Chapter 7

WATER MANAGEMENT

7.1 Quantity and quality of water resources

Surface waters

Latvia has a large surface water network due to its uneven moraine relief, its wet climate and the peculiarities of its geographical structures (Figure 7.1). There are about 12 400 rivers and brooks in Latvia with a total length of over 37 000 km. Four large rivers - the Daugava, the Lielupe, the Gauja and the Venta - account for 88 per cent of its total river discharge (Table 7.1) and are part of the Baltic Sea basin. The annual river discharge is 34.7 km^3, which amounts to almost 8 per cent of the total river discharge into the Baltic Sea. 44 per cent is local discharge, about 56 per cent are transit waters from Lithuania and Belarus. Latvia has 34.0 km^3 of surface water and 4.7 km^3 of groundwater resources available annually.

Latvia's river water regime is characterized by spring floods and low water periods in late summer, as well as periodic summer falls and winter rises in water level. During the spring floods, rivers transport about 45-55 per cent of the total annual water volume. About 35 per cent of Latvia's rivers that are 10 km or longer are partly or fully regulated.

Table 7.1: Characteristics of main rivers

	Length		Catchment area		Annual mean discharge
	Total	In Latvia	In Latvia	Share of Latvia's total surface	
	(km)		*(km^2)*	*(%)*	*(m^3/s)*
Daugava	1,020	357	24,700	38.2	720
Lielupe	119	17	56	13.6	104
Gauja	452	452	7,790	12.1	74
Venta	346	178	7,900	12.2	93

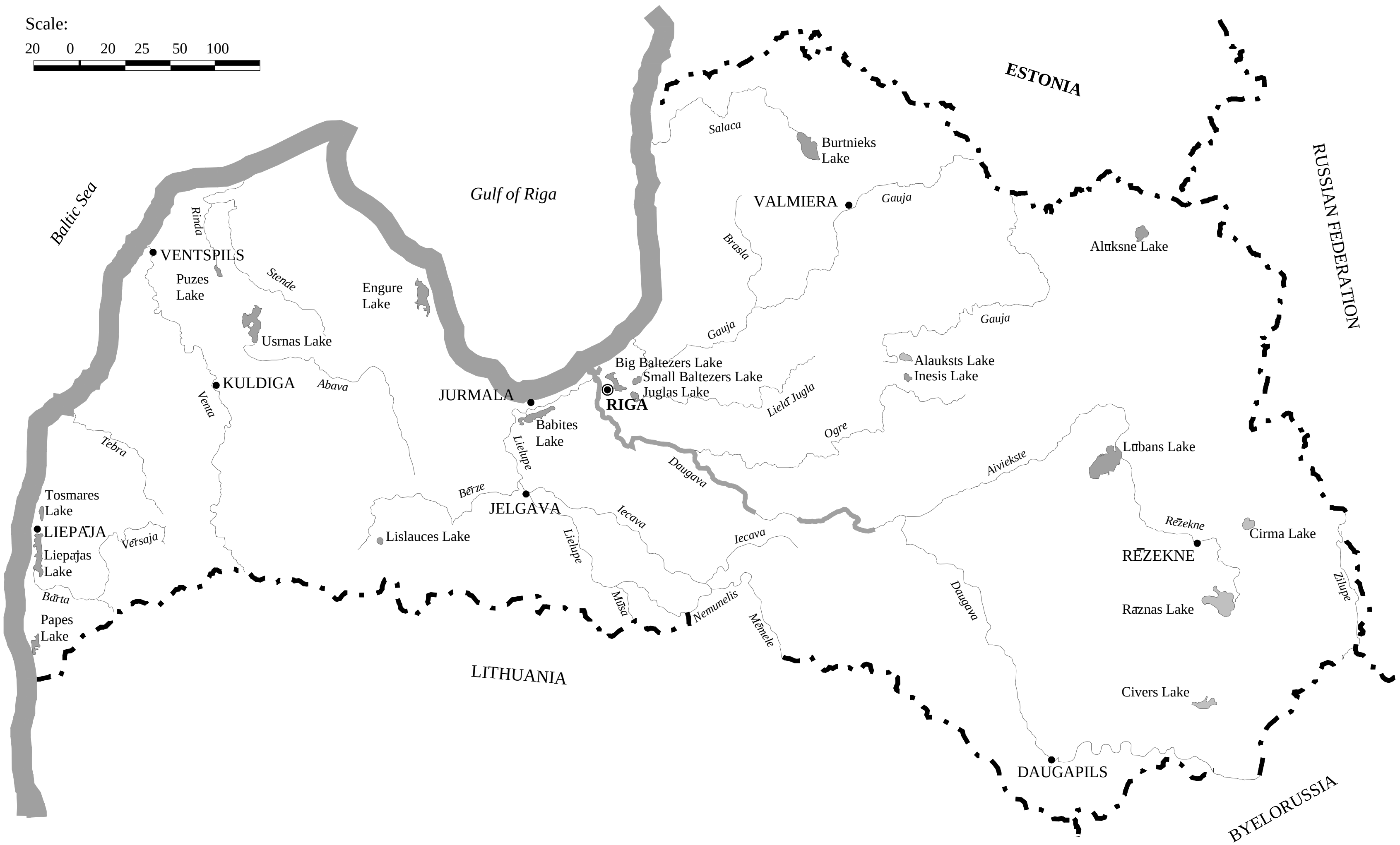
Source: Hydrometeorological Agency, 1998.

Table 7.2: Latvian rivers according to their length

River length	Number
Total	12 436
Shorter than 10 km	11 659
10 to 20 km	501
20 to 50 km	209
50 to 100 km	50
Longer than 100 km	17

