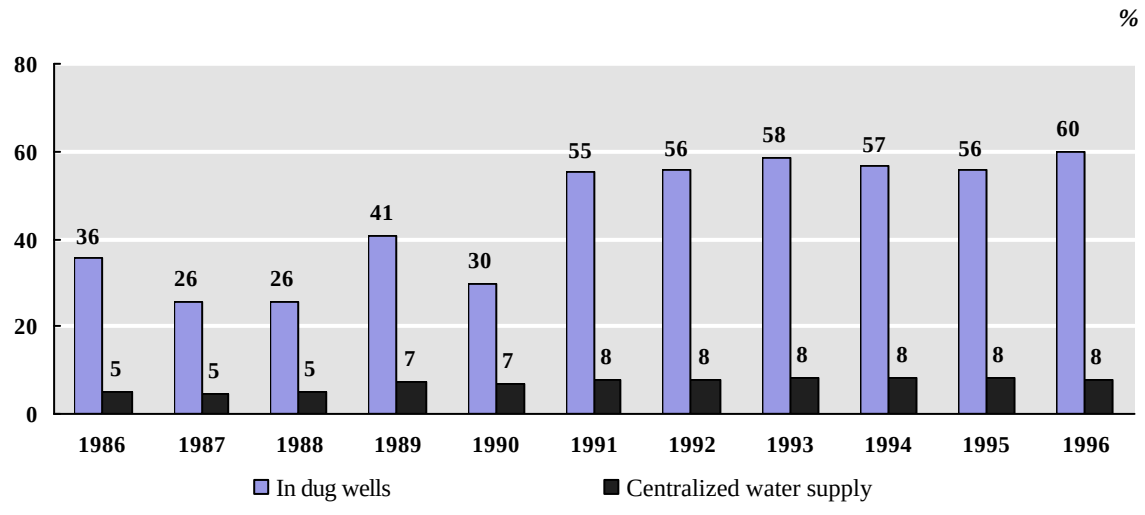
- national groundwater monitoring
- monitoring of wells
- monitoring of groundwater in contaminated sites.

In 1996 there were 26 main and 14 subsidiary monitoring stations in the national monitoring network. Groundwater pollution has been detected in almost one third of the country. Groundwater is the main source of drinking water in Lithuania. Particularly in rural areas and on the outskirts of cities, where piped water supply is less common, drinking-water supply is facing serious problems. Today 300 000 dug wells produce drinking water from shallow wells for 1 million Lithuanians. Due to intensive land use, shallow groundwaters are heavily polluted in large areas. It has been estimated for 1996 that 60 per cent of the dug wells did not meet hygiene standards and 37.5 per cent were polluted by nitrates (Figures 7.5 and 7.6). Chloride and sulphate levels often exceed the drinking-water standards as well. In some localities, such as the site of Jonava 'Achema' company, or at oil storage facilities as well as former Soviet military sites, groundwater is heavily polluted by nitrates and oil products. Groundwater in the Karst region in northern Lithuania contains increased amounts of nitrogen compounds and organic matter.

The main problem with the piped water supply is the high content of iron caused by natural enrichment of groundwater, and also by the widespread presence of ferrous pipes in the water supply networks, which are not protected against corrosion. In approximately 90 per cent of water abstracted from underground sources, iron concentrations are above 0.3 mg/l. Natural iron is being eliminated from abstracted groundwater in 32 treatment plants, which treat about 40 per cent of the groundwater that should be treated for iron. Manganese is found at concentrations of more than 0.1 mg/l in approximately 26 per cent of the drinking-water supply.

