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# WATERLATGOBACIT

## WORKING PAPERS RESEARCH PROJECTS SERIES

**PRINWASS PROJECT: An examination of the politics of privatization of water and sanitation services in Africa, Europe and Latin America. Cases from Finland and Greece.**



**Working Paper Vol. 4, N° 1**

(In English)

Cover picture: Tammerkoski River, Summertime at the industrial city of Tampere, Finland, 11 June 2005

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Working Papers Vol. 4, N° 1

Research Projects Series  
PRINWASS Project

**“An examination of the politics of privatization of water and sanitation services in Africa, Europe, and Latin America (1990-2004) – Cases from Finland and Greece”**

José Esteban Castro (Editor)  
Newcastle upon Tyne and Buenos Aires  
March 2017



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## Research Projects Series

### PRINWASS Project

*An examination of the politics of privatization of water and sanitation services in Africa, Europe, and Latin America (1990-2004) – Cases from Finland and Greece*

Jose Esteban Castro (Editor)

Keywords: Water and sanitation, public policies, political ecology of urban water, public services, privatization, neoliberal politics, Finland, Greece.

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## Presentation of the Working Paper

We are glad to present another issue of the PRINWASS Project Series (SPIPRW). The SPIPRW Series has the objective of making available edited materials based on the final reports of the PRINWASS Project ([www.prinwass.org](http://www.prinwass.org)). This project was carried out between 2001 and 2004 and was funded by the European Union's Fifth Framework Programme. PRINWASS is a major landmark for our Network, as WATERLAT-GOBACIT was created by a group of PRINWASS partners after the project ended to continue working together on the politics of water and water services.

Although some time has passed since the project ended, the topics addressed and the project's findings have significant relevance and can contribute towards better understanding some of the challenges currently facing the implementation of progressive, egalitarian water politics. In short, PRINWASS' main objective was to examine critically the policies of privatization of water and sanitation services implemented worldwide during the 1990s, looking at specific cases from Africa, Europe and Latin America. The project carried out case studies in Argentina, Bolivia, Brazil, England and Wales, Finland, Greece, Kenya, Mexico, and Tanzania, and developed comparative analyses of the main findings. Although the original reports were freely available by request, and we produced several specific publications based on the project's findings, much of the material remains largely unknown and, for this reason, we launched the SPIPRW Series to facilitate the dissemination of research results.

This Working Paper features two articles presenting edited materials based on the original reports from the case studies carried out in Finland and Greece. These two cases provide examples from contrasting experiences, which have important lessons for current debates on the privatization of essential public services. The Finnish cases examined in Article 1 illustrate a tradition of water services management strongly based on municipal control of essential public services. Although there has been historically a strong interaction between the public and private sectors, the provision of essential water and sanitation services is under municipal control, and the standards of provision are very high in terms of quality and coverage. Still, being part of the European Union, Finland has also been under pressure to allow stronger private-sector participation in the provision of essential public services, and the article highlights different scenarios facing the provision of water and sanitation services in the country resulting from these pressures. Article 2 presents a very detailed analysis of the privatization policies implemented in Athens in the late 1990s. The provision of water and sanitation services in Greece contrasts sharply with the Finnish situation, as the introduction of privatization policies in the country resembles more clearly the general pattern of neoliberal policies implemented worldwide during the 1990s. The original reports were written in 2003 and 2004, and therefore the articles sometimes contain references that may be outdated.

We hope that the readers will find this material useful and that it may contribute to the work of researchers, students, activists, and others in their activities to understand better the internal workings and the huge impacts of water privatization processes. These policies are not only very much alive, but are also experiencing a worldwide revival. Therefore, we believe that the findings and lessons that emerged from the PRINWASS

Project deserve this publication effort. We wish you all a pleasant and fruitful reading.

*Jose Esteban Castro*

General Editor and Working Paper Editor

Newcastle upon Tyne and Buenos Aires, March 2017

## ARTICLE 1

### The experience of Finland

*Osmo Seppälä* - Finnish Water Utilities Association (FIWA), Finland.

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#### Abstract

The article presents a synthesis of research results from the study of Finnish water and sanitation services. It addresses the role of the public and private sectors in the provision and management of these services, placing emphasis on the importance of municipal authorities and consumer-managed cooperatives in rural areas. The paper discusses the wide range of options that can be found in the cooperation between public and private entities, which is a long-term historical characteristic of the country's water and sanitation services sector. In the Finnish case, "private sector" in water and sanitation services refers mainly to a range of actors outside the public sector, most of which are small and medium scale providers of support services and manufacturers, and privately-run small cooperatives in rural areas. The article presents evidence of the levels of efficiency and quality of water and sanitation services, and offers a discussion of scenarios for the analysis of the main challenges facing these services, and suggesting likely trends and future developments.

**Keywords:** Public-private cooperation; water and sanitation services; water and sanitation cooperatives; municipal services; Finland

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## Resumen

El artículo presenta una síntesis de resultados de investigación del estudio de servicios de agua y saneamiento en Finlandia. El trabajo aborda el papel de los sectores público y privado en la provisión y gestión de estos servicios, colocando el énfasis en la importancia que tienen las autoridades municipales y las cooperativas gestionadas por los propios consumidores en las áreas rurales. El trabajo discute el amplio rango de opciones que se registra en las formas de cooperación entre entidades públicas y privadas, lo que es una característica histórica de largo plazo en el sector de los servicios de agua y saneamiento del país. En el caso finlandés, "sector privado" en los servicios de agua y saneamiento se refiere principalmente a un rango de actores afuera del sector público, la mayoría de los cuales son proveedores de servicios de apoyo y de manufacturas de escala pequeña y mediana, además de pequeñas cooperativas gestionadas por actores privados en las áreas rurales. El artículo presenta evidencia de los niveles de eficiencia y calidad de los servicios de agua y saneamiento, y ofrece una discusión de escenarios para el análisis de los principales desafíos que enfrentan estos servicios, así como también sugerencias sobre las tendencias y desarrollos futuros más probables del sector.

**Palabras clave:** Cooperación público-privada; servicios de agua y saneamiento; cooperativas de servicios de agua; servicios municipales; Finlandia

## Acknowledgements

The authors wish to acknowledge the Managing Directors and staff of the case-study water utilities for their assistance in obtaining the information. Mr Harri Mäki is acknowledged for his valuable inputs in assessing the data from the archives and for assistance in making the analysis on financial and economic performance of the utilities and institutional development stages.

## Introduction

The Finnish case study looks into the key principles and practices of public-private cooperation in water services based largely on local government (municipality) owned utilities which cooperate with the private sector. Such systems have a long tradition in larger Finnish cities and townships though many of them are fairly small compared with other European countries. In any case, this is the most common management model of water services in the EU member countries. It is important to note that the public involvement includes not only the state level, but also the regional and municipal (local) level. In the Finnish case, private sector involvement is understood in a broad manner, including also outsourcing non-core and support services and goods, incorporation of utilities, commercialisation of utilities, (small) private water associations and co-operatives, etc.

This option of municipality-owned utilities has several alternatives like the traditional municipal utility, an autonomous utility, a company owned by the municipality or an inter-municipal utility. In sparsely populated areas, joint water service systems are managed by private water cooperatives whose founding and operation are nevertheless in most cases supported by municipalities. Consumer-managed water and sanitation cooperatives in dispersed rural areas and small villages are largely private of their nature. Supra- and inter-municipal cooperation of water utilities is an increasing trend in Finland.

