Report on development of adaptive strategies for the Baltic States

Focus on Latvia

TECHNEAU

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Executive Summary

Introduction
The aim of the Work Area 1 in the TECHNEAU project is to consider the capability of present water systems to cope with ongoing and future challenges. It is assumed that actual challenges and adaptive strategies will vary between countries and regions.
This report on trends in the Baltic countries focuses on the specific situation in the three countries regions where the water quality is not sufficient to easily cover the demand for clean drinking water at any time and place. This report describes the main strategies for the Baltic drinking water supply systems development for the time period of 2010-2030. Seven local factors were identified and compared against the ten global factors, identified by the TECHNEAU WA1.

Importance
A comprehensive evaluation of the present and future trends in the Baltic countries was made, taking in the account political, demographic and economical factors.

Approach
In order to make suitable projections, it was necessary to start with a mapping of the present situation. Another focus of the activities was on the future projections of the present situation and the identification of driving forces, factors which are leading to changes. The information on current situation and trends is primarily based on available reports and literature.
Data material for this report was derived from Latvian Ministry of Environment, Estonian Ministry of Environment, Eurostat, other national and regional institutions and environmental agencies as well as water suppliers. Future trends and estimations have been derived from scenarios expressed by regional, national or supranational organisations.
Furthermore questionnaires were sent out to acquire expert opinions.

Result
Providing good quality drinking water whilst a decrease in economic conditions is occurring is a challenging task. Advanced technologies can support this undertaking but pose the financial burden to the water supplier exclusively and consequently might increase water prices which the consumer might not be willing to support. A better source protection and integrated water management approaches, including infrastructure improvements, are indispensable to produce more sustainable solutions.
Financing becomes more and more a limiting factor for realising appropriate solutions and adaptive strategies.

More information
The basic information is laid down in the report on trends in Baltic countries (Deliverable 1.1.3.)

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TECHNEAU Knowledge Integrator (TKI) categorisation
Categorisation of Knowledge Packages

Categorisation (i.e. classification, contains and constraints) of knowledge packages (KPs) can be carried out by 'checking' the appropriate boxes in the tables (see attachment). For example, for a KP investigating point-of-use treatment suitable for a developing world country, the following might be checked:

Classification: Process chain – Tap (Customer) – Point-of-use (POU).
Contains: Report; Literature review.
Constraints: Low cost; Simple technology; No/low skill requirement; No/low energy requirement; No/low chemical requirement; No/low sludge production; Developing world location.

Note that only the lowest level classification needs to be checked, e.g. Point-of-use (POU) in the above example.

Meta data can be included under the 'More Information' section of the Executive Summary Report, i.e. Author(s), Organisation(s), Contact details (name and email), Quality controller (name and organisation) and Date prepared. (The TKI administrator can enter Source (= TECHNEAU), Date submitted (TKI) and Date revised (TKI)).

TKI Categorisation

Classification											
Supply Chain		**Process Chain**		**Process Chain (cont'd)**		**Water Quality**		**Water Quantity (cont'd)**			
Source		**Raw water storage**		**Sludge treatment**		**Legislation/regulation**		- Leakage			
- Catchment		- Supply reservoir		- Settlement		- Raw water (source)		- Recycle			
- Groundwater		- Bankside storage		- Thickening		- Treated water					
- Surface water		**Pretreatment**		- Dewatering		**Chemical**					
- Spring water		- Screening		- Disposal		- Organic compounds					
- Storm water		- Microstraining		**Chemical dosing**		- Inorganic compounds					
- Brackish/seawater		**Primary treatment**		- pH adjustment		- Disinfection by-products					
- Wastewater		- Sedimentation		- Coagulant		- Corrosion					
Raw water storage		- Rapid filtration		- Polyelectrolyte		- Scaling					
- Supply reservoir		- Slow sand filtration		- Disinfectant		- Chlorine decay					
- Bankside storage		- Bank filtration		- Lead/plumbosolvency		**Microbiological**					
Water treatment		- Dune infiltration		**Control/instrumentation**		- Viruses		**Consumers / Risk**			
- Pretreatment		**Secondary treatment**		- Flow		- Parasites					
- Primary treatment		- Coagulation/flocculation		- Pressure		- Bacteria		**Trust**			
- Secondary treatment		- Sedimentation		- pH		- Fungi		- In water safety/quality			
- Sludge treatment		- Filtration		- Chlorine		**Aesthetic**		- In security of supply			
Treated water		- Dissolved air		- Dosing		- Hardness / alkalinity		- In suppliers			

storage		flotation(DAF)							
- Service reservoir		- Ion exchange		- Telemetry		- pH		- In regulations and regulators	
Distribution		- Membrane treatment		**Analysis**		- Turbidity		**Willingness-to-pay/acceptance**	
- Pumps		- Adsorption		- Chemical		- Colour		- For safety	
- Supply pipe / main		- Disinfection		- Microbiological		- Taste		- For improved taste/odour	
Tap (Customer)		- Dechlorination		- Physical		- Odour		- For infrastructure	
- Supply (service) pipe		**Treated water storage**						- For security of supply	
- Internal plumbing		- Service reservoir				**Water Quantity**		**Risk Communication**	
- Internal storage		**Distribution**						- Communication strategies	
		- Disinfection				**Source**		- Potential pitfalls	
		- Lead/plumbosolvency				- Source management		- Proven techniques	
		- Manganese control				- Alternative source(s)			
		- Biofilm control				**Management**			
		Tap (Customer)				- Water balance			
		- Point-of-entry (POE)				- Demand/supply trend(s)	x		
		- Point-of-use (POU)				- Demand reduction			

TKI Categorisation (continued)

Contains		**Constraints**		**Meta data**					

Report	x	Low cost		*Author(s)*		Janis Sprogis, Simona Larsson, Talis Juhna			
Database		Simple technology		*Organisation(s)*		RTU			
Spreadsheet		No/low skill requirement		*Contact name*		Talis Juhna			
Model		No/low energy requirement		*Contact email*		Talis.Juhna@rtu.lv			
Research		No/low chemical requirement		*Quality controller name*					
Literature review	x	No/low sludge production		*Quality controller organisation*					
Trend analysis	x	Rural location		Source					
Case study / demonstration		Developing world location		*Date prepared*					
Financial / organisational				Date submitted (TKI)		15.03.2009			
Methodology				Date revised (TKI)					
Legislation / regulation									
Benchmarking									

Summary

This report describes the main strategies for the Baltic (Estonia, Latvia, Lithuania) drinking water supply systems development for the time period of 2010-2030. The strategies have been developed based on the present trends of the development of the water supply systems in the Baltic region, in Europe and in the other regions within the TECHNEAU project. The trends have been described within the TECHNEAU project reports.

- A particular attention was paid to the development of those strategical measures which could promote the development of the Top Seven Trends in the Baltic countries and the Ten Major Trends (the most important global trends).

Previous studies in TECHNEAU project involved analyses of the SEPTED (Social Economical Political Technological Ethnical Demographical) dimensions in various representative regions led to the identification of region specific trends in several countries including the Baltic States. These regional trend studies were subsequently analyzed to highlight their common conclusions. Ten globally relevant trends were thus defined, namely climate change, urbanization/demographic changes, emerging technologies, ageing infrastructure, globalization, consumer involvement, emerging pollutants, energy, the efficiency driven water sector and more bottled water. Further the adaptive strategies for coping with these trends were developed. The strategies have been selected according to the regional economic development forecast. The socioeconomic activities are the most important factor for the development as it determines the trends and the proactive strategies for the drinking water supply sector. The decrease in the production volume, unemployment, the difficulties of paying back the loans and mortgage, the difficulties of selling the produce and products, bankruptcy and the global movement of the productive forces determine the forecast for the economic development in the Baltic countries.