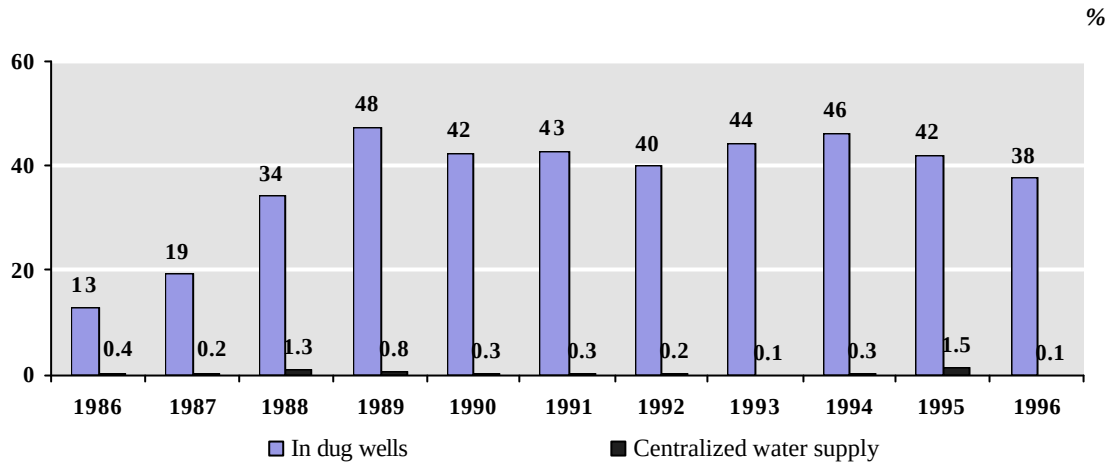
Another problem is fluorides, which may be locally present in drinking water. In north-western and west Lithuania high concentrations of fluorides (4-5 mg/l, sometimes up to 7 mg/l, compared to the standard for drinking water of 0.7-1.2 mg/l) are common and fluorosis has been diagnosed. On the

Figure 7.5: Water samples not meeting microbiological standards, 1986-1996



Source: Ministry of the Environment.

Figure 7.6: Water samples not meeting the nitrate standard*, 1986-1996



Source: Ministry of the Environment.

* Standard: 50 mg/l NO_3

other hand, in eastern and southern parts of the country, drinking water has low fluoride concentrations, paralleled by a high occurrence of caries among children.

Coastal and marine water quality

Currently, marine water quality is monitored at 32 monitoring stations, four of which belong to the international Baltic Sea monitoring programme. Three of the stations - Bãting•, Melnrag• and Nida - cover the heavily polluted sea areas. The Kur0iå Lagoon is monitored at 13 stations. The estimation of the riverine loads to the Kur0iå Lagoon and to the Baltic Sea is based on daily measurements of the water level and monthly sampling of water quality. The loads are calculated using linear interpolation between sampling days.

Most of the river waters enter the Baltic Sea via the Kur0iå Lagoon. It has been estimated that about 80 per cent of the Lagoon and 45 per cent of the Lithuanian coastal waters are heavily polluted with nitrogen and phosphorus. During the 1984-1996 period nitrate and phosphorus concentrations in the central parts of the Lagoon rose sharply. Phytoplankton biomasses have increased as well, and today blue-green algal blooms last from June-July to October-November. Several potentially toxic algal species are common. Comparison of historical data shows that since the 1920s the abundance of today's dominant blue-green alga has increased more than one order of magnitude and the Lagoon can be classified as highly eutrophic. Even fish kills are common in early summer, coinciding with the maximum phytoplankton biomasses.

There was no clear trend in nitrate or phosphate concentration in the coastal waters during the 1992-1996 observation period. The Lithuanian coast is quite open and thus the water exchange between the coast and the open sea is efficient. However, during the hot summer days the beaches of Klaip•da, Giruliai and Palanga often fail to meet sanitary standards.

Non-point sources of pollution

Almost half the Lithuanian territory is used for agricultural purposes: 38 per cent is arable land and 11.5 per cent pasture. Therefore, agriculture has a strong impact on water quality in rivers, lakes and coastal waters. Lithuania has reported to HELCOM that 50 per cent of the total riverine N load and 22 per cent of the total riverine P load originate from non-point pollution sources.