From Finland three (3) specific utility level case studies were selected, which elaborate the above mentioned issues in a practical manner. These case studies aim at contributing to the following overall objectives of the PRINWASS project. The three selected Finnish case studies are:

- 1) **LV Lahti Water Ltd** is a joint-stock full service water company owned by the city of Lahti in the southern part of Finland.
- 2) **Kangasala Municipality Water and Sewerage Works** is a municipal water and sewerage utility, which has been reformed as an autonomous municipal enterprise since 2002. It is responsible for drinking water supply and distribution, wastewater sewerage, and storm water drainage. The utility serves about 19,000 people within the area of Kangasala municipality.
- 3) **Lappavesi Ltd** is a bulk water supply (joint-stock) company owned by the municipalities of Lapua, Nurmo, Kuortane and Kauhava in the region of Southern Ostrobothnia in Western Finland (Map No 1). The population within the service area of Lappavesi Ltd is about 35,000. Lappavesi Ltd was established in 1972.

**Lapua Sewerage Ltd** is a joint-stock sewerage company owned by the municipalities of Lapua and Nurmo, and the Atria Oyj food processing company. Lapua Sewerage Ltd was established in 1973.

The case studies are based on collection and analysis of background material collected from the utilities; mainly annual reports and economic data (financial statements etc.).

Personal interviews were carried out with the Managing Directors of utilities and the Financial Manager of LV Lahti Water Ltd.

### **LV Lahti Water Ltd**

LV Lahti Water Ltd was selected as a case study as an example of a medium-sized town water utility, which is one of the first incorporated municipal water utilities in Finland. It was incorporated in 1994, and until then it was a semi-autonomous department of the city's technical department.

The main objective of selecting LV Lahti Water Ltd as a case study in PRINWASS project is to assess how incorporation of a municipal utility to a joint-stock company affects the performance and efficiency of the utility. Although the company is fully owned by the city, it operates strictly according to commercial operational principles. The case study will examine whether an incorporated municipal company can operate as efficiently as a private enterprise. Cooperation between the company and private enterprises in various types of supporting services is also studied.

### **Kangasala Municipality Water and Sewerage Works**

Development of water supply in Kangasala started in the 1950s. Since the 1970s, Kangasala has had active cooperation with the neighbouring municipalities in water supply. The development stages of the water utility have had various interesting features. The role of small private water works was important in the development of the municipal water utility.

### **Lappavesi Ltd and Lapua Sewerage Ltd**

Lappavesi Ltd is a bulk water supply (joint-stock) company owned by the municipalities of Lapua, Nurmo, Kuortane and Kauhava in the region of Southern Ostrobothnia in Western Finland (Map No 1). The population within the service area of Lappavesi Ltd is about 35,000. Lappavesi Ltd was established in 1972. Lapua Sewerage Ltd is a joint-stock sewerage company owned by the municipalities of Lapua and Nurmo, and the Atria Oyj food processing company. Lapua Sewerage Ltd was established in 1973.

Lappavesi Ltd and Lapua Sewerage Ltd were selected as case study utilities for the following reasons:

- Lappavesi Ltd as an example of wide supra-municipal cooperation in bulk water supply. The bulk supply company has clients among the municipalities (4) and several water cooperatives.
- Lapua Sewerage Ltd as an example of sewerage and wastewater treatment cooperation between municipalities and an industrial company.

The location of the three Finnish case study utilities is shown in Map No 1.

Map No 1.: Map showing the location of the Finnish case-study utilities



## Environmental conditions and water resources

### General

The United Nations World Water Development Report: Water for People, Water for Life (UNESCO, 2003) considers the water in Finland cleanest in the world. The report ranked 122 countries based on the quality of their water and their ability and willingness to improve it. Finland also scored the highest number of points on the overall Water Poverty Index which graded 147 countries according to their water use.

Finland has large resources of high quality raw water. About 60 per cent of drinking water is derived from groundwater, of which some 10 per cent is artificially recharged groundwater, and it usually requires little or no treatment. The rest of the drinking water

is obtained from surface waters, i.e. from rivers and lakes. Water quality is classified as good or excellent in about 80 per cent of the country's lakes and in 40 per cent of the rivers. Surface waters must be treated due to their high concentration of natural organic carbon which can, for example, lead to bad taste and odour.

Agricultural activities are presently the highest single source of nutrients to surface waters. The primary problem caused by these discharges is eutrophication of surface waters. Groundwater pollution caused by nitrate leaching from fields is a local problem. Nitrogen levels have been increasing, but the main reason may be the exceptionally warm and rainy winters in the late 1980s and early 1990s. The pulp and paper industry is clearly the most prevalent water polluting industrial sector in Finland (FEI, 2003).

### LV Lahti Water Ltd.

Lahti city gets its raw water mainly from the aquifer area of the Salpausselkä ridge in east-west direction and from the crush structure of Vesijärvi-Laune in north-south direction. The aquifer area is about 20 km<sup>2</sup>. It yields about 20,000-25,000 m<sup>3</sup>/d of ground water. The entire yield of groundwater aquifers within Lahti city area is about 30.000 m<sup>3</sup>/d.

There is another significant aquifer area in Hollola municipality area, called Hälvälä-Sairakkala aquifer area, which is about 45 km<sup>2</sup> wide. Its yield is about 45,000 m<sup>3</sup>/d.

The ridge formation of Salpausselkä acts as a natural filter and purifies the groundwater to such a level that it could be used as drinking water even without treatment. Groundwater is basically well protected from the effects of air pollution, radioactive fallout, bacteria, and from other potential contaminants. Salpausselkä groundwater has high oxygen content and does not contain excess iron, salinity, or other substances harmful to colour or taste. On the other hand, the aquifer areas are mainly located within the constructed city area, and need careful monitoring and protection to avoid gradual contamination through human activity.

The oldest groundwater intake in Lahti (Laune) had to be closed in 2001, because initially a small concentration of pesticides was detected and later the concentration exceeded the permissible level. The pesticide was called atrazine, which was commonly used until 1993 against weeds and pests.

LV Lahti Water Ltd made in 1994-1995 a groundwater protection plan for its groundwater intakes. This plan included a survey on the hydrogeological conditions and potential risks to groundwater. The most potential risks to groundwater quality were identified as (LV Lahti Water Ltd, 2003):

- Fuel stations and oil tanks
- Road and railway traffic
- Industrial chemicals

- De-icing chemicals (salts) used for roads
- Leaking sewers and infiltration of wastewater into ground
- Use of pesticides and fertilisers in gardens and parks
- Abstraction (excavation) of soil materials
- Excess soil landfills
- Car washing in unpaved areas.

The protection plan identified and proposed several alternative means and activities to reduce groundwater contamination risks. Many of these proposals have already been implemented, and the contamination risks have reduced for the most common risk activities. However, the groundwater contamination risk due to various solvents and pesticides persists also in Lahti. The closing of Laune groundwater intake in 2001 was a clear indication of this.

### Kangasala

Kangasala municipality gets its raw water from groundwater aquifers that are located along the ridge formations in north-west – south-east direction. The biggest water intake is Riku, which is located along Lake Vesijärvi about 4 km from the centre of the municipality. The raw water of Riku intake is mainly groundwater infiltrated from the lake. It is abstracted through four groundwater wells. The raw water is disinfected and pH is adjusted using soda.

### Lapua

Water resources for the use of Lappavesi Ltd are abstracted from the Lappakangas groundwater aquifer area in Kuortane municipality. The main reason for looking for regional cooperation in water supply was the unavailability of good quality raw water within the consumption area of most of the concerned municipalities (especially Lapua, Nurmo and Kauhava). Lappakangas area was the only significant good quality groundwater aquifer area in the neighbourhood.

Surface water resources (mainly rivers) in the area are not anymore in a condition that would favour their utilisation as a raw water source for drinking water purposes. The current surface water quality is also not suitable for artificial recharge of groundwater due to high concentration of organic matter.

## Characteristics and trends of the water and sanitation services

### Characteristics of water and sanitation services

Summary of the main characteristics and trends of water supply and wastewater services in the case study utilities are presented in Tables No 1 and 2.