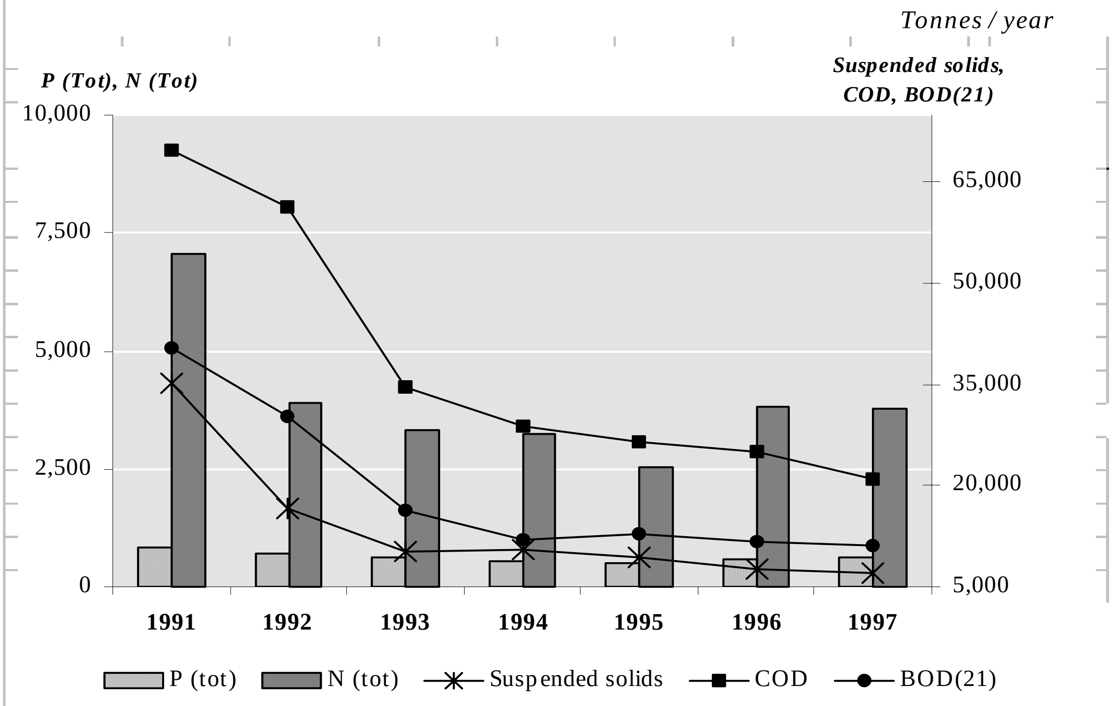
Source: State of the Environment Report of Latvia, 1996, ECMC.

Figure 7.1: Latvia's main rivers and catchment areas



Source: Encyclopaedia "Latvian Nature", 1995

Figure 7.2: Pollution load by the river network in Latvia, 1991-1997



The Dobris report (European Environment Agency, 1995) described the water quality of 80 per cent of Latvia's rivers in the early 90s as 'good' and 'fair', that means: insignificant pollution, moderate nutrient content, sufficiently high oxygen amount, rich flora and fauna, large fish population. Since then, the pollution load has fallen further (see figure 7.2). The drop has been particularly clear for suspended solids, COD and BOD, more limited for phosphorus and nitrogen.

River conditions in terms of organic substances do not vary much throughout the year, the annual average being 1 to 2 mg/l BOD_7, 1.5 to 3 mg/l N_{tot} and 30 to 120 µg/l P_{tot}. However, the total nutrient concentration shows some significant trends. The summer and autumn concentrations of total phosphorus (100 to 200 µg/l) and the spring concentration of total nitrogen (6 to 8 mg/l) in the river Lielupe are high. There is no definite and convincing explanation for this. However, the Musa, one of the main tributaries of the Lielupe, crosses the Lithuanian border with an autumn P_{tot} concentration of up to 250 µg/l and with a spring N_{tot} concentration of between 4 and 7 mg/l. Due to a lack of comprehensive monitoring data, it is not possible to evaluate the trend of the transboundary pollution load from Lithuania. The P_{tot} concentration in the river Venta is remarkably high as well, most likely due to the impact of waste-water discharges from Kuldiga.

The Latvian Environmental Data Centre has investigated the macro-zoobentos of about 200 small rivers (with about 500 observation points) over the past three years in co-operation with the Regional Environmental Boards. The biological water quality in 83 per cent of the rivers has proved to be 'good' or 'fair'. In the Valmiera region, 45 per cent of the small rivers can be classified as clean or nearly clean. The influence of point sources on the biological water quality was assessed at one third of the observation points. About 40 per cent of the point sources have a significant impact on biological water quality and cause changes in saprobic conditions.

Municipal waste water was the main source of phosphorus pollution in Latvia's rivers (44 per cent of the total phosphorus discharge) and agriculture was the main source of nitrogen pollution (68 per cent of the total nitrogen discharge) in 1990. Since then, the use of fertilizers has decreased by more than 85 per cent (Table10.2), while, in 1995, the nutrient load of municipal and industrial discharge was 40 per cent (total phosphorus) to 56 per cent (total nitrogen) lower than in 1991. However, the nutrient load measured in the water remains practically unchanged.

Table 7.3 : Permanent water pollution by river basin, 1997

tonnes / year

	Suspended matter	BOD full	P total	N total	Sulphates	Chlorides
Total	**7 064**	**11 142**	**626**	**3 783**	**4 924**	**6 075**
Bârta basin	25	32	2	11	82	11
Daugava basin	3 400	6 742	200	1 282	741	1 613
Gauja basin	2 762	2 722	253	1 293	533	2 196
Irbe basin	-	-	-	-	-	-
Lielupe basin	168	564	60	529	969	400
Nemuna basin	0	0	0	0	-	-
Pernava basin	7	3	2	10	-	-
Salaca basin	32	45	4	28	-	-
Sur Emajegi basin	12	18	1	4	-	-
Upava basin	1	2	0	1	-	-
Velikaja basin	16	13	3	12	-	-
Venta basin	125	293	33	191	-	-
Baltic Sea's coast	388	338	47	292	2 579	1 587
Gulf of Riga's coast	128	370	21	130	20	268

Source: Indicators of Environmental Protection in Latvia 1997, Statistical Bulletin, Riga 1998.

Latvia also has many *lakes* (more than 2 000), but most are small and shallow. The average depth of about 70 per cent of the lakes is less than 5 m. Only 16 lakes exceed 1 000 ha or 10 km^2; they account for 42 per cent of the total lake area (963 km^2). Latvia's lakes contain a total of about 2 billion m^3 of fresh water. All hydrobiological types of lakes are represented.