The pollutants discharged from non-point pollution sources into bodies of water are difficult to calculate and treat. There are different pollution sources such as storage sites for manure, oil products, agrochemicals, toxic solutions, land affected by erosion, increased effluent from drained lands. The main reasons for water contamination are inadequate agricultural practices that do not

meet ecological requirements and poor sanitary practices.

The run-off results from the application and storage of natural and chemical fertilizers, and from large-scale, intensive pig and poultry units located throughout the country. Pollution of surface and groundwater resources with fertilizers is caused by (a) poor application technology, (b) overfertilization in some areas, (c) poor tillage practices that fail to incorporate fertilizer into the soil, and (d) open storage facilities. Plants take up only 15-25 per cent of phosphorous fertilizer. The fertilization rate in 1995 was 62 kilograms of nitrogen, 32 kilograms of phosphorus, and 56 kilograms of potassium per hectare, of which an estimated 20 to 30 per cent do not penetrate the soil, but are washed away.

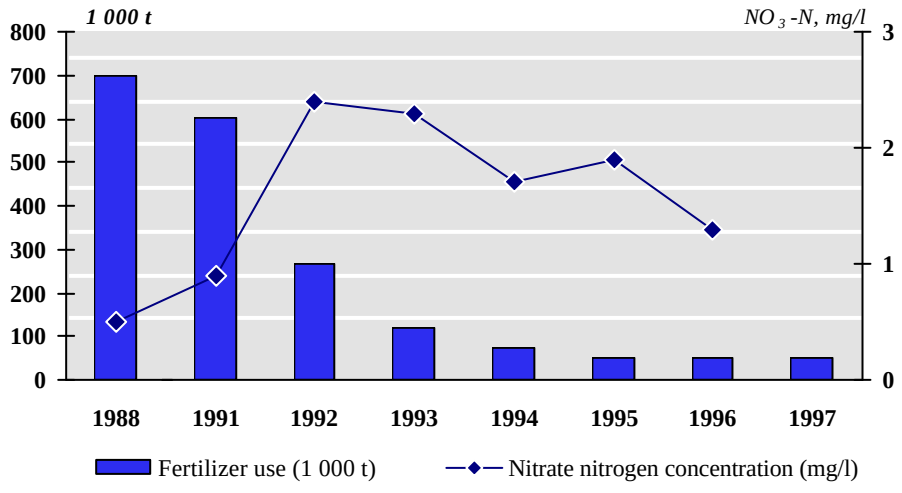
According to the Ministry of Agriculture, a tenfold increase in fertilizer prices and a sixfold increase in pesticide prices since 1991, have contributed to a massive decline in their use - together with the economic depression. From 1990 to 1994, agricultural production declined by almost 50 per cent and the use of fertilizers by as much as 80 per cent. This was not, however, reflected in the river water quality until 1994 (Figure 7.7). There are, of course, several reasons for this time lag. The nitrogen storage in the soil was high enough to enable the leaching to continue after inputs had dramatically decreased. Hydrological conditions also vary strongly from year to year and affect the leaching of nitrogen. It is expected that when the agricultural process stabilizes, fertilizer and pesticide consumption will once again increase. The Ministry of Agriculture predicts that, as a result of privatization, small farmers will increase the use of natural fertilizers and will use better fertilizer techniques.

A major national environmental management problem results from the 24 large pig-breeding complexes each producing between 12 000 and 54 000 pigs per year (in 1997, 520 000 pigs were raised), and 5 large poultry farms, all of which cause severe local pollution of surface and groundwater. Meat being a major export commodity for Lithuania, these large-scale farms will in all likelihood remain viable.

Marine transport

In addition to (municipal and industrial) waste water and agricultural pollution, marine transport also creates risks for the Baltic Sea environment. Klaip•da is Lithuania's only seaport and the fifth biggest port in the Baltic Sea region in terms of cargo trans-shipment volumes. Container traffic is increasing steadily. A project for a new container

Figure 7.7: Changes in fertilization* and nitrate nitrogen concentration, 1988-1997



Source: Ministry of the Environment.