Table No 1: Water supply services data.

Parameter	LV Lahti Water Ltd	Kangasala
<b>Connections</b>	11,550	3,656 households 19,730 cap
<b>Water supplied:</b>		
- billed (m <sup>3</sup> /d)	21,400	2,830
- UFW (%)	10.00	21.00
<b>Service coverage (%)</b>	97.90	87.40

Table No 2: Wastewater services data.

Parameter	LV Lahti Water Ltd	Kangasala
<b>Connections</b>	11,480	3,296 households 18,810 cap
<b>Wastewater amount:</b>		
- billed (m <sup>3</sup> /d)	22,190	2,706
- led to Tampere (m <sup>3</sup> /d)	-	4,239
- leakages (%)	25.00	56.60
<b>Service coverage (%)</b>	97.30	83.40

Recent trends in water and sanitation services are described in Tables 3.3 to 3.5, which show selected key performance indicators of LV Lahti Water Ltd from 1996 to 2001.

**Table No 3:** Selected performance indicators of LV Lahti Water Ltd in water supply from 1996 to 2001

INDICATOR (Water supply)	Unit	1996	1997	1998	1999	2000	2001
Water abstraction	Mm <sup>3</sup> /a	9.40	9,20	9.00	8.60	8.20	8.10
Water sales	Mm <sup>3</sup> /a	7.80	7.80	7.80	7.70	7.60	7.60
Max. consumption	m <sup>3</sup> /d	32,300	31,800	30,934	30,059	30,967	26,625
Min. consumption	m <sup>3</sup> /d	17,900	16,700	15,034	16,371	11,639	12,889
Unaccounted-for water	%	16.40	14.60	13.10	10.90	8.10	6,80
Energy consumption	kWh/m <sup>3</sup>	0.401	0.406	0.406	0.411	0.408	0.413
Water distribution network	km	443	443	444	446	447	458
Network maintenance costs	EUR/m	1.04	1.08	1.16	1.14	1.06	1.38
Network length per customer	m/customer	40.40	40.00	39.60	39.20	38.80	39.10
Customers (connections)	Number	10,964	11,098	11,240	11,378	11,528	11,703
Service coverage	%	97.70	97.70	97.70	97.70	97.80	97.90

**Table No 4:** Selected performance indicators of LV Lahti Water Ltd in wastewater services from 1996 to 2001.

INDICATOR (Water supply)	Unit	1996	1997	1998	1999	2000	2001
Service coverage	%	97	97	97.10	97.20	97.20	97.30
Billed wastewater	Mm <sup>3</sup> /a	8.20	8.20	8.40	8.20	8.20	8.10
Treated wastewater	Mm <sup>3</sup> /a						
- total		12.30	11.60	12.80	11.30	12.40	10.70
- Kariniemi		8.10	7.80	8.60	7.60	8.30	7.20
- Ali-Juhakkala	4.20	3.80	4.20	3.70	4.10	3.50	
Infiltration into sewers	%	33	30	34	27	35	25
Sewerage network	km	410	410	410	411	413	418
Storm water sewerage network	km	267	272	278	284	295	300
Network maintenance costs	EUR/m	0.72	0.79	0.79	0.77	0.78	0.75
Average age of rehabilitated sewers	years	35	37	37	38	40	37
Sewage pumping stations	Number	51	52	52	52	53	54
Pumping energy	kWh/m <sup>3</sup>	0.081	0.081	0.088	0.09	0.092	0.093

**Table No 5:** Selected performance indicators of LV Lahti Water Ltd in wastewater treatment and load to receiving water bodies from 1996 to 2001.

INDICATOR	Unit	1996	1997	1998	1999	2000	2001
BOD <sub>7</sub> :							
- Kariniemi	tn/a	67	82	55	42	52	34
- Ali-Juhakkala	tn/a	26	22	28	31	39	21
Ammonium nitrogen:							
- Kariniemi	tn/a	14.60	28.20	31.80	19.10	8.40	8.40
- Ali-Juhakkala	tn/a	5.70	2.40	9.30	6.80	7.70	1.80
Total nitrogen:							
- Kariniemi	tn/a	184	129	138	98	103	79
- Ali-Juhakkala	tn/a	143	130	119	123	137	135
Phosphorus:							
- Kariniemi	tn/a	2.30	3.60	2.10	2.30	2.70	1.70
- Ali-Juhakkala	tn/a	1.40	1.60	2.00	2.60	2.00	0.90
Bio-efficiency (BOD <sub>7</sub> + amm.N)	kg/ kWh	1.20	1.27	1.15	1.55	1.67	1.64
Phosphorus/ ferro-efficiency	P kg/ Fe tn	72.50	71.5	63.3	71.5	65.2	62.30
Energy consumption	kWh/ m <sup>3</sup>	0.65	0.75	0.70	0.71	0.65	0.72
Treatment costs	EUR/ m <sup>3</sup>	0.16	0.17	0.16	0.21	0.19	0.24

Figures No 1 and No 2 show the schematic operational structure of Lappavesi Ltd and Lapua Sewerage Ltd.

Figure No 1: Bulk water supply system of Lappavesi Ltd.

