1 EVALUATION OF CONSEQUENCIES FOR IMPLEMENTATION OF THE EU DIRECTIVE 98/83/EC ON THE QUALITY OF WATER INTENDED FOR HUMAN CONSUMPTION

1.1 SUMMARY OR THE REPORT

1.1.1 Introduction

The revised EU Directive (98/83/EC) of 3 November 1998 on the quality of water intended for human consumption will in 5 years replace the Drinking Water Directive 80/778/EEC of 15 July 1980.

The objective of the Directive on the quality of water intended for human consumption is 'to protect human health from the adverse effects of any contamination' of public drinking water supplies 'by ensuring that it is wholesome and clean' (*Article 1*). The Directive includes standards for microbiological, chemical (tables 1 and 2) and some physical parameters and sets out monitoring requirements and performance characteristics for methods of analysis. It also prescribes necessary actions in cases of non-compliance, including provisions for allowing derogation, as well as requirements for provision of information and advice to consumers.

The Directive applies to public supplies and water from private supplies sold on to consumers, including water sold in containers, and water used for the production of food for human consumption. It does not cover private supplies for consumers' own consumption (less than 10 m^3 per day, less than 50 people); these should be subject to separate arrangements.

Table 1-1. Part A. Microbiological parameters

Parameter	**Parametric value (number/ 100 ml)**
Escherichia coli (e-coli)	0
Enterocoocci	0
The following applies to water offred for sale in bottles or containers	
Escherichia coli (e-coli)	0/250 ml
Enterocoocci	0/250 ml
Pseudonomas aeruginosa	0/250 ml
Colony count 22^{o}C	100/ml
Colony count 37^{o}C	20/ml

Table 1-2. Part B. Chemical parameters

Parameter	Parametric value	Unit
Acrylamide	0,10	µg/l
Antimony	5,0	µg/l
Arsenic	10	µg/l
Benzene	1,0	µg/l
Benzo(a)pyrene	0,010	µg/l
Boron	1,0	Mg/l
Bromate	10	µg/l
Cadmium	5,0	µg/l
Chromium	50	µg/l
Copper	2,0	Mg/l
Cyanide	50	µg/l
1,2-dichloroethane	3,0	µg/l
Epichlorohydrin	0,10	µg/l
Fluoride	1,5	Mg/l
Lead	10	µg/l
Mercury	1,0	µg/l
Nickel	20	µg/l
Nitrate	50	Mg/l
Nitrite	0,50	Mg/l
Pesticides	0,10	µg/l
Pesticides- total	0,5	µg/l
Polycyclic aromatic hydrocarbons	0,10	µg/l
Selenium	10	µg/l
Tetrachloroethene and trichloroethene	10	µg/l
Trihalomethanes – total	10	µg/l
Vinyl chloride	0,5	µg/l

There are approximately 1.330 individual supplies of drinking water >10 m^3/day or serving >50 persons, and 80 larger drinking water supplies serving > 1.000 m^3/day or serving > 5.000 persons. A set of standards fully in compliance with the Directive has been introduced via Hygiene Norms HN 24:1998 and are also provided by the Drinking Water Law.

1.1.2 Existing institutional structure for the implementation of the Directive

The Ministry of Environment is the main institution responsible for management of water resources in Lithuania. Several other organisations responsible to the Ministry are also involved in water management:

- Joint Research Centre (JRC) coordinates surface water monitoring, collects information from the Regional Environmental Departments on drinking water use.
- Geological Survey of Lithuania is responsible for groundwater monitoring and maintenance of national database.

- Water Resources Department is responsible for integrated water management according to river basins.
- Eight regional departments of the Ministry of Environment issue permits for water use, control industries and do environmental impact assessment in the administrative districts.
- The supply of drinking water in Lithuania is provided by the municipalities, which are in most cases the owners of the water supply companies. Municipalities are also responsible for the extraction, delivery, treatment and monitoring of drinking water, and for the provision of information on drinking water quality to the public.
- The State Food Inspection is given responsibility for enforcement tasks of Drinking water law and quality regulations.

1.1.3 Review of drinking water quality in Lithuania

Information on drinking water quality was collected from the municipalities, Geological Survey and National Nutrition Centre. Municipalities provided information on drinking water quality from 765 well fields and separate wells and from 505 monitoring stations at consumer taps. The information on groundwater quality in the aquifers collected by the Geological Survey consisted of more that 7000 analyses. Data on fluoride concentrations was provided by the Ministry of Health together with the Geological Survey.

Data on the drinking water quality received was analysed and compared to the Lithuanian Hygiene Norm. Namely, data for each municipality, each city, town and village was collected. General numbers were known before, which said that approximately 60 per cent of drinking water did not meet Hygiene standard for iron, 43 per cent – standard for manganese.

The recent study showed that the following parameters of water quality do not meet requirements of hygienic regulations:

Table 1-3 Chemical and indicator parameters exceeding requirements of Hygiene Norm in the aquifers

Parameters	Analite	Allowable amount HN (directive)	Number of incompliance	Concentration from-to
Chemical	Nitrate, mg/l	50,0 (50,0)		
	Nitrite, mg/l	0,1 (0,5)	17	0,55 - 24
	Fluoride, mg/l	1,5 (1,5)	223	1,5 – 6,0
Indicator	Aluminum, mg/l	0,5 (0,2)	2	8.8-12.3
	Amonia, mg/l	2,0 (0,5)	21	2,02 – 22,5
	Chloride, mg/l	350,0 (250,0)	5	360- 494,4
	Iron, mg/l	1,0 (0,2)	374	iki 4
	Manganese, mg/l	0,2 (0,05)	8	0,32 – 37,7
	Perm. index, mgO_2/l	6,5 (5,0)	15	6,56 – 17,2
	Sulphate, mg/l	450,0 (250,0)	5	450 - 700

Only few chemical elements (fluoride and nitrogen compounds) exceed Hygiene norm requirements. Among indicator parameters iron, ammonia, manganese and permanganate index should be mentioned. Other water quality indices (aluminum, chloride, sulphate) seldom reach allowable limits. Elevated concentrations of fluoride were detected in 223 wells and well fields.