Note:
* In terms of pure ingredients.

terminal is already being carried out. The new oil terminal to be constructed in Bãting• will strongly increase oil transport, since the envisaged capacity of the terminal is about 20 million tonnes of oil products.

Increasing traffic implies an increasing risk of accidents and oil spills. Accidents were already common in the past, the most serious one being the breaking apart of a British tanker outside Klaip•da in 1981. In general, the dramatic increase in activity on the Lithuanian coast calls for proper risk management plans and facilities for oil pollution prevention.

7.3 Objectives and implementation of water policy

Legislation

Water management in Lithuania is mainly based on the Law on Environmental Protection (1992), together with the Law on Water (1997), the Law on the Protection of the Marine Environment (1997) and numerous other legal instruments. Implementing regulations have also been adopted. The most important are Special Conditions for Use of Land and Forest (1992, amended in 1995), Waste-water Pollution Standards (1996), Methodology for Estimation of Environmental Water Flow (1997), and the Regulation on Obtaining Permits for the Use of Natural Resources and Discharges of Effluents into the Environment (1995). Currently, the first priority in preparing legislation is harmonizing existing laws with EU legislation, as well as preparing legal instruments to implement the Law on Water and the Law on the Protection of the Marine Environment.

Policy objectives and action programme

The Lithuanian Environmental Strategy (1996) and the corresponding action programme for implementation provide the basis for a new approach towards more efficient water resource use and water management. The governmental goals for water protection are to:

- reduce surface water pollution from municipal waste water;
- reduce pollution with industrial and agro-industrial waste water;
- reduce groundwater pollution;
- reduce non-point source pollution of bodies of water;
- reduce pollution with surface (storm water) run-off;
- reduce the pollution load flowing into the sea;
- prevent sea water pollution from oil product transport;
- reduce the polluted water inflow from other countries.

The objectives of water resources protection are to:

- protect freshwater resources from overuse while extracting water from water intake sites;
- prevent further changes in the natural hydrographic network structure.

The corresponding priorities in water management are:

- waste-water treatment and reduction in discharges;
- rational use of natural and water resources.

Domestic waste water from cities, with the exception of Panev•ñys, is discharged into rivers after being only mechanically treated or after receiving insufficient biological treatment. In Kaunas, waste water is discharged totally untreated. Waste water in Vilnius, Klaipeda, Òiauliai and Palanga is already biologically treated. Therefore, it is expected that when the waste-water treatment plant in Kaunas starts operating, only 1 per cent of waste water will remain untreated. The construction of waste-water treatment facilities remains a top priority for investments, particularly for funds from the State budget, and loans and subsidies received by the State. In parallel, it is necessary to implement codes of good agricultural practices to reduce non-point source pollution of soil and water and introduce the polluter/consumer-pays principle, and develop the necessary water protection laws.

The environmental Action Programme, approved by the Government on 5 August 1996, lists numerous actions for water pollution prevention. Several technical actions aim at improving waste-water treatment in municipalities and rural areas. Training

the technical staff of treatment plants is also part of the Programme. The time schedule for its implementation is very challenging. It is strongly dependent on funding, particularly the construction of waste-water treatment plants in big cities. The part of the Action Programme concerning water management is summarized in Table 7.6. In 1992 Lithuania acceded to the Helsinki Convention on the Protection of the Marine Environment of the Baltic Sea Area. According to the 1998 Ministerial Declaration, Lithuania should reduce pollution discharges to the Baltic Sea by 50 per cent, including organic and biogenic substances as well as heavy metals.

Table 7.6: Environmental Action Programme in water management

Develop personnel training and certification programmes for waste water treatment facilities	1996
Reducing Baltic Sea pollution and contaminated water influx from other countries	
Prepare a draft government decree to improve the system of combating accidents at sea and s	1997
Work out a sea water protection programme for the transport of orimulsion and oil products	1997-1998
Conclude bilateral or multilateral inter-State agreements for the use and protection of transbou	1996-2000
Reducing groundwater contamination, improving drinking-water quality	
Develop drinking-water standard ……	1996-1997
Establish water intake sites and sanitary zones (lines) in cities according to the Ministry of H	1996-2000
Build drinking-water preparation facilities in central water intake sites (Klaipeda, ? iauliai, Jo	since 1996

Source: National Environmental Strategy, Ministry of the Environment.