The report covers a brief overview over the 3 main periods of the Baltic water supply system development, which are:

- The end of 19th century and the beginning of the 20th in the outskirts of the Russian Empire – the Baltic Countries;
- The industrialization and extensive population of the West of USSR;
- Baltic countries as the members of the EU

The main political solutions include the territorial reform of Latvia whereupon the existing 550 municipalities are joined into 120. The elections are expected to take place in spring, 2009. The existing financial crisis will support the establishment of the larger agricultural enterprises on the behalf of the smaller ones, which will go bankrupt. The available assets (land, equipment) will be purchased by the larger agricultural enterprises. Among the social factors the growing level of unemployment can be mentioned, which leads to the concentration of inhabitants towards the centres of the municipalities. The concentration of educational establishments and healthcare follow the trend. The battle against unemployment is one of the most important tasks for the coming years (2010-2030). The water supply companies should also undertake measures for the creation of the new employment positions, for example, by organizing units for the network flushing.

Thus the main tasks for the future development include the diminishing of the number of the municipalities and the influence of the financial crisis on the industrial development as well as the influence of the unemployment on the drinking water

sector. The main strategy according to the forecasts is the improvement of drinking water quality and the decrease of the water price.

Contents

1 Introduction

Previous studies in TECHNEAU project involved analyses of the SEPTED (Social Economical Political Technological Etnical Demographical) dimensions in various representative regions led to the identification of region specific trends in several countries including the Baltic States (Estonia, Latvia, Lithuania). These regional trend studies were subsequently analyzed to highlight their common conclusions. Ten globally relevant trends were thus defined, namely climate change, urbanization/demographic changes, emerging technologies, ageing infrastructure, globalization, consumer involvement, emerging pollutants, energy, the efficiency driven water sector and more bottled water. Further the adaptive strategies for coping with these trends were developed. Three general strategies have been defined:

- an integrated approach
- maximum flexibility
- consideration of local conditions.

1.1 Water stress in the Baltic countries

Water use is mainly affected by three sectors: agriculture, industry and households. On average, in the EU 14% of total water abstraction is used for public water supply, 30 % in agriculture, 10% in industry (excluding cooling water) and 46% as cooling water, mainly for power generation (EEA, 2004). Latvia differs from the other two Baltic States by having a larger demand for the public water supply, agriculture and industry whilst having less demand for the cooling and electricity sector (Fig. 1).

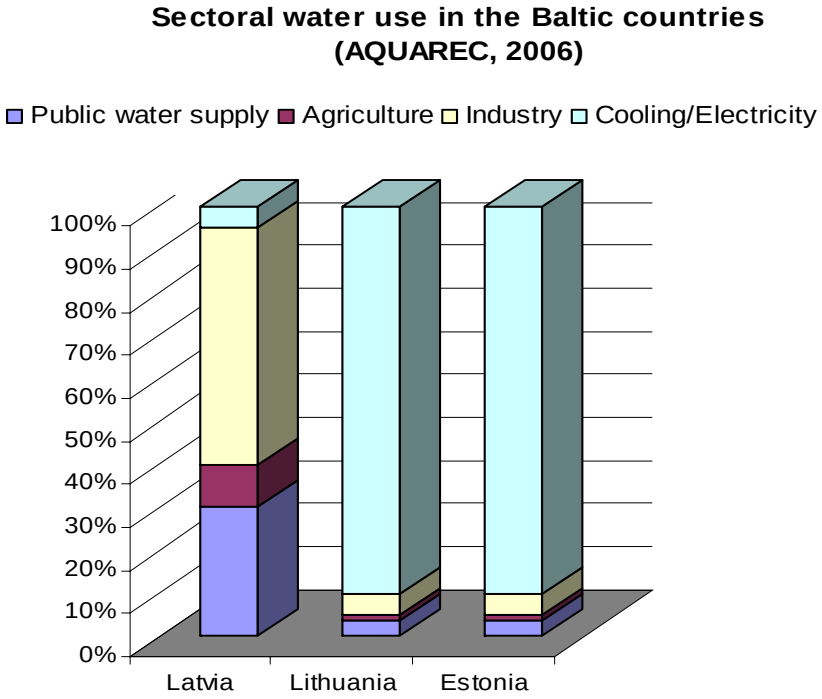

Figure 1. Water demand by sectors in the three Baltic States[1].

[1] Source http://www.aquarec.org/, Summary Report

The water stress index (WSI) is one indicator to quantify water stress in a region or country. It relates the parameters water availability and water use and is defined as the ratio of annual water withdrawal from ground and surface water to the total renewable freshwater resources. Hence high water stress indices can either be caused by low availability or excessive high water demand.
The OECD (2003) defines a water stress index of more than 40% as high water stress, 20% to 40% classifies as medium-high, whilst 10% to 20% is defined as moderate water stress. Approximately half of the European countries and almost 70% of the population are facing water stress issues. Israel and Belgium are exceeding water stress indices of 40% whilst Latvia, Estonia and Lithuania together with some other former Eastern-block countries stay at or below the 10% threshold (Fig. 2). These data refer to the country-level and do not reflect the fact that water scarcity often appears at a regional scale. However, water scarcity is not an issue in the Baltic States thus other trends, such as ageing infrastructures and the ownership of the water treatment systems will be reviewed in this report.

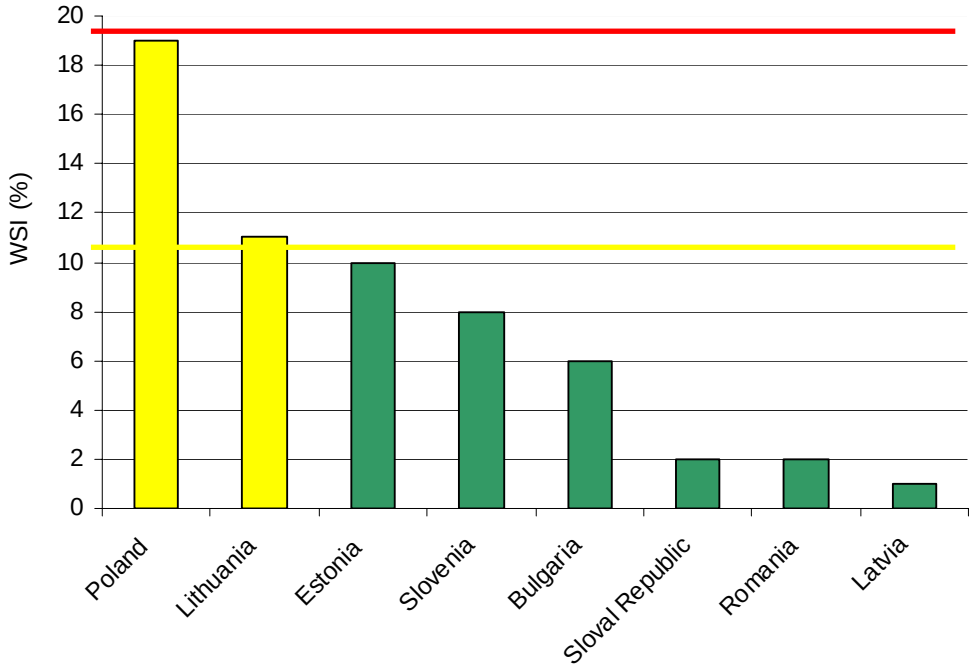

Figure 2. The water stress index in the Baltic countries and other former Eastern block countries[2].

This report describes results from testing the adaptive strategies in case study of Latvia with the end-users from the Baltic States. Situation in Latvia was largely assumed to be representative for other post-Soviet countries in Baltic region however, where available, the data from the other two countries are presented.
In the evaluation the concept of using flexibility as a strategy to address future water demand, required infrastructures and drinking water quality is studied in the context of 10 global trends, as defined by the TECHNEAU project WA 1 (Table 1).

[2] Source http://www.aquarec.org/, Summary Report

Table 1. The interpretation of the ten global trends in the Baltic countries.