Lake water quality is difficult to describe as there is no comprehensive lake monitoring programme. However, the Institute of Biology (University of Latvia) has studied several lakes. In 60 per cent of a random sample of 70 lakes the concentration of nitrates and in 31 per cent the concentration of phosphates exceeded the natural background level. The accumulation of nutrients from different sources has speeded up eutrophication during the last 30-40 years, which is a threat especially to those species that require nutrient-poor water habitats. Toxic blue algae have bloomed regularly in recent summers in the big shallow lakes surrounding Riga - Kisezers, Lake Jugla, Big and Small Baltezers (they provide some of Riga's drinking water). Lake Engure, one of the biggest shallow coastal lakes in Latvia, which has been on the Ramsar list since 1995, has a summer surface concentration of nutrients exceeding the background level - mineral nitrogen 1.2-1.6 mg/l, mineral phosphorus 0.09-0.2 mg/l (12 samples in 1995). However, the lake is still insignificantly eutrophic. In spite of this, the water quality of the other 40 per cent of the lakes still shows no sign of human impact. The bog lakes of Teici and Krustkalni Reserve are virtually unaffected by direct human impact.

In 1992-1994, the Institute of Biology also analysed the concentration of heavy metals in the top layer of lake sediments (0-2 cm). The concentration is low, except for cadmium, which is higher than 1 mg/kg in 30 per cent of the lakes. The source of this pollution is probably the intensive use of fertilizers in previous decades, or the accumulation of organic sediments due to eutrophication.

Groundwater

Latvia is located on the Baltic artesian basin formed by aquifers of different thickness, water amount and water quality. Groundwater from Quaternary (Devonian) deposits, which are 100 to 300 metres deep, is used for water supply. As a result of the continued and intensive exploitation of groundwater resources locally (abstraction significantly exceeds the natural regeneration of reserves), two large depressions have formed: at Liepaja and in the water abstraction area of Riga city and region. In Liepaja, the groundwater level had fallen 15-18 m, and in the Greater Riga region it had fallen 15 m (1996). Such pits create hydraulic preconditions for infiltration of polluted water into artesian water. So far, the Daugava's bottom waters have infiltrated the central part of

Riga's aquifer and marine water has infiltrated Liepaja's aquifer over an area of 3x5 km.
Regarding the chemical composition of groundwater:

- The calcium hydrogen carbonate groundwater type, with a mineral content of 0.3-0.4 g/l, is the one most used in Latvia. Calcium hydrogen carbonate waters usually meet the quality requirements for drinking water. Individual components may nevertheless pose problems, such as a high iron content (usually 0.3-3.0 mg/l), which is the most typical problem.

- Groundwater of a lower quality is found near the surface in Quaternary marine, old river bed and wetland deposits that are rich in muddy sediments. In such groundwater, an increased content of organic substances is found: C_{org} up to 80 mg/l, ammonia up to 30 mg/l, and iron at a concentration of 90 mg/l.

- Sub-surface groundwater of a higher quality is found in sand deposits. Mineralization is very low (0.16 g/l on average), as is the concentration of organic acids (C_{org} = 1-2 mg/l), iron (0.1-0.2 mg/l) and manganese (0.05-0.07 mg/l).

- Calcium sulphate waters are rarer. They are most widespread in the central and western part of Latvia. Water mineralization can reach 3 g/l. Waters with a mineralization of up to 900 mg/l and a sulphate content of up to 400 mg/l are used at the water extraction sites of Liepaja and Jurmala. They are less suitable for the supply of drinking water due to their increased hardness (up to 10 meq/l). Their sulphate content fails to meet WHO standards (< 250 mg/l). However, those cities currently do not have a better water source.

The overall quality of groundwater in Latvia is good. Groundwater pollution of agricultural origin is not as high as in much of western Europe. The nitrate content at groundwater monitoring sites very seldom exceeds 20 mg/l. There may be localized groundwater pollution problems. For example, in the district of Adazi, where agro-chemicals were used intensively, at the end of the 1980s nitrate pollution was found in half the 50 tested water wells, with concentrations between the natural background level (4.5 mg/l) and the Latvian limit value of 45 mg/l. It is also likely that in such areas as those surrounding the Bauska and Ulbroka pig farming complexes (Figure 10.1 in chapter agriculture), where nitrate concentration in drainage water reaches 164 mg/l and total phosphorous up to 2.6 mg/l, groundwater is polluted too. At other locations the chemical content of groundwater has been found to differ radically from the natural one, in particular in the vicinity of solid waste disposal sites (Getlini in Riga, Kudra in Jurmala, Demene in Daugavpils), liquid toxic waste ponds (Olaine, Incukalns, Jelgava), agrochemical warehouses (Iecava, Ventspils, Jelgava), oil storage sites (Jaunmilgravis, Tukums) and former Soviet military bases (Spilve, Factory No 177 in Riga).

Wells are generally more heavily polluted than sub-surface groundwater, due to the sanitary conditions around the wells. A research project on water well quality performed during 1992-1994 indicates that 17 per cent of wells are polluted with nitrates and nitrites (nitrate > 45 mg/l). In 6 per cent of wells, saprobic bacterial pollution was found. Most pollution occurred in small towns and villages, less on individual farms

To summarize, in general potable groundwater in Latvia has a high iron and an insufficient fluoride content. About one third of all water wells fail to meet WHO standards for iron. Even though iron is not a toxic element, an increased iron content (0.8-3.0 mg/l, WHO norm: < 0.3 mg/l) worsens the visual and organoleptic properties of water. At present, iron removal facilities exist at only 74 locations out of the 272 where treatment is needed, and this treatment is satisfactory at only 21. Significant improvements are needed. Also, the fluoride content (0.4-0.5 mg/l, WHO norm: > 1.5 mg/l) is insufficient and increases the risk of dental caries. Other chemical substances do not exceed the norms recommended by WHO for sources of drinking water, except in places (see above) where sodium chloride (from marine waters) has been found with a mineralization of up to 3.6 g/l. According to its micro-biological indicators, groundwater quality is generally good, and additional disinfection is not necessary.

Marine waters of the Gulf of Riga

The Gulf of Riga has a surface of 19 000 km^2, and a water volume of 430 km^3. It is quite deep (about 50 m) in the middle and much shallower to the north. Depending on the hydro-meteorological conditions, about 25 per cent of its total water volume is exchanged during one year. The average discharge of Latvia's rivers into the Gulf of Riga is about 29.1 km^3, in wet years up to 41.5 km^3 and in dry years about 17 km^3. At the beginning of the 90s this contributed more than 17 per cent of the total nitrogen and up to 5 per cent of the total phosphorous load discharged into the Baltic Sea.