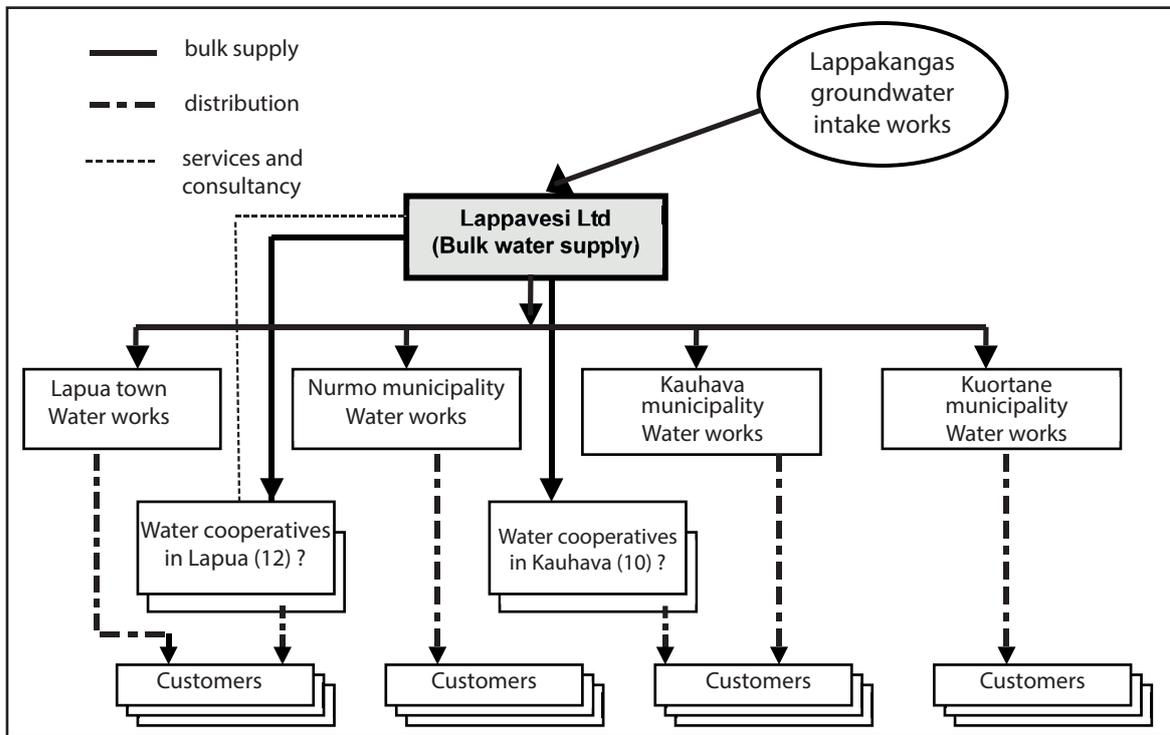
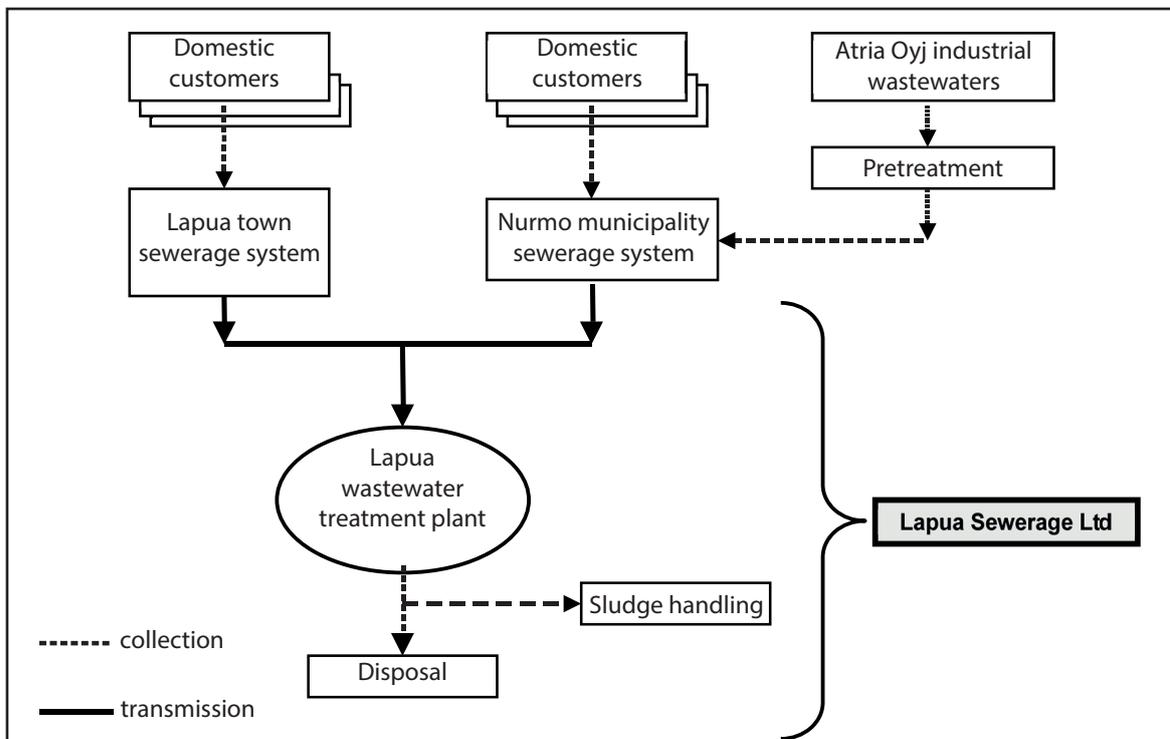


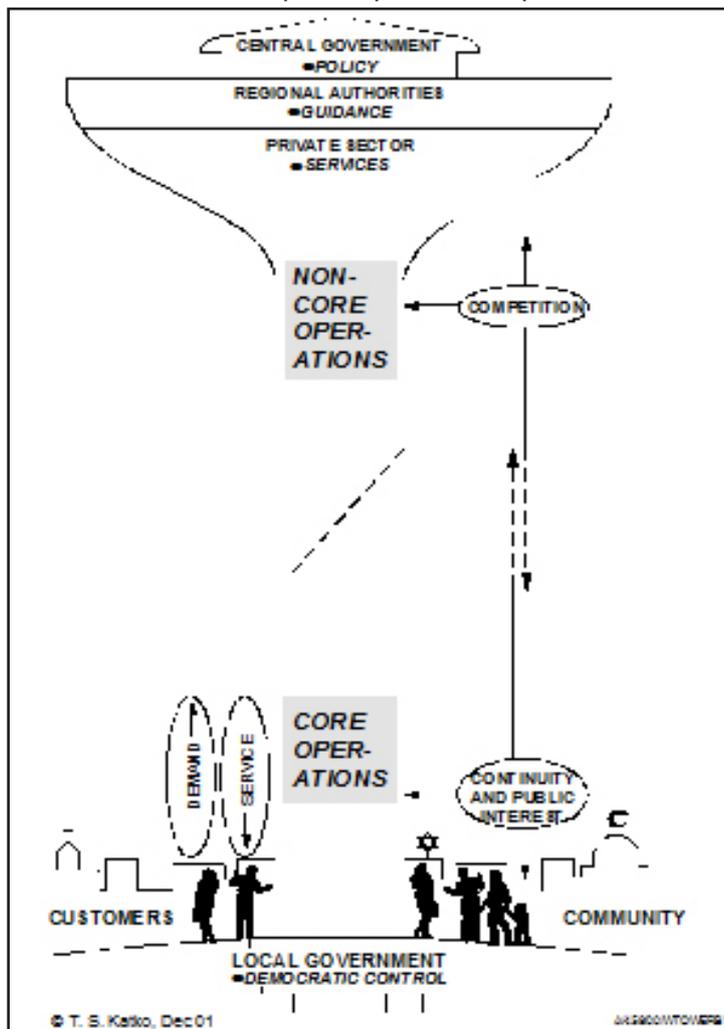
Figure No 2; Sewerage system of Lapua Sewerage Ltd.



Private sector involvement in water and sanitation services

Finland has a long and extensive experience in public-private cooperation in the water supply and sewerage sector, although perhaps not in the sense that public-private partnership is often understood (i.e. private finance initiative). Outsourcing of services – especially non-core services – of public water utilities in Finland is very extensive. Outsourced services can form as much as 60-80 per cent of the utility's turnover (cash flow) in many utilities. According to Metsälä (2001) the average cash flow of water utilities to private sector services varies between 21-65 per cent, the average being 40 per cent. In the actual operation and maintenance of utility operations, private sector services have mainly been used in pumping stations and sludge treatment. Figure No 3 illustrates the typical Finnish type of public-private cooperation, where water utilities are in municipal ownership but autonomous enterprises that outsource majority of their non-core services and goods from private companies.