Number	Trend	Implications in the Baltic countries
1	Climate change	Under investigation (Prof. Maris Klavins, Climate change and its impact on aquatic chemistry)
2	Urbanization/ Demographic changes	The decrease in the drinking water consumption The changes in the population density distribution
3	Emerging technologies	The existing immediate emerging technologies (sensors, computers) in Baltic States improve the quality and the delivery safety of the drinking water
4	Ageing infrastructure	The decrease of water quality in the drinking water distribution network The improvement of the infrastructure of the water supply companies
5	Globalization	None immediate
6	Consumer involvement	Experts consider the consumer involvement as not a major trend
7	Emerging pollutants	General decrease in water pollution loads but emerging of new kinds of pollutants
8	Energy	The integration of water supply system with energy sector is not a current issue and the lack of energy is not expected in the Baltic States. The amounts of the goods produced by various industries decrease. The produce of sugar beet and sugar cease as well as fisheries and fish processing. The energy required for functional needs of the society might suffice with what is already available.
9	The efficiency driven water sector	Water supply systems – the property of the municipalities The risk of individual well contamination
10	More bottled water	None immediate

The Baltic States are still in the process of social-economical transition from Soviet legacy toward liberal democracy and market capitalism with fast growing economy, rapid increase on gross domestic product, movement of labor and high inflation. Thus, adaptive strategies for future water supply should account for different possible scenarios of development.

One of the major problems identified in trend analyses was increasing financial burdens for water suppliers (due to loans, deterioration infrastructure elements,

decrease of water consumption, increasing demand for higher service from consumers). The strategy of changing structure of water suppliers was studied e.g. possibilities of merging smaller enterprises in to larger ones; combining centralized and decentralized treatment and distribution. Different scenarios are proposed by taking into account SEPTED factors. Flexibility of scenario (ability to cope with change) are the major concept behind the strategy.

The main specific features of Latvia water supply system from the point of view of the TECHNEAU project are:

- Insufficient removal of iron and manganese in several water supply systems which will be averted by the year 2015;
- Insufficient chemical and biological stability of the drinking water which is dealt with within the TECHNEAU project;
- The drinking water supply installations built and improved during the second years of independence (1991-2000) mainly using EU funding are wearing out, the automatization and measuring devices in particular, however the local municipalities lack funding for the reconstruction of these.

1.2 Centralized waterworks in the Baltic Countries

Centralized water distribution system has always been developing together with the other industries in all the countries and the Baltic countries are not an exception.

19th-20th century brought forward the development of industry all over the world including the Russian Empire and its outskirts – the Baltic countries. Thus in the major Baltic cities – Riga, Vilnius and Tallinn the first centralized water distribution systems were built, including the Baltezers station in Riga. The latter was started up in 1904 and it supplied the city with about 25 000 m^3 of good quality drinking water. The development was interrupted by the 1st World War. During the period between the wars (1918-1940) the water supply systems were updated and the water supply increased until the 2nd World War. After the 2nd World War the damaged pipelines were restored and new distribution systems were gradually built in all major Baltic countries till the year 1990. At the end of this period Riga city received about 450 000 m^3 of drinking water daily.

Following the collapse of the Soviet Union and its industry the consumption of drinking water in the Baltic States decreased. The same trend of drinking water economy was seen all over the world. The system was improved regarding the constituents, fitting which curbed useless water losses and technology processes, stimulating water economy were put in place.

Nowadays the water consumption in Riga city is 130-150 000 m^3 daily (compared to 450 000 m^3 in 1990). Within this period the less effective elements of the system (unproductive water sources) were closed down. The financing from the European Union was mostly directed towards improving the quality of the drinking water treatment and distribution networks. The water treatment facilities were updated, new technologies introduced and worn-out pipes were replaced. In addition, the small water supply systems were supplemented with iron removal equipment.

The Baltic States are still in the process of social-economical transition from Soviet legacy toward liberal democracy and market capitalism with fast growing economy, rapid increase on gross domestic product, movement of labor and high inflation. Thus, adaptive strategies for future water supply should account for different possible scenarios of development.

1.2.1 *Geographical location and municipal organization*

The Republic of Latvia is located in the North-East of Europe within the Baltic Sea Economic Region. Latvia covers 64 589 km2 of the area. The capital is Riga. The State borders with Estonia (north), Russia (east), Belarus (south-east) and Lithuania (south). Latvia has three important ice-free seaports through which important transit corridors from the East to the West go.

Administratively Latvia is divided into 33 regional level local governments: 26 districts and seven republic cities, which in parallel to the functions of territorial local governments also perform the functions of district local governments (Figure 3.). Latvia has 547 territorial local governments, and at the present time a merger of territorial local governments is taking place.

The Cabinet has approved an indicative project for the establishment of 102 territorial local governments. In accordance with Regional Development Law five planning regions have been established. The planning regions are to coordinate and facilitate cooperation between municipalities in promoting economic and social development on regional scale. The territories of five planning regions are close to the division of the country in five statistical regions.

Situated along the southeastern shore of the Baltic Sea, Lithuania shares borders with Latvia to the north, Belarus to the southeast, Poland, and the Russian exclave of the Kaliningrad Oblast to the southwest. The total area is 65,200 km² of which surface water occupies 1.35%. The current administrative division was established in 1994 and modified in 2000 to meet the requirements of the European Union. Lithuania has a three-tier administrative division: the country is divided into 10 counties that are further subdivided into 60 municipalities which consist of over 500 elderates.

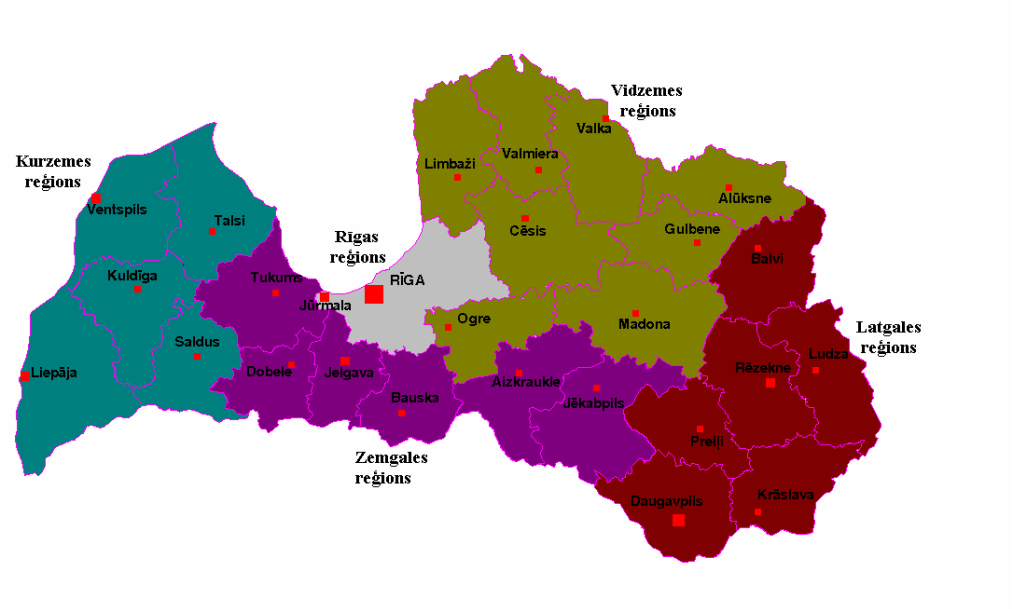

Figure 3. Municipalities in Latvia

Municipalities are the most important unit. Some municipalities are historically called "district municipalities", and thus are often shortened to "district"; others are called "city municipalities", sometimes shortened to "city". Each municipality has its own elected government. In the past, the election of municipality councils occurred once every three years, but it now takes place every four years. The council elects the mayor of the municipality and other required personnel. The municipality councils also appoint elders to govern the elderates. There is currently a proposal for direct election of mayors and elders, however that would require an amendment to the constitution.[26] Lithuania is divided into 60 municipalities.

Elderates are the smallest units and they do not play a role in national politics. They were created so that people could receive necessary services close to their homes; for example, in rural areas the elderates register births and deaths. They are most active in the social sector: they identify needy individuals or families and distribute welfare or organise other forms of relief.[27] Lithuania is divided into more than 500 elderates.