Between 1948 and 1994, discharges of nitrates increased significantly, particularly during the period of intensification of agriculture from 1960 to 1980. At present, according to pollutant input calculations, the nitrogen load to the Gulf of Riga would be expected to fall. But based on river pollution load calculations, the nitrogen load does not seem to be changing significantly (see figure 7.2). In the Gulf, nitrate concentrations peaked in 1989 and 1991, and dropped in 1993 and 1994. Whether this indicates a new trend cannot be decided with certainty due to insufficient data.

Phosphorus is the limiting factor for eutrophication in the Gulf of Riga; this means that the phosphate supply limits algal blooms in spring. Nitrate is not completely consumed during that time. The winter values, which are little affected by eutrophication, are a better indicator of nutrient concentration trends. For the period of 1974-1995, they seem to indicate still increasing concentrations of total phosphorus.

The increase in oxygen deficit on the bottom layer of the sea stopped during the late 80s. In the past few years, oxygen concentrations did not fall below 1.7 ml/l. Perennial (1977-1995) trend analyses of phytoplankton, zooplankton and zoobentos show that significant structural changes continue to influence the ecosystem, i.e. a decrease in phyto and zooplankton biomass, a modification in zoobentos species and bloom of blue algae.

7.2 Water use and waste water

Water abstraction and use

Of the total water intake of 404 million m^3 in 1997, 167 million m^3 was groundwater and 237 million m^3 surface water. Abstraction rates have shrunk in the last decade (Table 7.4). Latvia's annual water abstraction from natural sources was 162 m^3 per capita in 1997. The level is determined by the economic activity in the region, as well as by the number of households that have piped water. The losses during distribution (the poor state and quality of pumps and pipes causes problems in many systems) may also contribute to the regional differences in water abstraction.

The difference between water use and abstraction is considered to be the water lost in distribution. According to Table 7.4 the losses in the water supply system stand at about 25-30 per cent.

Because of economic recession, water use has fallen since 1991 (Table 7.4). Groundwater use has dropped proportionally in all the aquifers used. One positive result, for example, is that the groundwater depression at the Arukila - Amata water complex has been reduced.

Table 7.4: Water abstraction and use, 1991-1997

Million cubic metres/year

	1991	1992	1993	1994	1995	1996	1997
Water abstraction							
Total *of which*	695	650	513	477	456	428	404
Surface water	352	337	264	239	222	222	196
Underground	303	285	231	217	195	181	167
Water utilization							
Total	596	531	407	370	334	323	295
Public supply	204	188	190	..	173	165	138
Industry *	220	181	105	..	86	..	101
Agriculture **	152	144	57	..	55	..	56
Other	20	16	..	..	..	..	..

* Including energy production.

** Including fisheries.

Sources: Indicators of Environmental Protection of Latvia 1997, Central Statistical Bureau of Latvia, Ri
Latvian Environmental Data Center (1991-1996)

Groundwater is the main source (71 per cent) of drinking water as its quality is generally good. Surface water is predominantly used for industrial, agricultural and fishery needs. Only 29 per cent of drinking water is taken from surface water sources. This is the case in four cities - Riga, Daugavpils, Ventspils and Olaine – where surface water is used as well as groundwater. The total population of those cities stands at more than 1 million. The use of surface water for drinking water supply pushes up treatment costs. Moreover, there is a higher risk of drinking-water pollution in the event of a chemical spill, such as that observed in 1990, when cyanide was accidentally discharged into the Daugava after an accident at the Belarussian Novopolock chemical plant.

Table 7.5: Water use in 1997

in litre per capita and day

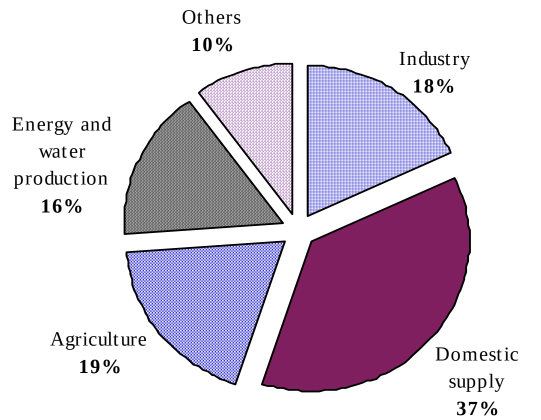
	Total water use	Industrial use	Other (domestic) uses
Total	**326**	**156**	**170**
Cities	367	141	227
of which:			
Riga	377	139	237
Daugavpils	401	200	200
Jelgava	..	..	..
Jurmala	..	..	..
Liepaja	366	209	157
Rezekne	..	..	..
Ventspils	484	117	367
Countryside	284	172	113

Source: Environmental Protection Indicators in Latvia, 1997, Statistical Bulletin, Riga 1998.

In 1997, average domestic water use was 170 l/d/cap., with a lower consumption in the countryside (113 l/d/cap.) than in cities (227 l/d/cap. average in the 7 main towns) (Table 7.5). Water use per capita in Riga amounted to 237 litres per day, in Ventspils to 367 l, in Daugavpils to 200 l and in Liepaja to 157 l. Municipal systems also distribute water to companies and institutions with a water abstraction capacity below 50 m^3 per day (in Riga, below 200 m^3), which also discharge their waste water into the municipal sewage system. About 75 to 98 per cent of the population in large cities and about 40 to 50 per cent in small and medium-size towns are connected to piped water systems. In rural farms and villages, shallow wells are used for individual water supply; the wells are often in poor condition. In general, water use is rarely metered.

In 1997, natural water resources supplied 295 million m^3 of fresh water: 37 per cent of which to the public water supply, 18 per cent to industry (plus 16 for energy production) and 19 per cent to agriculture (mostly used in fish farming) (Figure 7.3). These figures differ significantly from the European averages: 53 per cent to industry, 25 per cent to agriculture, and 19 per cent to households. Figure 7.4 illustrates the water use and waste-water discharge in industry and agriculture. Occasionally, enterprises of one industry treat waste water from others, so that the waste water they discharge into water basins sometimes exceeds the amount of fresh water that they received.