Institutional aspects

The Ministry of the Environment and the Ministry of Health are involved in water management in Lithuania. There are 8 Environmental Protection Departments, which issue water permits. Fifty-six regional agencies and city inspectorates within the Environmental Protection Departments are responsible for the use and protection of water resources locally. Institutions such as the Hydrometeorological Service of Lithuania (responsible for estimations of water quantity), the Joint Research Centre (responsible for monitoring water quality), the Marine Research Centre (responsible for monitoring the Kur?iå Lagoon and the coastal waters), and the Hydrographic Network Service (State control of technical status of dams, reservoirs and other hydrotechnical constructions) are subordinated to the Ministry of the Environment. The State Centre for Public Health and the State Hygiene Inspectorate, which are subordinated to the Ministry of Health, are responsible for monitoring compliance with drinking-water standards and controlling recreational bodies of water. The Lithuanian Geological Service, subordinated to the Ministry of the Environment, is responsible for groundwater resources.

Instruments and measures

Standards for basic physical and hydrochemical values, for nutrients and metal content in surface and sea water, for hazardous pollutants (metals, organic compounds and their halogenic derivatives) content in water sediments will be reviewed shortly, with a view to adapting them to the EU environmental standards. Currently, the implementation of the Helsinki Commission's recommendations regarding the technological processes of paper, chemical, leather, textile, oil-refining, food, and metal-finishing industries is being considered.

There are three important economic instruments in use in water management: natural resource taxes, pollution charges, and subsidies for the construction of waste-water plants. Taxes on the use of water resources have been in effect since 1992. Of late, the use of water resources has declined to levels below permissible limits.

The environmental fund for investments is necessary to provide incentives for waste and pollution minimization and to raise additional funds. These are aimed at paying for resource-saving or

industrial pollution minimization projects. Once the project is on stream, its revenues will be used to repay loans to the environmental fund for investments, thus revolving and increasing it.

In connection with the development plans for Klaip•da port and the Bãting• oil terminal, several studies have been carried out on the environmental management of the marine transport sector. The Bãting• oil terminal project also included an EIA and plans for its proper environmental management.

The most significant management project regarding the marine transport sector was the preparation of the National Oil Spill Contingency Plan. The Plan (Phase 1) was finalized in 1995. The proposal for its implementation (Phase II) includes the description of the administrative structure and responsibilities of different authorities as well as operational activities (see also Chapter 5).

It is foreseen that biological waste-water treatment plants will be constructed in Alytus, Utena, Vilkaviókis. Biological treatment plants will be built in Ukmerg• and Òirvintai, and the construction of a plant in Anykó…iai will be finished in 1998. The capacity of all the above-mentioned plants will be 28.5 million m^3/year. Nitrogen and phosphorus will be removed from the discharge in all plants in the above-mentioned towns (except Òirvintai). In addition, it is foreseen that nitrogen and phosphorus will be removed from the discharge in new treatment plants in Klaip•da, Òiauliai and Palanga. The plan is also to modernize the biological treatment technology in Vilnius so that it will remove nitrogen and phosphorus. Experimental plants applying natural treatment methods are going to be built in villages, several of them with foreign assistance (Denmark, Switzerland). According to data from the Statistics Department, 105 cities and towns have a centralized sewage pipe system or separate sewage networks.