The current system of administrative division receives frequent criticism for being too bureaucratic and ineffective. Significant complaints have been made about the number of counties, since they do not have much power. One proposal is to create four lands, a new administrative unit, the boundaries of which would be determined by the ethnographic regions of Lithuania. The benefit would be that the lands would follow natural boundaries, rather than being defined by bureaucrats or politicians.[28] Another of the proposed solutions involves reducing the number of counties so that there would be five in total, each based in one of the five largest cities with populations of over 100,000.[29] Others complain that elderates have no real power and receive too little attention; they could potentially become local initiative communities which could tackle many rural problems.[30]

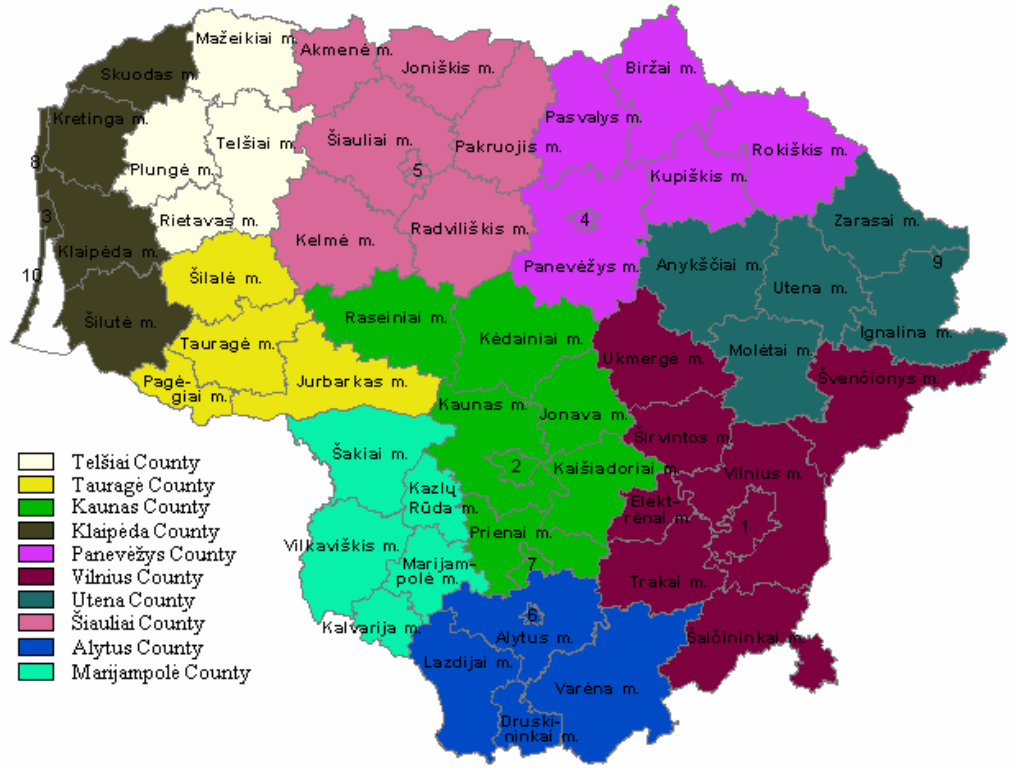

Figure 4. Municipalities in Lithuania

Estonia is bordered to the north by Finland across the Gulf of Finland, to the west by Sweden across the Baltic Sea, to the south by Latvia (343 km), and to the east by the Russian Federation (338,6 km). The territory of Estonia covers 45,227 km².
A municipality is the smallest administrative subdivision of Estonia. Each county is further divided into municipalities which are of two types: urban municipality and rural municipality. There is no other status distinction between them. Each municipality is a unit of self-government with its representative and executive bodies. The municipalities in Estonia cover the entire territory of the country.

Municipality may contain one or several populated places. Some urban municipalities are divided into districts with limited self-government, e.g. Tallinn consists of 8 districts.

Municipalities are ranging in size from Tallinn with 400,000 inhabitants to Ruhnu with as few as 60. As over two-thirds of the municipalities have a population of under 3,000, many of them have found it advantageous to co-operate in providing services and carrying out administrative functions. Since March 2008 there are in total 227 municipalities in Estonia, 33 of them are urban and 194 are rural.

1.2.2 Population

At the beginning of 2001 there were 2.36 million inhabitants in Latvia 69% of who lived in cities, with about 1/3 of the population concentrated in the capital city. 54% of all inhabitants are females. Population density is 36.6 per km2, which is significantly lower in comparison with the average indicators of the EU member states. The size of the population as whole has a tendency to decrease: natural increase indicators have been negative since 1991. Demographic forecasts indicate that the number of workforce will stay stable till the year 2010. The number of economically active population may fall between 2010 and 2020 and this decline will be accompanied by ageing of population and essential changes in the age structure of workforce. fast decline of young people aged 15-24 and the increase of people aged 45-64.
As stressed in the Latvian National Report "Rio+10" to the World Summit on Sustainable Development in Johannesburg, the low number of population and low intensity economy have been the main reasons that determine generally better environmental quality compared to the member states of the European Union. At the same time, developing economy threatens the environment that is confirmed by worsening of selected indices.
Coastal geological processes are of high importance in Latvia, because a high proportion of the population lives in the coastal zone. Observations show a significant rising trend in the yearly mean sea water level. The total length of segments of solid, vegetated shores with erosion risk during storms with a given wind direction, is 62% of the total shoreline. The main measures for conservation of the sea coast are following: dumping the dredged sediments from harbour aquatories and ship route canals in the shallow water belt (0-6 m depth); renewal of trampled, eroded by wind or water, or thoughtlessly excavated foredunes (e.g., with dune grasses, willows and sea buckthorn, wooden fences); renewal of bathing areas and provision of services.

Figure 4. Solid Vegetated Sea Shores with High Risk of Erosion
Source: Latvian Environment Agency, 2002

The population of Lithuania, the largest of the Baltic states, is 3.4 million. Its capital and the largest city is Vilnius.

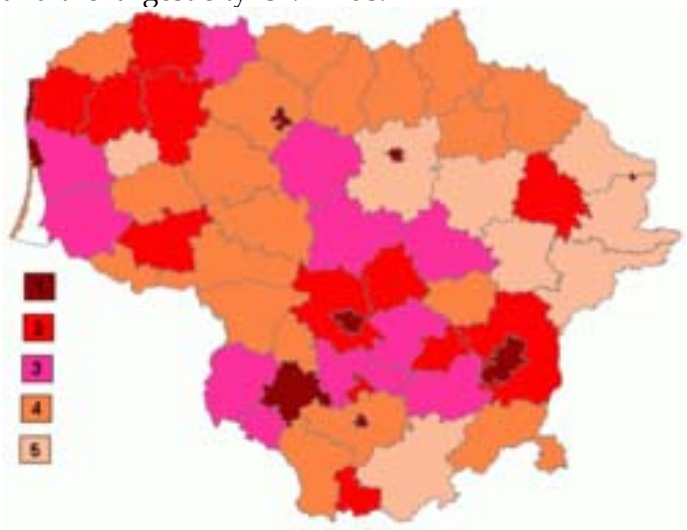

Figure 5. The density of population in Lithuania

Estonia with a population of only 1.4 million is one of the least-populous members of the European Union. There are currently 33 cities and several town-parish towns in the county. More than 70% of the entire population lives in the towns.

1.2.3 The economy

Latvia is a small and open economy. Since independence in 1991 successive administrations have prioritised macroeconomic stability and a conservative public spending discipline. This robust approach to economic management helped to overcome the output contraction in the early phase of transition and to return on the stable growth path. Even after the Russian crisis the growth of Latvian GDP remained positive. Average GDP growth rate over the period of 1996-2002 amounted to 5.8% at constant prices. Nevertheless, the experiences of the 1990s demonstrated the challenges facing Latvia of being a small and open economy and the dangers posed by external economic shocks. Despite Latvia.s economic growth rates, GDP per

capita of 35% of the EU average (in purchasing power parity standards) is well below the desired. The long-term objective of Latvias knowledge based economic development strategy is to attain the EU per capita average within the next 20-30 years.

In 2003, before joining the European Union, Lithuania had the highest economic growth rate amongst all candidate and member countries, reaching 8.8% in the third quarter. In 2004 — 7.3%; 2005 — 7.6%; 2006 — 7.4%; 2007 — 8.8%, 2008 Q1 — 7.0% growth in GDP reflects the impressive economic development.[31] Most of the trade Lithuania conducts is within the European Union.