Figure 7.3: Water use by different consumers, 1997



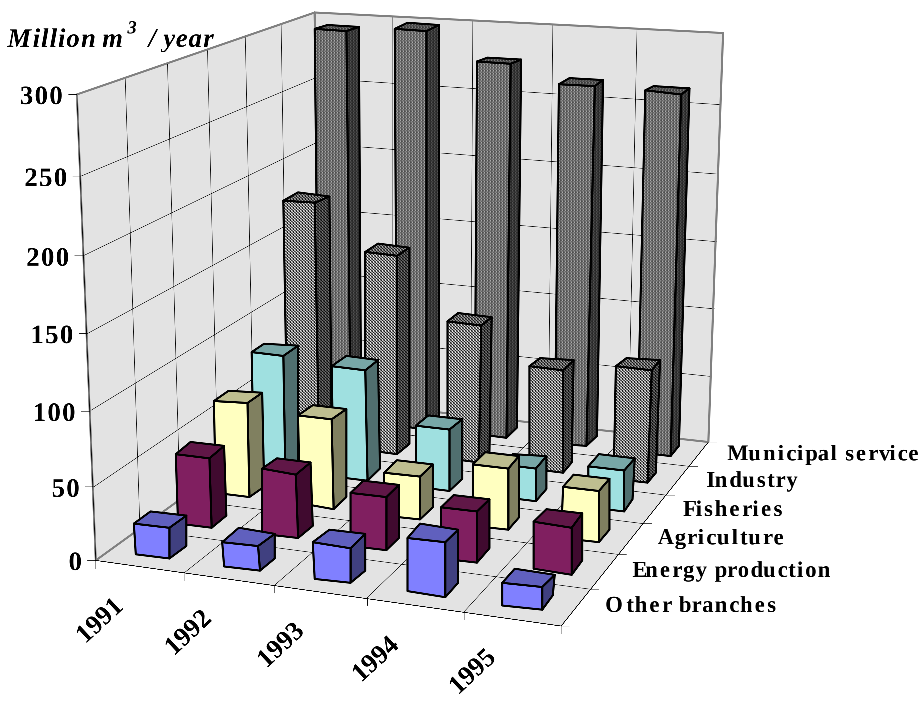
Source: Indicators of Environmental Protection of Latvia 1997, Central Statistical Bureau of Latvia, Riga 1998.

The National Environmental Policy Plan sets the improvement of drinking-water treatment as a priority goal, as the quality of water sampled from water supply systems is questionable (See Chapter 12, Figure 12.2). Measures to improve and modernize the water supply systems and optimize water tariffs are seen as necessary.

Waste water discharges and treatment

In 1997, about 327 million m^3 of waste water from registered point sources were discharged into Latvia's bodies of water. 60 per cent was treated, but of this amount 61 per cent only partially. The municipalities discharged the most waste water:

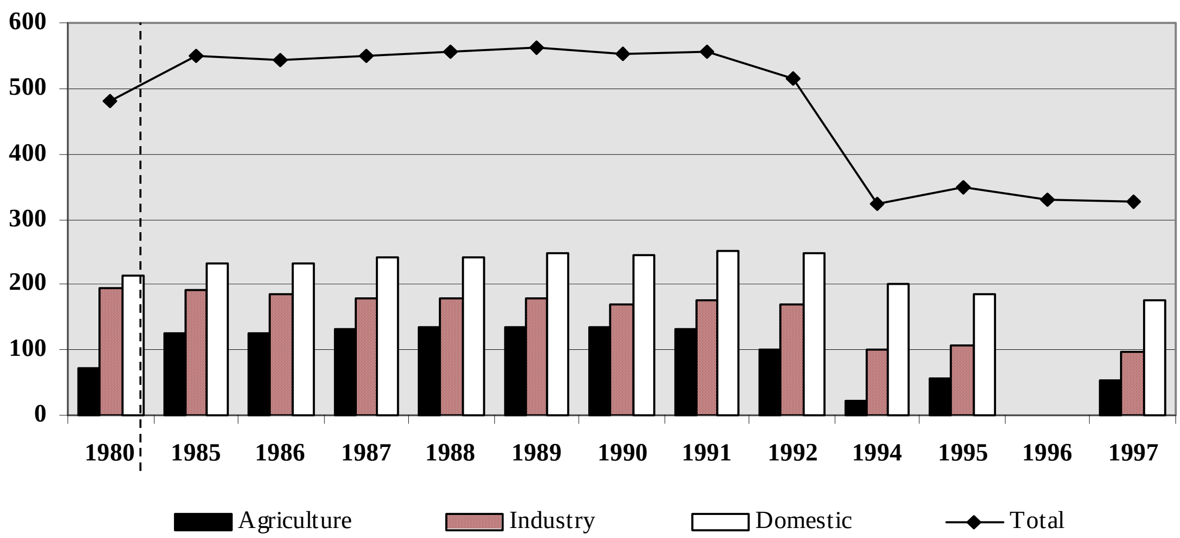
Figure 7.4: Changes in water abstraction by sectors in Latvia



Source: Environmental Data Centre.

Figure 7.5: Generation of wastewater, 1980-1997

Million m^3 per year



Sources: Indicators of Environmental Protection of Latvia 1997, Central Statistical Bureau of Latvia, Riga 1998.

177 million m^3, of which 74 per cent partly treated and 26 per cent untreated, half of the latter being relatively clean discharges. Sewer systems in large towns collect waste water from households (communal) and small industry. The second largest producer of waste water is industry: 98 million m^3, of which 56 per cent is treated, about 1 per cent untreated, and the rest relatively clean water (cooling water, rain water, etc). Agriculture is third with 52 million m^3.

Since the early 90s, the generation and discharge of waste water have fallen significantly, mainly due to the economic recession (Figure 7.4). Waste-water discharges fell by 41 per cent between 1990 and 1997. The proportion of untreated waste water also dropped, because the capacity of the facilities was no longer exceeded. In 1997, the 603 physical treatment units were operating at 34% of their capacity; the 981 biological treatment facilities at 49% of their capacity and the 8 chemical treatment plants at less than 10% of their nominal capacity.

In the early nineties, most of the treatment plants already existed but were overloaded or in poor condition. Due to the drop in pollution load and waste-water volume, 1995 experienced decreases of 70 per cent in biodegradable substances, of 54 per cent in nitrogen compounds and of 40 per cent in phosphorous compounds. Within the framework of the Convention on the Protection of the Baltic Sea and its Strategic Implementation Programme, pollution hot spots along Latvia's rivers and coastline were identified. The most important were Riga, Daugavspill and Liepaja, where existing waste-water treatment plants were upgraded. To solve the problem of the numerous small and medium-sized municipalities (about 800) where treatment performances were insufficient, the so-called '800+' programme was launched with EU help. Seven facilities are already finished, 20 are being built and 45 are on the drawing board. Today, about 40 per cent of secondary treatment plants still fail to comply with Latvia's BOD standard and EU discharge requirements, but Latvia is devoting much effort to this issue and progress is swift.