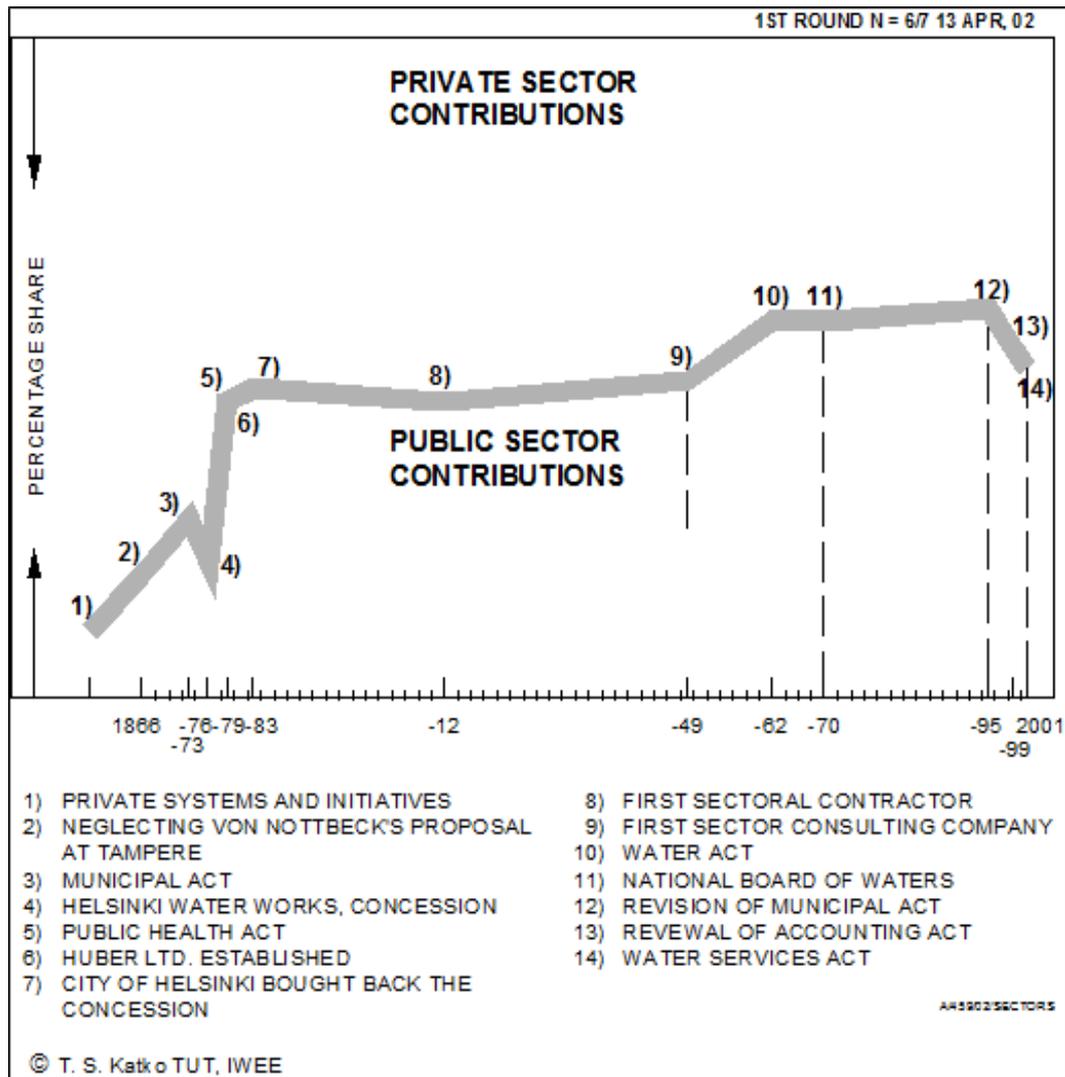
Figure No 3: The Finnish model of public-private cooperation in water services



Source: Hukka and Katko, 2003.

The relative shares of the public and private sector in the development of water and sewerage services in Finland have changed over time, as illustrated roughly in Figure No 4. The figure includes the authors' view of the main affecting events and factors in the relative shares.

**Figure No 4:** Relative shares of public and private participation in the development of water and sewerage services in Finland and the main factors affecting the changes.



Source: Modified from Hukka and Katko, 2003

### Private sector participation in the case study utilities

LV Lahti Water Ltd is a joint-stock company fully owned by the City of Lahti (all 20 shares are owned by the city). Yet, the utility operates mainly according to the commercial principles in a similar way as any private enterprises. The economic performance of LV Lahti Water Ltd has been very good since the incorporation.

In Kangasala the role of small private water works was important in the development of the municipal water utility.

A strong feature of Lappavesi Ltd is its supra-municipal cooperation (cooperation between several municipalities). The main driver for the supra-municipal cooperation was the unavailability of good quality raw water within the area of most partner municipalities, except Kuortane. The experiences for already 30 years from the bulk water supply company have been positive.

Lappavesi Ltd has different types of cooperation with the smaller water cooperatives in the area. Some water cooperatives buy water in bulk from Lappavesi Ltd, but some have their own groundwater intakes. Water cooperative probably remain independent as long as they still have willing and capable managers and champions. The municipalities seem rather unwilling to merge water cooperatives into their municipal water and sewerage works. Lappavesi Ltd sells some services to water cooperatives, but in a fairly limited scale. These include services related to water treatment processes, leakage detection, and alike. In fact, Lappavesi Ltd gives these services in most cases free as a sign of good public relations.

All three case study utilities are outsourcing services and activities substantially from the private sector (Charts No 1 to 7). The share of the private sector of the total expenditure varies between 45 and 80 percent on an average, but for Lapua Sewerage Ltd it has been as high as about 90 per cent on an average. The main activities and services that are outsourced from the private sector include:

- Construction and rehabilitation of infrastructure
- Materials supply (pipes and equipment)
- Instrumentation and automation works
- Maintenance and service.
- Laboratory services
- Sludge handling (1/3 of the annual turnover)
- Instrumentation and automation works
- Maintenance and service.

## Demo-geographic and socio-economic characteristics

Selected indicators of the demo-geographic and socio-economic characteristics of the municipalities and service area of the case study utilities are shown in Tables No 6 to 8.

Table No 6: Population in the municipalities of the Finnish case study utilities.

Municipality	Population (1.1.2003)	Total area (km <sup>2</sup> )	Population density (cap/km <sup>2</sup> )
Lahti	97,968		
Kangasala	23,010		
Lapua	13,998	751	18.60
Nurmo	11,323	362	31.30
Kuortane	4,366	462	9.50
Kauhava	8,161	485	16.80

The population of Kangasala has during the recent years grown strongly. The net population growth has been:

- Year 2000: 357 people
- Year 2002: 434 people (+ 1,9 %)

Kangasala aims strategically at about 100 people's net growth annually. The fact that the growth has been much bigger has caused increasing pressure also for water and sewerage services in form of investments into new water infrastructure. Population growth is mainly directed to existing housing areas in order to reduce network construction pressure for new areas. (Äikäs, Juuti and Katko, 2003).

Table No 7: Age and gender distribution of the population.

Municipality	Total population (1.1.2003)	0-14 years (%)	15-64 years (%)	65- years (%)	Male (%)	Female (%)
Lahti	97,968	15.90	68.20	15.90	47.00	53.00
Kangasala	23,010	20.40	66.80	12.80	49.30	50.70
Lapua	13,998	18.30	63.00	18.70	49.60	50.40
Nurmo	11,323	23.90	66.80	9.30	50.00	50.00
Kuortane	4,366	15.90	61.40	22.80	50.50	49.50
Kauhava	8,161	18.20	63.40	18.40	49.20	50.80

Table No 8: Employment and income development pattern.

Municipality	Agriculture and primary production (%)	Secondary production (%)	Services (%)	Unknown (%)
Lahti	0.3	31.6	66.5	1.6
Kangasala	2.8	31.1	64.8	1.3
Lapua	10.9	35.1	51.1	2.9
Nurmo	4.3	29.5	64.3	1.9
Kuortane	17.7	28.6	50.5	3.2
Kauhava	11.4	30.3	55.1	3.2

The biggest industrial employer in Lahti city is Isku-Yhtymä Oy – the furniture manufacturing company, which has about 1.160 employees. Lahti city has about 6.050 employees. In Lapua area the biggest employer in the area is Atria Oyj – the food processing company in Nurmo municipality, which has about 1750 employees. Nurmo municipality has about 500 employees.

## Techno-institutional development and innovation

### Characteristics of the system's infrastructure

#### *LV Lahti Water Ltd*

##### Water intake and treatment:

LV Lahti Water Ltd has seven (7) own groundwater intakes, which are located within the area of Lahti City and Hollola municipality. LV Lahti Water Ltd has an abstraction permit for 32,500 m<sup>3</sup>/d, and in addition it is allowed to purchase 3,000 m<sup>3</sup>/d groundwater from Hollola area from the federation of municipalities (between Lahti and Hollola). This federation was established in 1972 for raw water abstraction.

The groundwater is treated against pipe corrosion by dosing lime and sodium hydroxide. Small dosage of chlorine (0.1 g/m<sup>3</sup>) is added to prevent microbial growth in the network.