1.1.4 Fluoride in groundwater

In a recent study (1999) carried by the Geological Survey of Lithuania and the Ministry of Health the fluoride concentrations in groundwater (primary source of drinking water in Lithuania) in the North-West region of Lithuania were investigated. The study determined that there were fluoride concentrations in excess of the value stipulated in the revised EU Drinking Water Directive (98/83/EC), i.e. ≥1.5mg/l. According to the Study, fluoridic water affects a total of 90 112 (2.4% of the total Lithuanian population). Formally speaking, cost of fluoride abatement in drinking water is not a direct consequence of the directive but rather non-compliance with national drinking water standards. EU accession, however, establishes more strict requirements on water intended for human consumption.
The inhabitants of north-west Lithuania using potable water with elevated fluoride concentrations can be broken down into:

- 22 524 persons in the countryside.
- 67 588 persons in towns and cities.

The range of fluoride concentrations in North West Lithuania varied from well to well. 2122 wells were sampled and ~10% (223 wells) recorded levels greater than 1.5mg/l. The highest reported fluoride concentration was found to be 6.54mg/l.
Cost assessment of suitable fluoride abatement technologies have been performed.

Table 1-4: Cost assessment analysis

Options	Investments (LTL)	Operational cost (LTL)	Present Value litas) 30 years @8%
For the countryside			
Dilution	5 400 000	270 000	**8 500 000**
Alumina adsorption	2 800 000	420 000	**7 600 000**
Nalgonda process	132 000 000	36 000	132 000 000
Home defluoridation	5 000 000	250 000	7 900 000
Bottled drinking water		164 000 000	1 900 000 000
For the towns			
Alumina adsorption	7 000 000	1 050 000	**19 000 000**
Nalgonda process	41 000 000	110 000	42 000 000
Home defluoridation	14 800 000	7 400 000	99 000 000
Bottled drinking water		494 000 000	8 600 000 000

Based on the available information and data, it was found that the most cost-effective fluoride abatement technologies are:

1. **For the countryside:** from the available data alumina adsorption appears to be the most cost effective defluoridation technique. However, due to limitations in the data, dilution must also be considered as a viable option (less than 900 000 litas difference over a 30-year period). Only until a detailed feasibility study has been undertaken can the most cost effective technique be deduced.
2. **For towns:** alumina adsorption appears to be the most cost effective technique.

Two main human diseases may occur using drinking water with high fluoride concentrations: dental and sceletal fluorosis.
Dental fluorosis, which is characterised by discoloured, blackened, mottled or chalky white teeth, is a clear indication of over exposure to fluoride during childhood when the teeth were developing. These effects are not apparent if the teeth were already fully grown prior to fluoride overexposure.
Chronic intake of excessive fluoride can lead to severe and permanent bone and joint deformations of skeletal fluorosis. Early symptoms include sporadic pain and stiffness of the joints; headache, stomach ache and muscle weakness can also be warning signs. The next stage is osteosclerosis (hardening and calcifying of the bones) and finally the spine, major joints and nervous system are damaged.
Dental or skeletal fluorosis is irreversible and no treatment exists, the only remedy is prevention by keeping fluoride limits within safe limits.
Appropriate measures have to be taken for mitigation of fluoride concentrations in drinking water before Lithuania joins a family of EU countries.

1.1.5 Iron removal

According to information received courtesy of the Water Suppliers Association the total amount of required iron removal capacity equals to approximately 174000 m3/d and investments needed for construction of de-ironing plants comprises 92 million LTL.

1.1.6 Cost assessment for the implementation of the directive

Total investments needed for fluoride and iron removal from the drinking water equal to 101,8 million LTL. Part of this investment related to fluoride abatement technologies should be implemented before 2004, the rest part related to construction of iron removal plants can be distributed along the longer period. The tables 14.5 and 14.6 show investment distribution for construction of fluoride abatement (period of 2 years) and iron removal plants (period of 15 years) and impact of these investments on inhabitants of Lithuania.

1-5 table. Additional monthly cost per person for the improved drinking water quality

	Fluoride abatement	Iron removal
Number of affected people	90 000	800 000
Additional monthly cost per person before the loan paid back starts (LTL/month)	0,83	0,84
Additional monthly cost per person after the loan paid back starts (LTL/month)	1,04	1,50
Part in the mean household income, per person per month*, %	0,2	0,35

Mean monthly household income of person per month is – 428 LTL (1999).
At present the avarage drinking water tariffs in Lithuania raech 3,3 LTL/per person per month. Construction and installation of fluoride abatement facilities will increase water tariffs by one third (about 1 LTL) and construction of de-ironing plants will add 10 per cent more. Although in general this figure is not large, it could be a big burden for low income people. Therefore the system of differentiation (subsides) of tariffs for inhabitants with high and low income should be established.

About one million of Lithuanian citizens will benefit from the implementation of the Directive.