7.3 Water policy objectives and management practices

Priorities for water policy

The Latvian National Environmental Policy Plan (NEPP) lists 10 priority problems. Among them are transboundary water pollution, the eutrophication of watercourses, the degradation of water systems and the poor quality of drinking water. A long list of specific measures is given to solve these problems. At present, as resources are limited, the most vigorous efforts are focusing on reducing the pollution burden from municipalities, which include both households and small industries. A series of measures has been specifically developed to: (i) improve household waste-water treatment and water management technologies, and the technical condition and operation of the sewerage network; (ii) construct new waste-water treatment facilities and expand the sewerage system. Other measures listed in the NEPP will become priorities as soon as resources become available. For all other issues, the EU approximation process sets the pace and the agenda.

Another priority at the moment is the possible setting-up and implementation of water management according to catchment area. Eight big catchment areas cover Latvia's territory. The MEPRD is raising awareness among the local authorities. It is insisting on the necessity of an integrated approach at the catchment area level by the various stakeholders.

The quality of drinking water is also a priority problem in NEPP, in particular for groundwaters with a high iron content.

Legislation

Latvia's environmental law includes two aspects of water protection: extraction and other forms of water use, and protection against pollution. Both issues are regulated in the Water Law of 1972 and subordinated legislation. The function of the 1973 Water Law in the environmental legal system is limited. The Law is complemented by the Natural Resources Tax Law, which provides tools for water taxation. The 1997 Regulations subordinated to this latter Law apply to both water pollution and water extraction. Most important, in practice, are the 1997 Water Use Permit Regulations. They link the permit to both laws in terms of quality and taxation, thereby rendering the adoption of a new law on water less urgent, bearing in mind that a modern law on water will in any case be needed when the IPPC directive is on the agenda.

Property rights to water resources, including water use, are regulated by the Civil Law of 1937. According to this Law, the sea and some specified lakes and rivers are public waters (State property). All other inland waters are in principle private, except if there is no private ownership. However, reserves and restricted areas may be established for certain needs. There is a special procedure for the exploitation of reservoirs and lakes, which is determined in each case.

The Civil Law states that everybody has the right to use water for household needs if it does not harm public interests and does not violate the landowner's rights. Other provisions concern fishing rights in public and private waters.

Moreover, the Civil Law regulates the situation where several landowners depend on the same river.

The Water Law of 1973 applies to all groundwaters and surface waters, including rivers and reservoirs. The Water Law contains certain substantial requirements for water use, water protection, prevention and discharge of harmful water, etc. Water has to be used in a rational way. The Water Law requires a permit for certain uses. In practice, however, the permit requirements are determined by the Regulations on Water Use of 1997. Their goal is to efficiently manage water resources.

The Water Law, which also aims at improving water quality, contains basic and somewhat vague provisions against pollution. The Law does not explicitly cover non-point sources and diffuse pollution.

The above-mentioned water permit covers not only the use but also the pollution of water. The Water Use Permit Regulations focus on the limits on discharges, thus aiming at preventing pollution at the source. The types of activities that need a permit for polluting water are not clearly defined. It can be concluded from the legal context, however, that permits are needed for stationary sources that discharge water, while mobile sources (e.g. ships) and non-point agricultural sources are not included. If waste water is discharged into a municipal sewage treatment plant, the Water Use Permit Regulations do not require a permit. Instead, the developer has to enter into an agreement with the sewage treatment facility. The municipality sets limits and collects fees as agreed (substituting the natural resources tax) (see also Chapter 3).

The 1997 Regulations specify detailed requirements concerning the information that has to be included in the permit application, e.g. the waste-water treatment facility, the source and quantity of waste water, the technological processes, etc. The permits are issued by the Regional Boards. The application is, however, first submitted to the municipality where the facility will be located, and the municipality is involved in the further procedure.

The Regional Boards consider different factors when deciding on the limits:

- Conclusions by the Environmental Expertise Division of the REB,
- Technical condition of the equipment and possibilities for improving it without making large capital investments,
- Conditions of the receiving water body and its self-purifying ability,
- Maximum permissible concentration regulations for waste water (emission standards),
- Performance of water purification at similar waste-water treatment facilities,
- Waste-water purification strategy of small towns in Latvia,
- Quality objectives for surface water according to HELCOM recommendations and EU directives,
- The applicant's current respect for specific requirements and norms and completion of steps provided in a project proposal (plan for environmental improvements).

Pollution and disposal of waste from ships at sea are regulated in the Maritime Code of 1994. In principle, the Code prohibits discharges of waste and other substances at sea, but special discharge permits may be issued by the MEPRD. The Code also determines a procedure to be followed in emergencies and regulates issues of civil liability of nuclear shipping operators and civil liability for the transport of nuclear materials by sea.

The water quality *standards* that were adopted during the Soviet period were quite strict. Standards were set for sub-surface and surface waters, and they applied to sea and inland waters. The inland water standards differentiated between lakes and rivers, reservoirs, watermill lakes, small hydroelectric lakes and drinking water. Certain new "water quality objectives" have been drafted according to the HELCOM recommendations and the different EU directives on water quality (fresh water – fishing waters, bathing waters, water for human consumption, drinking surface waters). The Cabinet adopted these standards in 1997. All Soviet standards will be revoked in January 1999. However, in practice, MEPRD has applied HELCOM water requirements since the early 90s.

The Water Use Permit Regulations also define "emission standards" as "maximum permissible concentrations for waste water". *Inter alia*, they determine the type of use, quantity, and dates of water use, precautions, limits on its use and other restrictions. For new facilities, the emission standards and above-mentioned quality standards are immediately binding. For old plants, a more flexible approach is adopted. In general, a plan for reaching compliance is set up, taking into account several criteria and fixing a time frame for implementation.

Institutions

Many ministries are involved in water management and share various tasks (see Table 7.6). Water protection and planning of water protection falls within the responsibility of MEPRD. According to the Law on Local Authorities (1994), the local municipalities are responsible for water supply and waste-water treatment.

Drinking water quality is the responsibility of the Ministry of Welfare. Its Environmental Health Centre monitors drinking water quality (see Chapter 12).

The Marine Administration, a State institution subordinated to the Ministry of Transport, is responsible for operations in the event of pollution from ships. Any inspector authorized by MEPRD and the Marine Administration has the right to control a ship's oil pollution certificate, which is issued according to international requirements.