The current total capacity of the groundwater pumping stations is about 31.000 m<sup>3</sup>/d, as follows:

- Jalkaranta: 17,000 m<sup>3</sup>/d
- Urheilukeskus: 4,500 m<sup>3</sup>/d
- Laune: 4,500 m<sup>3</sup>/d (closed in 2001)
- Renkomäki: 2,500 m<sup>3</sup>/d
- Riihelä: 2,000 m<sup>3</sup>/d
- Kunnas: 1,000 m<sup>3</sup>/d
- Kärpänen: 1,000 m<sup>3</sup>/d
- Kuntayhtymä: 3,000 m<sup>3</sup>/d (water purchased from Hollola)

##### Water supply network:

LV Lahti Water Ltd has a water distribution network with total length of 450 km. About 50 per cent of the network consists of plastic pipes. There are altogether five (5) elevated water reservoirs (Löyttymäki, Mustankallio, Pirttiharju and Nikkilä).

The specific domestic water consumption is about 160 l/cap,d. The coverage is 98 per cent, which means that there are almost 95,000 people connected to the water supply network.

### Sewerage and storm water drainage network:

LV Lahti Water Ltd has a sewerage network with total length of 410 km and a storm water drainage network of 290 km. The sewerage network is divided into two main drainage areas (northern and southern). The city centre still has a combined system of wastewater and storm water sewerage. The system has over 50 sewage pumping stations.

### Wastewater treatment:

LV Lahti Water Ltd has two wastewater treatment plants:

- Kariniemi wastewater treatment plant for the northern drainage area
- Ali-Juhakkala wastewater treatment plant for the southern drainage area.

The two treatment plants treat altogether over 36,000 m<sup>3</sup>/d of wastewater in a biological-chemical process. Kariniemi treatment plant applies total nitrogen removal for part of the year. Both plants apply ammonium nitrogen removal. Phosphorus removal is achieved by using ferrous sulphate and ammonium nitrogen removal is assisted by using lime.

Treated wastewaters from Kariniemi are led in a rock tunnel (length 4,5 km) to River Porvoonjoki near the Ali-Juhakkala treatment plant. The rock tunnel is flushed every two weeks using lake water from Lake Vesijärvi. There is a balancing and settling basin for the flushing water in Ali-Juhakkala (area 1.5 ha and volume 62,000 m<sup>3</sup>). The settled sludge is treated at Ali-Juhakkala treatment plant.

Sewage sludge is treated at both treatment plants using digestion, drying and composting. Composted sludge is utilised for gardening and agriculture.

### *Kangasala*

#### Water intake and treatment:

Kangasala water and sewerage utility has three (3) own groundwater intakes. Groundwater is disinfected and also the pH is adjusted using soda. There are also two connections to the water distribution network of Tampere Water, through which Kangasala can draw 300-600 m<sup>3</sup>/d in exceptional situations.

#### Water supply network:

Kangasala water and sewerage utility has a water distribution network with total length of 185 km. There is a stripe shaped network from Huutijärvi village to Vatiala, and from Vatiala to Asema, Ruutana and Haviola villages. Raikku village has about 2 km of separate water distribution network. About 70 per cent of the network nowadays consists of plastic pipes (Äikäs, Juuti and Katko, 2003, p. 88).

There are three (3) elevated water reservoirs in the system (Kirkkoharju, Harjunsalo and Lentola) with a total storage capacity of 2.111 m<sup>3</sup>. There are also six pressure booster stations in the system (3 for domestic customers and 3 for industrial customers).

The specific domestic water consumption is about 143 l/cap,d. The coverage is about 87 per cent, which means that there are about 19,700 people connected to the water supply network.

#### Sewerage and storm water drainage network:

Kangasala water and sewerage utility has a sewerage network with total length of 166 km and a separate storm water drainage network of 21 km. The system has 46 sewage pumping stations and four storm water pumping stations.

#### Wastewater treatment:

Kangasala does not anymore have its own wastewater treatment facilities, because all wastewaters from the centralised sewerage system of Kangasala municipality have been transmitted to Tampere since 1980. The annual amount of wastewater transmitted to Tampere is about 1,5 million m<sup>3</sup>/a. The wastewater amount billed from customers is about 1,0 million m<sup>3</sup>/a.

#### *Lappavesi Ltd and Lapua Sewerage Ltd*

#### Water intake and treatment:

Lappavesi Ltd has altogether 33 groundwater intakes (wells) in a series of four aquifer areas. The intakes are located as follows:

- Menkijärvi and Lakajoki: 2 wells (1991)
- Kuopiontie and Akanristi: 3 wells (1993)
- Hirvikangas: 2 wells (1996)
- Hirvikangas / Perikytö: 2 wells (1997)
- Lahdenkangas / Kuortane: 2 wells (1999)
- Porrasoja: 4 wells (1999).

The ground water quality is reasonably good, but Lappavesi Ltd applies some treatment to the raw water. Iron and humus removal is done in Porrasoja treatment plant. The flotation sludge is dried using centrifuges. Disinfection is done using ultraviolet radiation. The current water use is about 15,500 m<sup>3</sup>/d. Industry uses about 4,500 m<sup>3</sup>/d and domestic customers about 11,000 m<sup>3</sup>/d.

#### Water supply network:

Lappavesi Ltd owns and operates the main transmission lines. Distribution networks and water reservoirs belong to the municipal water works in Lapua, Nurmo, Kauhava and Kuortane municipalities.

#### Sewerage network:

Lapua Sewerage Ltd owns and operates the main transmission sewer lines (about 18 km) and main pumping stations (5). Since 2002 the pumping stations have been operated and monitored using a remote controlled SCADA-system. Sewerage collection networks within the municipalities belong to the municipal water and sewerage works.

#### Wastewater treatment:

Lapua Sewerage Ltd operates the wastewater treatment plant which is located in Lapua town, constructed in 1993. The current population equivalent of the municipal wastewaters is about 9,000 (Lapua 7,000 and Nurmo 2,000). Industrial wastewater load is about 60 per cent of the total load. In addition to the main wastewater treatment plant, the system comprises a balancing tank (for industrial wastewaters) and alkaline dosing.

#### Stormwater drainage:

Stormwater drainage is the responsibility of the municipalities.

#### Capacity and innovations

##### *Human resources and organisation*

LV Lahti Water Ltd has about 100 employees. The number of employees has gradually decreased since the incorporation in 1994 (Table No 9). Distribution of staff to various departments and activities is shown in Figure No 4.

Table No 9: LV Lahti Water Ltd personnel 1996-2001.

Personnel	Unit	1996	1997	1998	1999	2000	2001
Permanent staff	Employees	107	105	102	100	98	96

Kangasala water and sewerage utility has nowadays 15 permanent employees (5 on monthly salary and 10 on hourly salary), and one temporary employer. In addition, there are 10 persons employed by the municipality who carry out tasks for the water utility, but are not paid by the utility.

Lappavesi Ltd has altogether six (6) employees ( $\frac{1}{2} + \frac{1}{2} + 4$ ) and Lapua Sewerage Ltd altogether four (4) employees ( $\frac{1}{2} + 3$ ). This means that some of the staff, such as the Managing Director, are shared between the two companies. (Figures No 5 and 6).

The water and sewerage works of the owner municipalities have the following sector personnel:

- Lapua: seven (7) employees (for water, sewerage, waste management, streets)
- Nurmo: five (5) employees
- Kauhava: 3-4 employees
- Kuortane: two (2) employees.

Figure No 5: Organisation and staffing of LV Lahti Water Ltd.