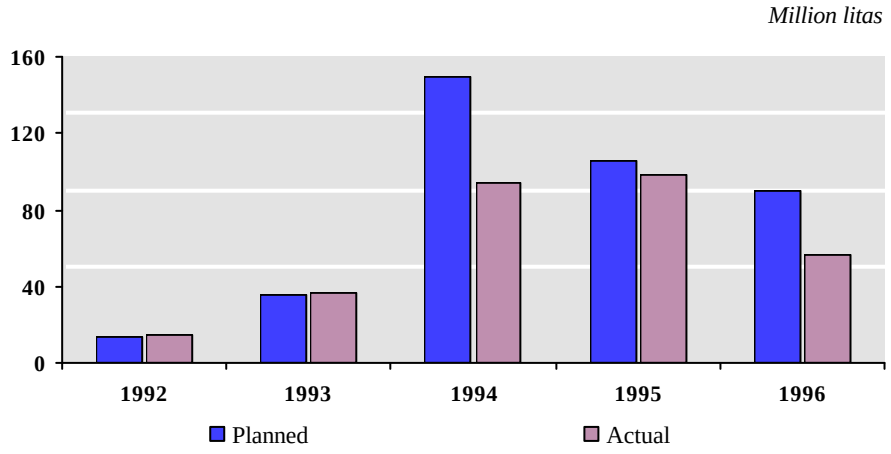
Most environmental expenditures go to water protection, i.e. waste-water treatment plants. The main sources of finance are the State budget, foreign loans and grants. In 1996, 56.6 million Litas were allocated from the State budget for waste-water treatment plant investments (Table 7.7) and 29 million Litas for current expenditure (Figure 7.8). SNPF allocated 0.27 million Litas and 2.6 million Litas, respectively. The Municipal Environment Funds allocated 10.5 million Litas for investments and 16.2 million Litas for current expenditure.

In addition to national funding, foreign loans and grants provide an important source of financing. So far committed foreign grants for water protection total about US$ 31 million and loans almost US$ 62 million. Investment expenditures for water pollution control for the period from 1993 to 1996 are described in Table 7.7.

7.4 Conclusions and recommendations

Lithuania has succeeded in preparing the ground for modern water management in all respects, and has also in many ways improved the aquatic

Figure 7.8: Expenditures for waste-water treatment from the State budget



Source: Ministry of the Environment.

Thousand litas

	1993	1994	1995	1996
Total	**68 186**	**189 264**	**160 796**	**143 027**
State budget	36 250	94 600	98 500	56 600
Municipal budget	-	-	700	1 979
State Nature Protection Fund	-	298	351	265
Municipal Environmental Protection Funds	-	5 905	5 024	10 500
Enterprises' own funds	31,936 a/	88,461 a/	56,221	73,683

Sources: Ministry of the Environment; Department of Statistics.

a/ Data do not include expenditures for integrated technologies.

environment. It appears that the need for further improvements is well understood, and that most of the measures that are now required are well known. For example, basic environmental protection requirements for different sectors, as well as environmental protection policy enforcement measures, should be incorporated into the Law on Environmental Protection at its next revision.

The legal and regulatory framework for water resources management exists, but important laws still remain to be passed, particularly for municipal water-supply and sewerage services and for land uses that have major consequences for water resources management. It is not possible to develop and adopt all needed legal acts at the same time. The recent adoption of the new Law on Water was a big step forward. Now, implementation becomes the priority – i.e. the development, adoption and application of new legal instruments, such as new standards. These standards need and will be harmonized with applicable EU practices.

Recommendation 7.1:
The necessary legislation required after the recent adoption of the new Water Law should be a priority for future work on legal instruments. The introduction of integrated water management for individual river basins should be considered, including institutional changes in line with the new water management policy of the European Union.

As elsewhere, a mix of regulatory and economic instruments is progressively being implemented in Lithuania's water management. In the near future, the developmental focus should be on new economic instruments to encourage pollution and waste minimization and prevention and the preservation of water resources. Such instruments would make management more flexible. The instruments should be consistent with the polluter-pays principle. They should promote the introduction of cleaner production.

Recommendation 7.2:
The tool kit of water management should be extended primarily with economic instruments. Appropriate taxation should be developed in particular for water resource management.