Instruments currently in force

Monitoring

In February 1998, MEPRD accepted the Latvian Surface Water Monitoring Programme. Two other monitoring programmes, on groundwater and on marine water, are also being drawn up. These programmes are long-term strategic documents, which will ensure an optimal implementation of the water monitoring system, and good coordination between the numerous organisms involved.

There are monitoring stations for recording the quality of waters in Latvia. They monitor inland, coastal and marine waters. Monitoring is also done at certain major discharge points. The Water Quality Monitoring and Management System samples, analyses, evaluates, forecasts and presents water quality data.

Water quality monitoring of the bigger rivers is mainly based on chemical parameters and is carried out by the *Environmental Pollution Observation Centre* (EPOC) of the Hydrometeorological Agency. The evaluation of hydrochemical water quality of the lower parts of the rivers is based on the monitoring programme at the «*HELCOM*» points: Carnicava (Gauja), Salacgriva (Salaca), Lipsi (Daugava), Kalnciems (Lielupe) and Vendzava (Venta). There are a few more HELCOM points (on Irbe, Saka and Barta rivers). In the past two years, the Environmental Data Centre has conducted biological surveys on several smaller rivers. The water quality in lakes is monitored spot-wise by the Hydrometeorological Agency and the Institute of Biology (University of Riga). There is no comprehensive lake monitoring programme.

The quality of groundwater is monitored by the State Geology Service. When water is used for drinking water purposes, its quality is monitored by the State Department of Environment and Health. There is no programme to monitor the quality of individual wells in rural areas, which represent few users.

The marine ecosystem in the Gulf of Riga has been monitored since the mid-60s, first by the *Baltic Scientific and Research Institute for Fishery* and later by the *Sea Monitoring Centre* of the Hydrometeorological Board. At present, it is monitored by the *Sea Monitoring Department* (Institute of Hydro-Ecology, University of Riga). The information concerning nutrient and phytoplankton concentrations is inadequate, because there are not enough sampling points (3 in winter, 12 in summer) and sampling frequency is too low (twice a year).

Enforcement and economic instruments

The Environmental Protection Inspectorate monitors water pollution on the regional level. The Environmental Protection Law gives certain powers to the Inspectorate, e.g. to carry out inspections. In practice, control is often facilitated because the polluter reports emissions to the Inspectorate.

When permit limits are violated, the Natural Resources Tax provides the most important sanctions. Water pollutants are taxed according to their toxicity and discharged quantities. The basic charge rates are indicated in Table 3.3 of Chapter 3. The rates rose in 1996-1997. If the permit limits are exceeded (extraction and pollution rates), an extra tax is imposed, in addition to the basic tax specified in the Natural Resources Law (see Chapter 3). The extra tax is three times the basic tax. This legal environmental sanction is in practice the most important for extracting and polluting activities. Other possibilities are administrative fines, permit withdrawal, closing of the facility and criminal sanctions. In addition, criminal and administrative liability applies to cases where limits are exceeded, or water pollution is caused.

Expenditures

Expenditures for water protection surpassed by far environmental expenditures on other issues. Since 1991, they have regularly consumed more than 80 per cent of total environmental expenditures (for details see Table 3.6, Chapter 3). In 1997, 40 per cent of the expenditures of the Latvian Environmental Protection Fund (LEPF) were spent on water protection, and 74 per cent of the Latvian Environmental Investment Fund (LEIF) will be spent on investment in water management in 1998. Lll figures corroborate the priority currently given to the water sector. Investments in the water sector have also increased since 1995, as shown in Figure 7.4.
There are two technical assistance projects in the water sector: a Swedish project "The Latvian Approach to the Water Resources Framework Directive" and the Danish EPA assistance to MEPRD "Approximation of Legislation and Regulations in the Water Sector".

7.4 Conclusions and recommendations

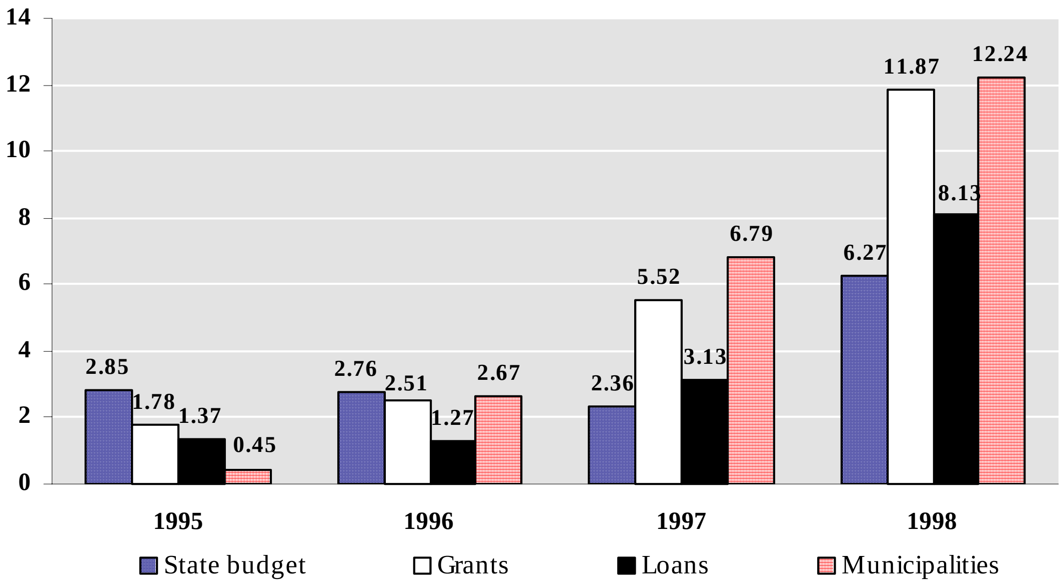
Overall, Latvia is endowed with high-quality waters. Latvia is rich in reserves of potable groundwater. Except for individual localities, it is possible to ensure water supply from groundwater of acceptable quality almost anywhere. Problems of quality arise only from increased iron and reduced fluoride contents, and often from excessive hardness. While insufficient in number, iron removal facilities exist, but are not optimized. At least, an effort to make them operational is necessary.