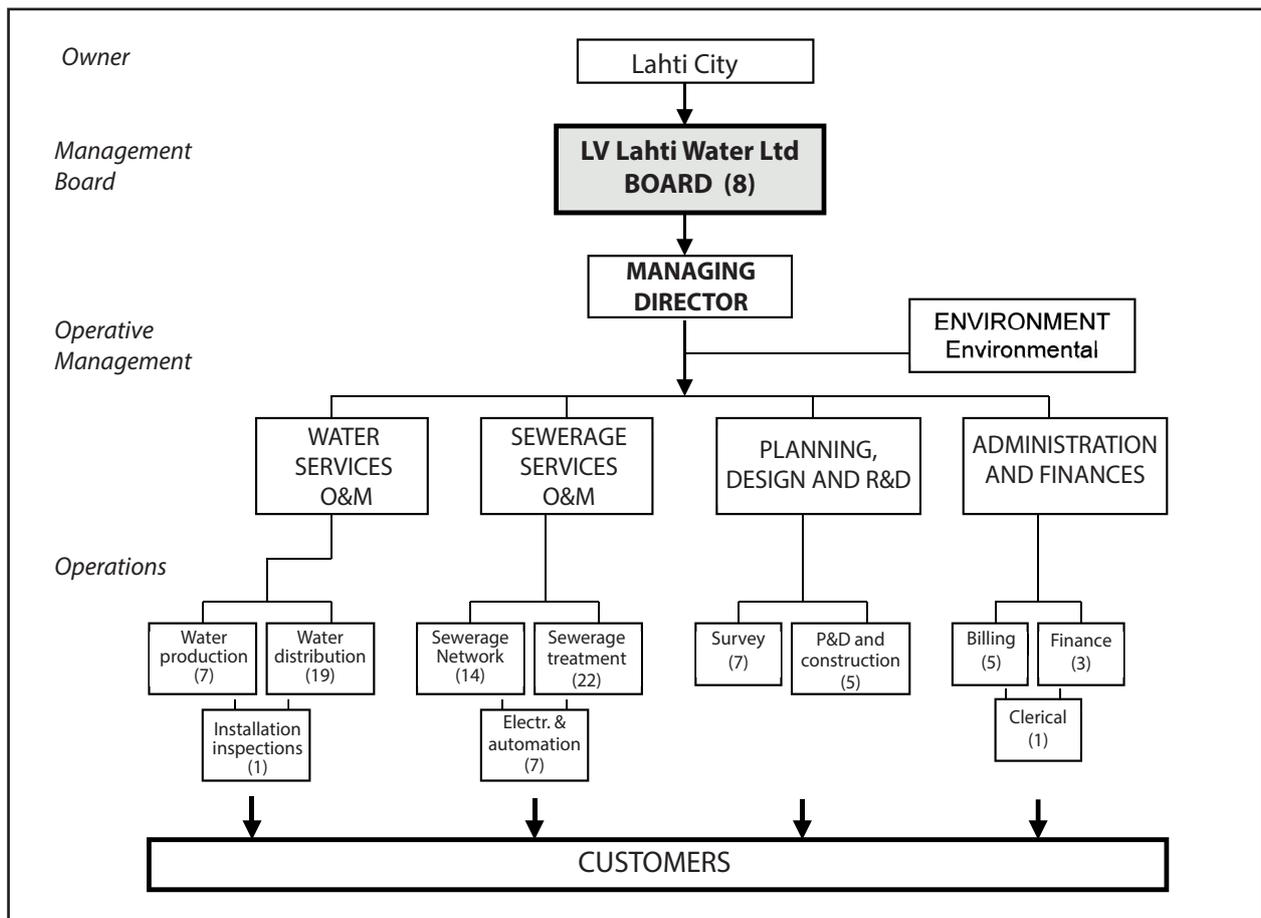


Figure No 6: Management system and staffing of Lappavesi Ltd.

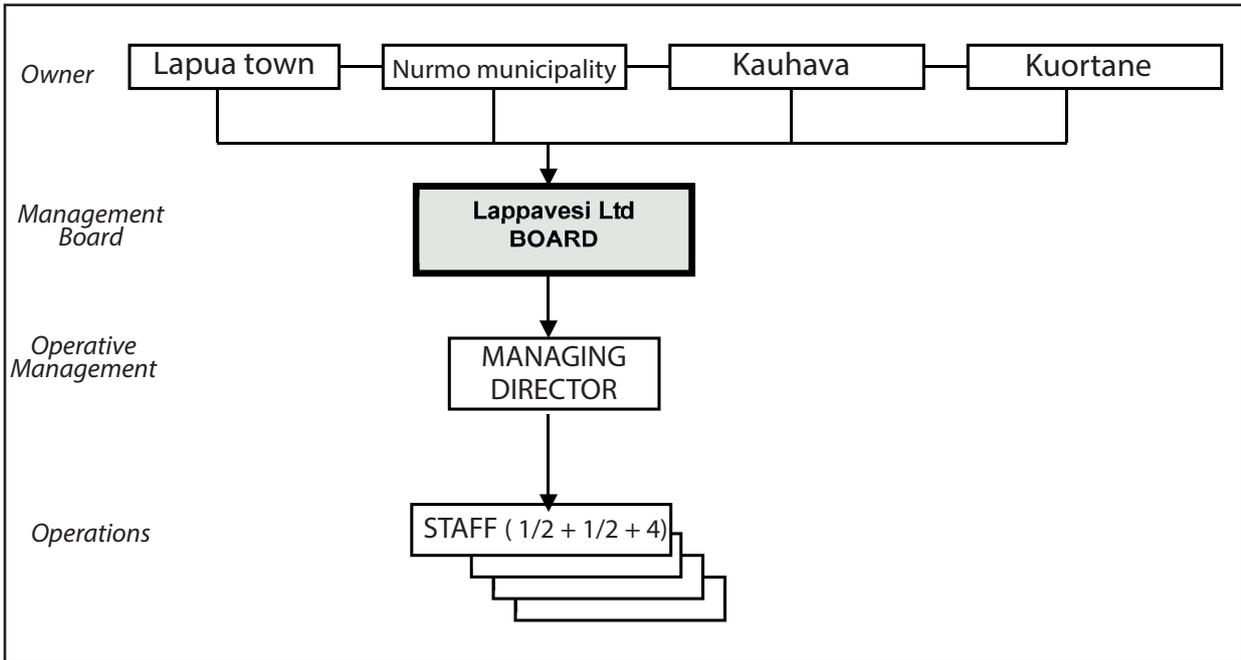
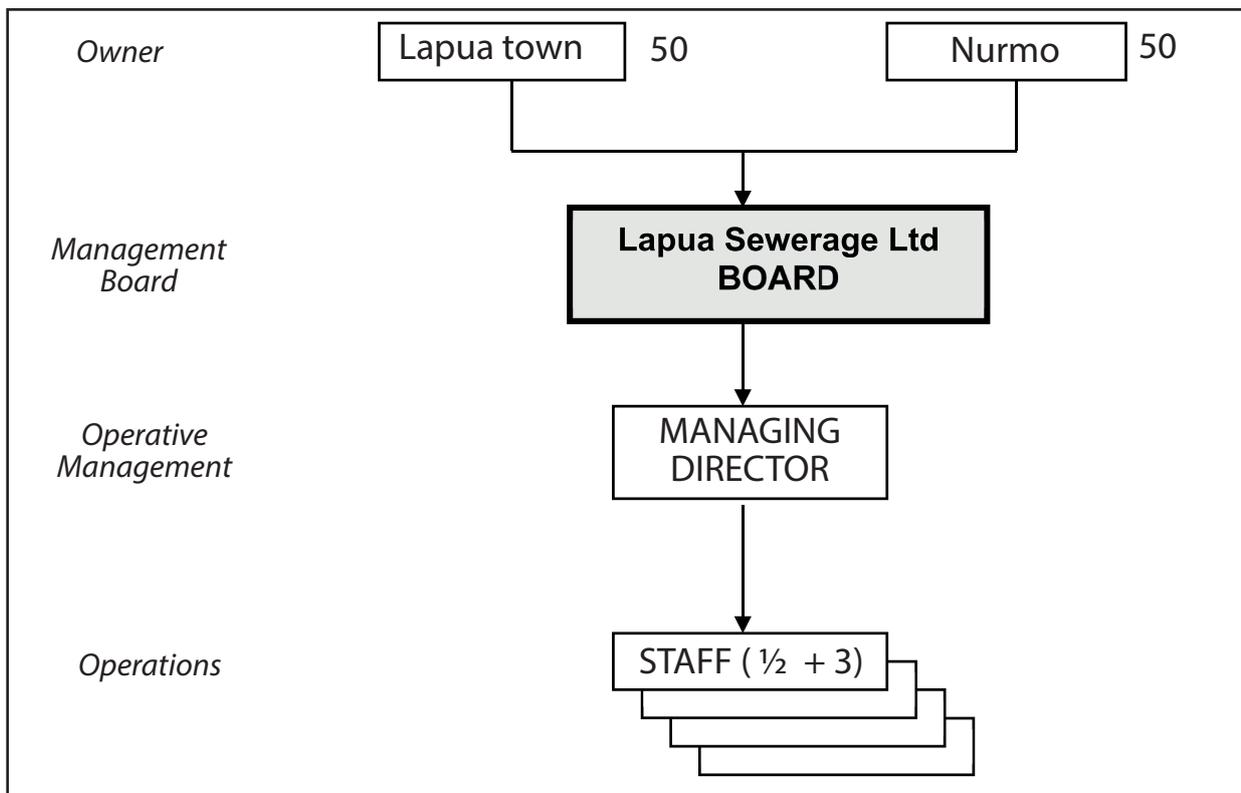