The main area of concern for water management is water pollution. Problems with water use continue to exist, in terms of both pollution and resource management. The Ministry of the Environment imposes a water tax to make industries and households reduce their water use. With regard to industrial water users, the wide introduction of closed circuits should be monitored, as it could give indications as to the adequacy of the tax rate level. At the municipal level, programmes aimed at saving water resources and reducing losses as well as using resources rationally and preventing their exhaustion (and contamination) should be developed and implemented. Finally, decreasing public water supply probably means that, from an economic point of view, there is no need to maintain all well-fields.

Recommendation 7.3:
The full-fledged introduction of a modern water use policy requires stronger municipal programmes and capabilities. The economics of individual well-fields should be reassessed from

the point of view of expected developments in water supply and use.

Water quality has improved to some extent during recent years, mainly because of the construction of treatment plants. Now that the economy is in recession and investments in some municipal and industrial waste-water treatment are increasing, the challenge for Lithuania is to keep improving its water environment, effectively using the available diversified tools such as technical, command-and-control, and economic instruments. When determining new needs for water quality management, the economic aspects need to be analysed. The experiences with local networks should be taken into account in such analysis, which should therefore preferably be organized in a decentralized framework.

The completion or modernization of a large number of municipal waste-water treatment plants and industrial pre-treatment facilities will increase the scale of the sludge problem in the future. As proper land markets develop following restitution and privatization, land-intensive solutions will need to be replaced by modern sludge management technology.

Recommendation 7.4:

The introduction of modern sludge treatment technology should be expected to become a priority for investments in the foreseeable future. Establishing quality standards for industrial waste water might promote the introduction of pretreatment of industrial effluent waters before they enter municipal sewage systems.

Special protection zones have reduced the impact of agriculture on water pollution. However, many rivers and lakes have no such zones or have only partially established ones. The establishment of private farming will help to reduce pollution from cattle farms and arable lands. However, the problem of waste water from farmsteads will become acute. During the process of privatization and land reform, there is the possibility of constructing small waste-water treatment plants for small farms and private businesses. Lithuanian engineers, with the assistance of foreign colleagues, are working on projects to develop such treatment plants.

Baltic Sea pollution from Lithuanian agriculture has eased recently. However, this improvement does not stem from deliberate environmental

measures, but from the economic recession. Therefore, it can be expected that in the near future, as agricultural production increases, agricultural impacts on watercourses will also increase. The above issues can be managed successfully only through close cooperation between the Ministries of the Environment and of Agriculture.

Recommendation 7.5:
The Ministry of the Environment and the Ministry of Agriculture should seek institutional solutions and set up adequate routines for cooperation to manage environmental issues of common concern.

Eutrophication and oil spills are the main problems of Lithuania's coastal waters. The development of a national contingency plan for oil spills is a clear achievement in this regard. It is now crucial (1) to implement the plans for the construction of biological waste-water treatment plants, first in the main cities and industrial plants and later on in smaller municipalities, (2) to implement the HELCOM recommendations regarding agricultural activities, and (3) to implement the National Oil Spill Contingency Plan.

Recommendation 7.6:
Efficient improvement in water quality along the Baltic Sea coast requires the swift implementation of the relevant HELCOM recommendations and of the existing National Oil Spill Contingency Plan.

As neither point nor non-point sources of pollution are adequately monitored, their pollution cannot be reduced. To be able to participate fully in the cooperation within HELCOM, special attention should be paid to the harmonization and quality assurance of the whole monitoring process (design, sampling, laboratory analyses, data storage, data analysis, reporting and dissemination of results). This recommendation covers the monitoring of both natural waters and waste water.

There are many data on Lithuania's water resources, their quantity as well as their quality. These data are, however, only partly used. Strong efforts should be put into developing data banks as well as into reporting and particularly into a thorough analysis of cause-effect relationships in order to be able to make full use of the data in decision-making. The publication of results in international journals should be promoted.

Recommendation 7.7:
Existing monitoring should be improved in accordance with HELCOM practices, as should the quality of monitoring data and of other environmental data. Their accessibility and their actual use in analysis should be improved by all possible means.