It is a member of the World Trade Organization, and the European Union. By UN classification, Lithuania is a country with a high average income. The country boasts a well developed modern infrastructure of railways, airports and four-lane highways. As of October 2008, an unemployment rate is 4.7%. According to officially published figures, EU membership fueled a booming economy, increased outsourcing into the country, and boosted the tourism sector. The litas, the national currency, has been pegged to the Euro since February 2, 2002 at the rate of EUR 1.00 = LTL 3.4528,[32] and Lithuania is expecting to switch to the Euro on January 1, 2013. There is gradual but consistent shift towards a knowledge-based economy with special emphasis on biotechnology (industrial and diagnostic) – major biotechnology producers in the Baltic countries are concentrated in Lithuania – as well as laser equipment. Also mechatronics and information technology (IT) are seen as prospective knowledge-based economy directions in Lithuania.

In 1994, Estonia became one of the first countries in the world to adopt a flat tax, with a uniform rate of 26% regardless of personal income. In January 2005 the personal income tax rate was reduced to 24%. A subsequent reduction to 23% followed in January 2006. The income tax rate will be decreased by 1% annually to reach 18% by January 2010. The Government of Estonia finalized the design of Estonia's euro coins in late 2004, and is now intending to adopt the euro as the country's currency between 2011 and 2013, later than planned due to continued high inflation. In 1999, Estonia experienced its worst year economically since it regained independence in 1991, largely because of the impact of the 1998 Russian financial crisis. Estonia joined the WTO in November 1999. A balanced budget, almost non-existent public debt, flat-rate income tax, free trade regime, fully convertible currency backed by currency board and a strong peg to the euro, competitive commercial banking sector, hospitable environment for foreign investment, innovative e-Services and even mobile-based services are all hallmarks of Estonia's free-market-based economy.

1.2.4 Water services

1.2.4.1 Latvia

In Latvia 84% of inhabitants are served by water distribution networks. He specific household consumption in liter per person and day has been estimated as ranging from 64 to 200. The total production of drinking water has been estimated to 290 219 900 liters per day. The origin of the drinking water is mostly groundwater (67%), followed by surface water (33%).

Water services (water supply, wastewater collection and treatment) are not provided in appropriate quality and in accordance with environmental requirements in most of the settlements in Latvia. In order to ensure qualitative services for as many inhabitants as possible and in order to considerably reduce the environmental

pollution, the financing for the development of the water services according to the strategic investment priorities has been allocated to agglomerations with a population equivalent above 2 000. The main financing sources in the pre-accession period have been Phare and ISPA. For the period 2004-2006 the continuation of the development of appropriate water services in these urban agglomerations has been defined as one of the highest priorities in the Reference Framework Document for the Cohesion Fund. At the same time, there are around 750 settlements, where the number of inhabitants is (much) lower than 2 000 and where around one third of Latvias population lives. The majority of these settlements are located on the Baltic Sea coast, along the banks of rivers and lakes that are potential tourist places. Small population numbers, employment problems and the absence of the entrepreneurship have a considerable impact on municipal budgets and are limiting their ability to improve the water services.

Table 2. Investments in environmental protection in Latvia (mio LVL)

Year	**Co-financing**	**Financing from projects**	**State budget**	**Sum**	**Development of waterworks**	
					Mio LVL	%
2006	27.61	14.05	11.90	53.56	35.54	66
2005	21.51	9.43	7.34	38.28	32.43	84
2004	11.45	5.74	5.31	22.50	14.32	64
2003	5.70	6.77	3.64	16.10	7.58	47
2002	2.51	3.90	4.45	10.86	5.92	54
2001	5.86	10.72	6.09	22.67	17.46	77
2000	5.52	19.19	10.71	35.42	31.50	89
1999	5.51	13.69	8.04	27.24	24.30	89
1998	7.49	8.72	6.90	23.11	19.58	85
1997	4.03	6.58	3.73	14.34	11.72	82
1996	2.61	2.79	3.26	8.66	7.23	83
1995	1.19	1.26	2.20	4.65	4.36	94
Total	**100.98**	**102.84**	**73.57**	**277.39**	**238.23**	**76**

Despite rich surface water resources, approximately 13 300 m3/capita (average in EU-15 is 7 250 m3/capita (only Ireland, Finland and Sweden exceed Latvia in this regard), and the possibility to provide drinking water to the entire territory of Latvia from ground water resources (currently only in Riga surface water is still used as source of drinking water) the protection of water resources and their rational use are not properly ensured. The overall quality of ground water is good in Latvia with the exception of elevated concentrations of iron, manganese and sometimes there are problems with the hardness of water and too high sulphate concentrations. To comply with the drinking water quality standards abstracted groundwater is treated before it is distributed to the final consumers. At the moment appropriate drinking water treatment is being provided to around 35% of the population. Although the quality will be good after treatment the drinking water quality provided to the final consumers is often worsened due to the poor condition of the water supply networks. According to the monitoring data for the year 2001, the overall quality of drinking water supplied to the consumers was not corresponding to the

requirements for both the chemical quality (49.5% of the samples) and the biological quality (5.3% of samples).
Here it should be noted that the quality of drinking water at final consumer is only controlled at the request (and expenses) of the house owner. Around one third of the water is being lost in the water supply networks, which is comparable to other EU-15 and Accession Countries. Estimated network losses vary widely over Europe: e.g. on average 15% in Italy, 30% on average in France, 33% in the Czech Republic. However poor metering and monitoring in some countries makes accurate estimations difficult.

Table 3. The use of the EU Cohesion Fund finances in the drinking water sector in Latvia

Project	Project status												Costs, EUR	Co-financing from the Cohesion Fund
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011		
No 2000/LV/16/P/PE/001 The development of water supply and sewerage services in Riga													30 041 262	20 702 476
No 2000/LV/16/P/PE/002 The development of water supply and sewerage services in Jelgava													17 253 833	12 940 374
No 2000/LV/16/P/PE/003 The development of water supply and sewerage services in Ventspils													19 437 822	9 135 848
No 2001/LV/16/P/PE/008 The development of water supply services in Jurmala													14 353 148	10 764 861
No 2001/LV/16/P/PE/007 The development of water supply services in Eastern Latvia river basins													106 293 817	44 616 000
No 2002/LV/16/P/PE/009 The development of water supply services in Rezekne													13 964 333	9 726 100
No 2004/LV/16/C/PE/001 The development of water supply system in Ventspils (II)													43 543 775	18 516 077
No 2004/LV/16/C/PE/002 The development of water supply system in Olaine and Jaunolaine													22 254 129	11 209 854
No 2004/LV/16/C/PE/003 The development of water supply system in Liepaja (II)													25 297 487	21 502 863
No 2004/LV/16/C/PE/004 The development of water supply system in Daugavpils (II)													33 523 422	16 420 991
No 2005/LV/16/C/PE/003 The development of water supply system in Riga (II)													81 219 185	58 838 450

1.2.4.2 *Lithuania*

Approximately 70% or 2.5 million of the inhabitants of Lithuania get drinking water from the public water supply system while 0.9 million (approx. 30%) of the inhabitants get drinking water individually from shaft wells or separate drilled wells. About 1.9 million inhabitants are supplied with safe publicly supplied drinking water from specialized water supply companies. In suburbs, small towns and country side settlements the inhabitants (approx. 0.5 mio) are supplied with drinking

water of poorer quality (the indicative concentration values for iron, manganese, turbidity and other exceed the specified values).