Water quality is also considered to be *good* or *fair* in most rivers (80 per cent). The level of nutrients in the big lakes around Riga, in previous decades subject to serious eutrophication, is believed to have fallen off since the 80s. This assumption would have to be validated through a comprehensive lake monitoring programme, which does not exist up to now. Nevertheless, some big towns are still supplied with surface water from big rivers. This is the case of Daugavpils, Ventspils and Olaine, which will switch to groundwater supply. Riga still relies mostly on surface waters. Therefore, the amount of polluting water discharged into rivers should be reduced and safety measures, such as early warning schemes, should be put in place.

Another concern is the marine water quality in the Gulf of Riga. Despite the 90 per cent reduction in mineral fertilizer application since the early 90s, the trend analysis (1987-1995) of nitrogen and phosphorus loads does not show a general decrease in nutrients brought by the seven biggest rivers.

Figure 7.6: Investments in water sector by sources, 1995-1998

Million ECU



Source: Environmental Investment Programmes in Latvia, MEPRD, 1998.

Table 7.6: Water (responsibilities) in Latvia

MEPRD Carries out national policies for water protection and rational water use	**Ministry of Agriculture** Implements State policy for agriculture, forestry and fishery	**Ministry of Welfare** Responsible for public health and occupational health and safety issues	**Ministry of the Economy** Responsible for energy issues	**Ministry of Transport** Carries out activities connected with the transport of hazardous goods by rail, road and sea
State Environmental Inspectorate: Supervises environmental State inspectors of REPB; controls and supervises the implementation of environmental legal acts	*Regional Agricultural Department (26):* Evaluates plans for agricultural land reform	*National Environmental Health Centre:* Controls drinking quality	*Energy Supply Board:* Providing of energy supply (HES)	***Marine Administration:*** Issues permits for transport by sea and controls pollution of the sea.
Regional Environmental Protection Boards (8): Control and supervise use of water, issue water use permits	*State Plans Protection Inspection:* Controls pesticide use	*State Sanitary Inspection:* Determines use of waste-water sludges		*Port Administration:* Controls pollution of port territory
State Environmental Impact Assessment Board: Evaluates the level of environmental hazard posed (not only pollution but also e.g. physical damage to nature) by an economic activity and the environmental conditions at a particular site, and makes proposals for improving environmental quality	*State Board of Land Improvement Systems:* Controls land improvement systems.			----------------------------------- ***Ministry of the Interior:*** Responsibilities are fire safety, rescue work and civil defence.
Marine Environmental Protection Board: Controls inland water, territorial sea waters, continental shelf, Latvia's economic zone and port authorities				*Civil Defence Centre:* Responsible for emergency planning, information to the population in case of accident, etc.
Geological Service: Management of groundwater (subsoil).				
Hydrometeorological Agency: Monitors environmental quality				
Environmental Consulting and Monitoring Centre: Establishes environmental monitoring and compiles and disseminates environmental information				
Environmental Data Centre: Data collection and processing, methodological oversight of laboratories				

The responsibility is not to be put entirely on Latvia; most of its rivers originate in neighbouring countries and bring with them a noticeable pollution load. As mentioned in Chapter 5, Latvia strives to establish bilateral and multilateral agreements with bordering countries to tackle this problem. Nevertheless, eutrophication of the Gulf of Riga is still a threat and would have serious repercussions.

Latvia is aware of its responsibilities for taking concrete action to cut the pollution of surface water and is striving to reduce its pollution load. Under HELCOM, the Baltic Sea Joint Comprehensive Environmental Action Programme encourages countries to focus on and combat especially point pollution. The measures aim at discharges from industrial plants and waste-water treatment units, encouraging first a precise description of the pollution generated. It seems that in Latvia, in spite of the obligations laid down in the permits, the monitoring of pollution by polluters is still weak. A particular effort should be made in this respect.

Recommendation 7.1:
The regulation included in the water permit that requires effluent monitoring by polluters should be enforced more strictly.

The NEPP insists on the importance of protecting water quality. The bulk of the environmental expenditures is devoted to improving the functioning of municipal waste-water treatment units, to upgrading them or to building new ones. This is clearly a goal that should be further encouraged. Due to the limited funds available, the country should carefully select the sites where the cost-effectiveness of investment is optimal. Improved emission monitoring, as advised above, would be particularly helpful to steer these choices.

Recommendation 7.2:
The allocation of available funds to the upgrading of existing and the construction of new waste-water treatment facilities which clearly improve treatment efficiency should be maintained and pursued as a top priority. Balancing the need for substantial funds for these purposes on the one hand and their scarcity on the other will make it necessary to rely on a phased approach to the full implementation of relevant EU legislation in all cases.

Considering the important effort and resources spent on upgrading and renovating the water infrastructure in this period of economic recovery and tight budgets, it would be good to know the exact cost of supplying drinking water to the population and of collecting and treating waste water. It would be a good guide for a national water tariff policy. Such a policy could help finance required investments into water supply installations.

Recommendation 7.3:
To assess the full costs of water abstraction and supply, waste-water collection and discharge, it is important to formulate a national water tariff policy.

It would be useful to select, in particular in a longer-term perspective, the water management practices that best fit the Latvian context. Increased research funds should be allocated to the evaluation of water management practices as well as the formulation of alternative options. At the moment, the organizational units that decide on the strategies and plans are not the same as those that decide on investments regarding water management infrastructure. It would be preferable to integrate the decisions by the different units of the MEPRD that are involved in the procedure and strive to ensure that investment programmes are decided fully in line with strategies and plans. In addition, local decision-making would certainly be more efficient if the local players were more involved. A decentralized decision-making structure by catchment area would be advisable.

Recommendation 7.4:
The Ministry of Environmental Protection and Regional Development should play an active role in the decision regarding water investment programmes. The creation of a regional level of management administration - water catchment basins and agencies - to improve water management at the regional level should be seriously considered.

Another problem worth mentioning is the lack of co-operation between administrative structures and institutions responsible for or involved in water management (see Figure 3.1). Existing legal acts do not clearly attribute responsibilities and duties to the different State institutions. There is no co-operation between State institutions and the local authorities, the State institutions having in general the monopoly in decision-making. Moreover, often monitoring is redundant in some places or insufficient in others, data collection and processing are weak, and access to data is difficult. All these drawbacks can be overcome through better coordination between the various partners.

<u>*Recommendation 7.5:*</u>
An interministerial working committee for water management should be created to better coordinate actions and balance different interests in water management. The Ministry of Environmental Protection and Regional Development and Ministries of Health, of Agriculture, of Transport, of the Economy and of the Interior should be involved.