The municipal institutions ensure that the inhabitants of the municipal territories are publicly supplied with the necessary quantity of drinking water or have created the necessary conditions for individual supply. The Ministry of Environment of the Republic of Lithuania performs administrative regulation in the field of drinking water supply. The State Food and Veterinary Service carries out the state control of drinking-water safety and quality. The suppliers who distribute drinking water through the pipe network are responsible for the safety and quality of water as far as the inlets of drinking water to the water pipeline inside the buildings, which are owned by the drinking water users. The users themselves are responsible for the safety and quality of water in the pipelines inside the buildings owned by them.
There is no specialized coordination body. The National Health Council and the National Commission of Health Affairs under the Government of the Republic of Lithuania have the right to discuss and take decisions on questions related to the elaboration and implementation of the water supply and quality improvement policies[3].
The drinking water costs are a significant part of consumers' budget. The minimum wage is 90 LTL; the median salary 176 LTL; the price of drinking water is 0,238 LTL/m^3 and medium consumption of water is 7 m^3/month/person. Thus, the cost of drinking water (excluding sewage system) is 1,85% of minimum wage and 0,95% of medium salary. The demands for drinking water quality are nearing the requirements in the EU (98/83/EC) or are meeting those. Until year 2015 (population less the 10 thousand) for several parameters (bromides, THMs, Al, Fe, Mn and COD) are set below the maximum permissible levels of (98/83/EC). Only parameters which regulated in addition to 98/83/EC are water hardness (< 7 mgeq/l). No specific governmental monitoring program emerging pollutants exits. Directive 2000/60/EC is in force since 2006. This program is mainly oriented on the assessment of general water quality situation determining also Cd, Pb, Hg, Ni, oil products and Cu, Zn un As on case-by-case basis. This programme includes monitoring of underground water and surface water basins used for drinking water acquisition
The water prices are still below actual expenses needed for maintenance and development of water supply systems. During the last years, the renovation and building of water supply systems are partially covered by European Cohesion and other funds. This allows water companies to save partly on investments and increase technological standards. The water prices in each municipality are regulated by special institution - Public Utilities Regulator. Thus, increase of water prices is not likely to be rapid.

1.2.4.3 Estonia

Drinking water quality is one of Estonia's priorities for the time period discussed in this report. The requirements of Council Directive 98/83/EU are established in Estonian law in the Public Health Act, the Water Act, and regulations passed implementation of these. In Estonia the responsibility for implementing Council Directive 98/83/EU is divided between the Ministry of the Environment and the Ministry of Social Affairs, specifically the latter's subsidiary agency, the Health Protection Inspectorate.

[3] (Source: European Environment and Health Committee, http://www.euro.who.int/eehc)

Protecting the health of the population and coordinating activities in this area falls within the responsibility of the Ministry of Social Affairs, which drafts legislation aimed at assuring a healthy human environment, as well as strategies and policies to advance the same.

Cost for water and wastewater are 0.42 and 0.56 Euro, respectively. Cost of water and sewerage contribute about 0.9% of average wage. The fact that people are saving water (water consumption of drinking water is as low a 98 l/d.capita) may indicate that water costs is a significant part of the family budget. Price for water differs among different municipalities. The highest costs (about twice more) are in Tallinn which is only private (International Water: a USA-Italian owned, and British-run, company) water supply enterprise in the Baltic States. After privatization the privatization the enterprise has received critics at the international level for inducing a financial pressure on water consumer by seeking for unreasonable profit. This created critical attitude towards privatization. However need for investments and better management is driving for partnership with private companies. Thus, privatization is still an option (legally it is possible), however other models are possible: connecting small water companies and delegating management to large companies.

The major problem is regional excess of fluoride content (more than 1.5 mg/L), which derives from the ground water aquifer being used. The Health Protection Inspectorate data show that the fluoride content is excessive in the water of 103 water works. Water which does not meet fluoride requirements is used by 27 057 persons (2.3% of the Estonian population). Groundwater in Estonia is usually aggressive to water distribution pipes (causes corrosion). This has been largely neglected. Because network becomes a problem most likely water stabilization technologies (to decrease deterioration of water quality in the network) shall be introduced. Estonia has local water quality problems due to past pollution (particularly caused by Soviet Army and local boiling houses), intensive land use or natural peculiarities. The human impact on groundwater resources has resulted increased concentration of nitrates in uppermost aquifers. The natural NO_3 concentration in Estonian groundwater should be mostly less than 1 mg/l, but about a half of Estonian territory has the NO_3 concentration in the uppermost aquifer at least 10–30 mg/l. The most affected is the S–O aquifer, but also Quaternary and Devonian groundwater in South Estonia have high NO_3 concentrations. In addition, the groundwater quality is threatened by pesticides use, past pollution, deterioration of sewerage etc. In the North East Estonia (the area of oil-shale mines) SO_4 contamination is a serious problem. Due to the excavation works the water table is lowered and oxidation of pyrite causes the increase of SO_4 concentration in ground water up to 500 mg/l (naturally 20 mg/l).

The quality of water is considerably better at communal water works than in private wells. Of communal waterworks samples tested in 1996, 3.9% did not meet requirements with respect to microbiological indicators and 14.6% with respect to chemical indicators; the respective percentages for private wells were 28.5 and 40.4. The content of nitrates in the water of pit wells is often high. For instance, in the city of Tartu nitrates exceeded the permitted level in 63% of cases, often being several times higher. In rural areas the nitrate levels in drinking water have decreased considerably during the past few years.

An important problem is aging of water supply piping, which often mandates rebuilding of the entire system or its total replacement in places. As much as 30-35% of the water in a network may be lost to frequent piping breakdowns and bad plumbing equipment. The condition of shallow individual wells is poor both from a

technical standpoint and from that of water quality. Although pit wells should be cleaned and disinfected at least once a year, as a rule neither is done.
The occurrence of alga toxins in drinking water is only possible in unprocessed water taken from the open water reservoirs in Tallinn and Narva.
The available data do not give information on how many and what types of parameters were determined in water samples, for which parameters the tested drinking water did not meet requirements, and how many people used the water and for how long. Therefore it is not possible, on the basis of this information, to assess the health risk that low-quality drinking water poses to the Estonian population. It is possible to state approximately that about 9,000 persons use water from shallow individual wells which fails at least one parameter of quality, and 150,000 persons use drinking water from communal water supplies which fails at least one parameter.

Failure of drinking water to conform to quality requirements is mainly related to excessive content of iron, manganese, ammonia, and chloride. These result mainly from their natural occurrence but often are related to poor condition of the distribution pipes.

Data from the health protection services show that levels of indicators exceed limit concentrations in water of 253 water works (41% of all water works), which serve 344 390 persons (29.6% of the population). The production, storage, processing, and distribution of this water which fails indicator standards takes place under special licences for marketing of water which doesn't meet quality requirements but is not hazardous to health. Such licences have been issued to 94% of these water works. They have also been presented with action plans for improving water quality.

Some additional facts[4] are listed below:

- 77% of the population has continuous access to an improved water supply;
- 77% of the population has access to improved sanitation;
- All Estonian cities and many smaller communities have a water supply system;
- There are a total of 1377 water works;
- According to Health Protection Inspectorate data, 77% of the population used communal water in 2004. However, the proportion of the population covered by communal water varies widely from region to region. Over all, 86% of persons in larger cities use communal water, and 59% of persons in rural communities do so;
- However, there is also considerable difference among towns and hamlets: for example, communal water supplies reach 95% in Paide, but 66% in Türi, less than 50% in Elva, 19% in Vasalemma, but 100% in Loo hamlet in Harju County.

[4] (Source: European Environment and Health Committee, http://www.euro.who.int/eehc)

The Ministry of the Environment has completed the draft regulation on the measure for the development of water management infrastructure, which establishes the principles of distribution of the 6.4 billion kroons in funding provided by the European Union's Cohesion Fund. Support for the advancement of water management is designed to achieve the development of public water supply and sewerage systems for the provision of water infrastructure and sewerage services for citizens that meet all requirements. During this programme period the European Union is supporting the construction and renovation of drinking water supply systems for settlements of 2000 or more residents and the construction and renovation of the public sewerage system in waste water collection areas where the pollution load is the equivalent of 2000 or more people. Should the budget for the measure allow, the renovation of drinking water supply systems serving areas with between 50 and 1999 residents will also be funded as well as the renovation of public sewerage systems in waste water collection areas whose pollution load is less than 2000 pollution equivalents.

This funding will give Estonia firstly, high quality drinking water, which will significantly reduce the risks to people's health and secondly, a reduced pollution load throughout the water and living environments thanks to properly developed waste water collection, which will also see less pollutants flowing into the Baltic Sea. Drinking water that meets all standards must be available to every settlement with more than 50 residents by the end of 2013. Around 86% of people in the country currently get their water from the public water supply. The aim is to increase that to 90%. The first round of applications for funding will begin within four months of the regulation entering force, with local governments and water companies owned 100% by one or more local governments able to apply for grants.

The draft regulation of the measure was produced by the Ministry of the Environment in association with the Environmental Investment Centre and the Ministries of Finance and Agriculture, and is currently being reviewed through the e-law system by the Ministries of Justice, Economic Affairs and Communications, Agriculture, Finance and Social Affairs and the Regional Minister. 25,149 billion kroons of funding has been provided within the framework of the implementation plan for the development of the living environment, with a total of 7 billion available to Estonia for the advancement of water management. In addition to developing infrastructure, support for water management is also designed to eliminate the focal points of residual pollution and to improve the biochemical and biological condition of watercourses[5].

[5] (Source: Ministry of Environment, Estonia www.envir.ee)

2 The main adaptive strategies for further development of drinking water sector in the Baltic countries

The development of Baltic water supply systems will take place in the conditions of economic recession. During the last 20 years the most developed countries – ES countries, USA, Japan- were characterized by extensive industrial and consumer crediting. During the last 5 years the urge of manufacturers to gain profit resulted in overproduction of goods not in demand in the market and the insolvency of manufacturers related to the loan banks. The consumers expecting stable salaries and wishing to improve their living standards applied for mortgage and other loans. Now a part of these consumers have become unemployed and their mortgaged properties are being sold in auctions.

The employed pay the taxes which should cover the unemployment benefits however the state income for the unemployment benefits is decreasing. The dissatisfaction of the unemployed may lead to riots in the Baltic countries.

Already from the 1980 there is a trend to move the manufacturing enterprises to regions where the manpower is cheaper (China, India, Brazil). During this time in Latvia the cultivation of sugar beet has stopped completely, the fishery has ceased and the small and medium-sized farms dealing with cultivation of grain and livestock breeding have become unprofitable. The expenditure towards medicine, education and other sectors have been decreased by one fourth or fifth. It is difficult to see favourable conditions for creation of new jobs. In addition, currently a territorial reform is being currently carried out in Latvia. The municipalities are joining and together with the number of municipalities the available employment places will shortly decrease by 50%.

It is anticipated that the unemployed will move from the cities to the countryside and create self-subsistence households. As a result, the proportion of decentralized drinking water supply equipment will increase.

The abovementioned socio-economic activities require several main strategic trends:

- to preserve the large water supply systems and the companies managing them;
- to improve the drinking water treatment technology in order to minimize the decrease of the quality of drinking water within the network;
- to replace the worn out mechanic and automatization equipment;
- to improve the network operation by regular flushing.

2.1 The decrease in the drinking water consumption

2.1.1 Introduction

Both Baltic and European national economy specialists forecast the increase of the energy supply cost as well as increase of water supply/wastewater treatment prices. As a result of this both the inhabitants and the manufacturers will use the water in a more economical fashion. Thus within the time frame until the year 2030 the consumption of the drinking water will not increase. In fact, it is likely that the amount will actually slightly decrease.

2.1.2 Proactive measures

In the situation when the increase in the price cannot be stopped everything should be done to slow down its increase. Possibilities how to manage water supply systems more efficiently must be sought.

2.1.3 The main actions of the adaptive strategy

The economical use of the electricity is the main objective. The pressure in the water supply systems is kept relatively unchanged and adjusted in the pumping stations. The water pressure is not stable at the tap of so called most demanding consumer and the pumping stations must work with a large reserve pressure and thus use a lot of electricity. The working regime of the pumping stations must be adjusted so that at the manometer of the most demanding consumer the pressure is minimal required and relatively unchanged together with the minimal required pressure reserve.

The minimal necessary pressure in the system has to be defined more accurately and reduced as far as possible. A possibility to reduce the energy utilization must be sought by introducing an additional pumping station with the objective of a pressure increase (pumping pipe-to-pipe).

The expediency of use of the groundwater regulating reservoirs must be analyzed and these could be substituted with up-to-date second elevation pumps and frequency modulation. The automatization of water supply systems must be continued thus decreasing the expenditure for personnel wages.

2.1.4 Conclusions

The economical use of the electricity is the main objective. The working regime of the pumping stations must be adjusted so that at the manometer of the most demanding consumer the pressure is minimal required and relatively unchanged together with the minimal required pressure reserve. The minimal necessary pressure in the system has to be defined more accurately and reduced as far as possible. The automatization of water supply systems must be continued thus decreasing the expenditure for personnel wages.

2.2 The change in the population density distribution

2.2.1 Introduction

The Baltic and EU national economy forecast is that the population in the Baltic in general and in every three of the Baltic countries will continue to slowly decrease till the year 2030. The specific water consumption will not increase in the conditions of economic stagnation and recession. There might be shortage of jobs in the rural areas and small towns.

The increase in the fuel price will render the lifestyle in the rural areas and small towns far from the workplace economically unfeasible. The population movement from rural communities to the outskirts of the capitals or the main cities and the cheap housing areas close to the workplaces will take place. The middle class will continue to transfer from the main cities to the 20-25 km wide coastal region characteristic to the Baltic countries.

The strategy of the water supply enterprise till the year 2030 should be planned considering that the population number within this time period will not increase but the population density in the outskirts of the capitals and other main cities as well as in coastal areas will increase.

2.2.2 Proactive measures

In order to create favourable conditions for the implementation of the development trends a local adaptive strategy is necessary. The State Ministries, responsible for the regional growth should arrange a detailed planning for the territories of source water and the building plots. It is strategically important to employ technical and

economical analyses to establish wherever it is useful to enlarge the existing centralized water supply systems, build new, centralized but moderate sized systems or even build new and local water supply systems for a group of the buildings, secluded farms or households. Even within the small Baltic region the optimal solutions for the water supply may differ since the freshwater sources suitable for drinking water preparation considerably decrease in the direction from the south of Lithuania to the north of Estonia.

In the south-north direction the density of the upper layer of the post-ice age rock and the stores of freshwater in the pores of the rocks. In the surroundings of Vilnius small, local water supply systems might prove feasible while in Tallinn area the population might be supplied by expanding the centralized water pipe.

2.2.3 Conclusions

The State Ministries should arrange a detailed planning for the territories of source water and the building plots. In the south-north direction the density of the upper layer of the post-ice age rock and the stores of freshwater in the pores of the rocks. In the surroundings of Vilnius small, local water supply systems might prove feasible while in Tallinn area the population might be supplied by expanding the centralized water pipe.

2.3 Water supply systems – the property of the municipalities

2.3.1 Introduction

The choice of development of drinking water supply utilities and the water supply to the populated areas is the task of the municipalities.

To this day there are 551 active municipalities in Latvia. The process of territorial reform carried out by the Government comprises the merging of the small municipalities and to diminish the total number till 100-120. The merging according to the existing legislation must be done considering the principle of voluntary participation using persuasion. Thus the reform is difficult to implement as some municipalities are not convinced on the usefulness of the reform. After the merge of the municipalities their water supply systems will merge as well and supporters are lacking in favor of the larger, intermunicipal supply systems. These questions were debated upon in the workshop on the drinking water supply attended by the leading representatives of the water supply systems from the three Baltic States which was held in Riga, 21st of May, 2008. The informative campaign on the usefulness of a creation of large water supply systems in the Baltic region must be continued. Further information on the infrastructure and the administration of Latvian water supply and wastewater treatment companies is found in the appendix written by the executive director of Latvian Water Supply and Wastewater Treatment Association E. Taurins.

2.3.2 The options of improvement of Baltic water supply systems

Option No.1

Every county municipality should have its own water supply system and the supervising authority should only operate within the county. The financing should go to every county municipality. The process/money flow should be coordinated by the Union of Rural Municipalities or the Association of Managing Companies/Enterprises.

However, it could be difficult to introduce new technologies in the small municipalities which call for the consideration of other options.

Option No.2
The creation of the regional societies of the municipalities and the corresponding associations of managing companies/enterprises (e.g. one for each region of Latvia: Kurzeme, Latgale, Vidzeme and Zemgale) can take place.
The financing would come from the association's municipalities fees which are distributed by the council of the association. The association of the municipalities or the association of the managing companies/enterprises coordinates the tasks and finances.
The advantages of this option would be the possibility to concentrate the funds and direct them towards the implementation of the main regional tasks. However, this option could also mean that the adoption of a resolution on a common ground could be more difficult.

Option No.3
A Water Supply Structural Unit, created within the Association of the Municipalities of the Republic overseeing two (for the sake of the competition) managing companies/enterprises of the water supply system. The fixed assets which are a part of the water supply systems should still remain as a property of the local municipalities. The financing would come from the municipalities' fees, distributed by the Association of the Municipalities. The advantages of this option include a creation of a progressive large-scale enterprise; however, it might be seen also in a light of a democratic dictatorship.

Option No.4
The privatization of the municipal water supply systems (including the fixed assets) with a clause to supply the drinking water to all consumers and maintain the operational capacity of the water supply system. The financing could come via the bank loans with the Government acting as the coordinating body. There are several advantages which this scenario could implement such as efficient economy and low water prices, established by the competition. The only possible doubt is that the proprietor could use the system for the profit meanwhile disregarding the quality of the service.

2.3.3 Conclusions
There is a trend to diminish the number of the existing municipalities. The existing 551 Latvian municipalities might merge into 120 county municipalities. Somewhat later also the managing water supply organizations might merge.
At the moment the first scenario is the most feasible one. It will be difficult for the small municipalities to organize the educational and the public health arrangements. Presently the option of formation of four regional second degree municipalities is discussed in Latvia.

2.4 The improvement of the infrastructure of the water supply companies

2.4.1 Introduction
The drinking water supply installations expansion and improvement after gaining the independence is financed mainly by EU funding, the minimum fixed co-financing allotted by the government of the republic or the municipality. In the beginning the larger part of the financing was directed towards the updating of the drinking water supply equipment but lately more attention is paid towards the external piping and

its renovation or change. The municipal financing is still not enough for the regular up- keeping and without external help the municipalities are not able to change the already worn-out meters as well as the automatization and control equipment.

2.4.2 Proactive measures

The main tasks are to continue the updating of the water supply systems with the aim to improve the quality of the drinking water and to diminish the risk of the water quality deterioration *en route* from the treatment site to the consumer. One should also strive to diminish the concentrations of unstable organic matter and the total microbial count in the treated drinking water.

2.4.3 Conclusions

Groundwater which is fit for drinking or is such after non-extensive treatment is available in sufficient quantities even in the vicinity of small cities and villages. There is no need to create a inter-regional networks in which the long pipelines and pumping will raise the costs of drinking water.

The rural regions and small settlements will find it useful to preserve or install small centralized systems, consisting of wells and iron removal systems. The supervision and maintenance of such small systems could be the task of one regional utility employing mobile staff.

2.5 The risk of individual well contamination

2.5.1 Introduction

According to the report on the development tendencies the non-systematic measurements show that in a large part of the individual wells (30-50%) the quality of water is below that of the centralized water supply systems. In the individual wells one mostly finds undesirably high concentrations of nitrates or bacteriological contamination.

2.5.2 Proactive measures

The water in the individual wells should be less harmful to the health and more palatable. The possibility of well contamination should be explained to the society and the consumer. More systematic observations on the well water quality should be undertaken.

The agencies of environmental health together with the municipal associations should prepare and issue recommendations on the arrangement and use of the individual wells for the de-centralized water supply. The owners of the wells should be advised to check the quality of the water at least once a year in a certified laboratory. The agencies of environmental health should also consider a register of individual wells. The contamination of the groundwater or a well can occur as a result of an imprudent or irresponsible household or economical action. The contamination may enter the groundwater or the well from lavatories which are situated improperly or misplaced, from a misuse of pesticides or from the cattle sheds. More and more correctly installed waste water treatment equipment should be arranged in the less inhabited places. The threat of biological and chemical terrorism must be considered as well. There are many psychologically unbalanced individuals sprouting among the society which are capable of committing the weirdest crimes thus one must not exclude a deliberate contamination of the wells. The construction of closed wells should be recommended in order to inconvenience the access of undesirable individuals to the water source.

2.5.3 Conclusions

The explanatory campaign, monitoring and up-to-date technological solutions will decrease the risk of acquiring low-quality water from the individual privately owned wells.

2.6 The decrease of the water quality in the drinking water distribution network

2.6.1 Introduction

The undesirable qualities of the drinking water cause various chemical and biological processes during the prolonged residence time of the water in the ferrous metal pipes. As a result the water quality in the distribution network is decreased.

2.6.2 Proactive measures

The increase of the water demand in the given period is not anticipated thus the residence time of the water in the pipes will not decrease. The decrease in water quality may be avoided or mitigated by:

- Improving the drinking water treatment process thus rendering it more stable chemically and biologically;
- Flushing out the accumulated corrosion and biological growth products from the pipelines.

2.6.3 Conclusions

The deterioration of water quality in the networks could be combated by improving the drinking water treatment process or introducing flushing as a legally required action.

2.7 Decrease in water pollution loads/emerging of new kinds of pollutants

2.7.1 Introduction

In the past the chemicals used in the agriculture were the main source of pollution. In the context of market economy the handling of chemicals, pesticides and fertilizers is more sparing. In addition, the awareness of the consumers increases together with the available information concerning the GAP use of pesticides in EU and the MRL's. The willingness to pay for ecologically grown goods is thus increasing.

The process of controlling of the industrial wastewaters is in progress thus diminishing the possibility of leaking of such untreated waters into the rocks and groundwater. However, at the same time new threats are generating by the development of other branches such as pharmaceutical and biotechnological industries.

2.7.2 Proactive measures

New legislative measures calling for decreasing of maximum allowed concentrations in wastewaters should be undertaken. Concerning the agriculture, the farmers should be efficiently controlled and encouraged to use less and less chemicals. Also the hospitals and pharmacological/biotech industries should be monitored closely thus minimizing the risk of occurrence of genotoxins, androgens, estrogens and not yet approved pesticides in their wastewaters.

2.7.3 Conclusions

Individual farmers should be monitored regarding their agricultural practices and produce, as well as hospitals and industries involved in producing new chemicals,

regarding their wastewater. If necessary, new legislative measures should be undertaken.

3 Conclusions

This report describes the main strategies for the Baltic (Estonia, Latvia, Lithuania) drinking water supply systems development for the time period of 2010-2030. The strategies are based on the close connection between the developments of drinking water supply systems with the economic activities of the specific region. In Europe and in Baltic States in particular an extensive economic activity is not foreseen. The decrease in the production volume, unemployment, the difficulties of paying back the loans and mortgage, the difficulties of selling the produce and products, bankruptcy and the global movement of the productive forces determine the forecast for the economic development in the Baltic countries. In the light of this the investments in the development of drinking water supply systems will be limited and planning should be made towards the maintenance and increase of efficiency of the existing systems. Thus the main tasks for the future development include the diminishing of the number of the municipalities and the influence of the financial crisis on the industrial development as well as the influence of the unemployment on the drinking water sector. The main strategies for the next 20 years should be the increase of the safety and quality of the drinking water together with the maintenance of the quality within the distribution networks by regular flushing.
The major conclusions regarding the adaptation of the Latvian water supply sector are as follows:

- During the transition, the country had to cope with new principles of water management;
- Quality and efficacy of work within the companies still has to be improved;
- The sustainability approach has not been used in handling investments in water sector (but rather meeting standards reflecting post Soviet thinking), thus some parts of the system have been neglected, e.g. especially the quality in water distribution networks;
- While mitigating these problems requires further investments, an increase of tariffs is difficult to implement due to low trust of consumers in water suppliers;
- Improved cooperation and even merging of small enterprises are crucial to handle current and future challenges alongside with intensified cooperation between water companies and research.