Figure No 7: Management system and staffing of Lapua Sewerage Ltd.



### Plans for future regional cooperation

LV Lahti Water Ltd has cooperation in water abstraction with Hollola municipality. There have been negotiations and plans on more active cooperation between the two utilities, but currently they are not progressing substantially.

There are plans for increased supra-municipal cooperation in water supply within the Tampere-Valkeakoski region (so called TAVASE-cooperation). Kangasala is also involved in this cooperation. According to these plans, all municipalities (13) in the area move gradually entirely to use groundwater.

According to TAVASE plans, a raw water intake and an artificial groundwater infiltration plant will be constructed in Vehoniemi area in Kangasala (Map No 2).

Map No 2: Schematic plan for TAVASE water intake areas and treatment plants.



Source: TAVASE, 2001.

### Technological innovations

Lappavesi Ltd has taken some innovative technologies in use among the very first Finnish water utilities. Some examples include:

- Vortex type flotation process as the third water utility in Finland
- Centrifugal drying of iron concentrated water treatment sludge as the first water utility in Finland
- Ultraviolet radiation disinfection (in use only in about 10 water utilities in Finland).

### **Policy-institutional environment**

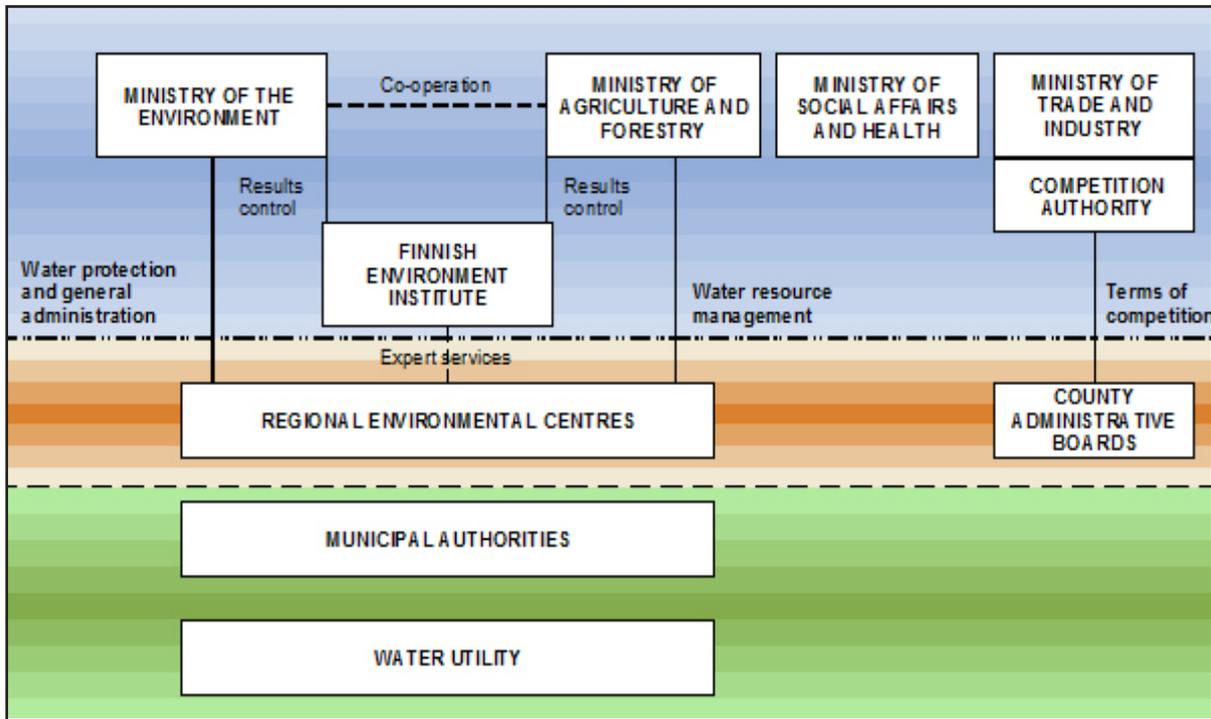
#### Institutional framework of water and sewerage services in Finland

The institutional framework of water and sewerage services in Finland is described in Figure No 7. Water resource management at the central (state) level is the responsibility of the Ministry of Agriculture and Forestry (MAF) and the Ministry of the Environment (MOE). These ministries are in charge of water and environmental policy and strategy development and legislation. Under these ministries the Finnish Environment Institute (FEI) operates as a national advisory body. Other national level key authorities are the Ministry of Social Affairs and Health (MOSAH) and the Ministry of Trade and Industry (MTI). MOSAH gives the guidelines for drinking water quality, and MTI through its Finnish Competition Authority currently supervises the economic activities and competition in the water and sewerage services sector.

At the regional level water utilities are supervised by the regional environment centres that also are responsible for regional planning, monitoring and guidance in water issues within their area. The Environmental Permit Authorities are giving the permits in accordance with the Water Act. They issue the permits for the utilities having the substantial environmental impacts.

Municipalities are responsible for the provision, i.e. the enhancement and development of water and sewerage services in their jurisdiction. The municipal council makes decisions concerning the general bases for charges for municipal and other services. The water and sewerage utilities, which are mainly owned by the municipalities, produce water and sewerage services in their service territory. Utilities are monitored and controlled by the municipal health protection and environment protection authorities.

Figure No 8: The role of central-, regional- and local level water administration in Finland.



Source: Modified from Vehmaskoski, Pietilä & Seppälä, 2002.

EU directives are put into effect by Finnish legislation. In 2001, an EU water policy framework directive came into force which established goals, minimum requirements and an action plan for water pollution control and sustainable use of water resources. The Water Act (1961) is currently amended. It deals with the water resources management in general.

The Environment Protection Act (2000) is a general law which governs activities which pollute soil, waters and air.

The Water Services Act (2001) sets a general obligation for the development of water and sewerage services by municipalities aimed at supplying a sufficient amount of domestic water of a good hygienic standard at a reasonable cost as well as proper sanitation from the viewpoint of environmental protection.

The Health Protection Act (1994) includes provisions on the quality of domestic water and its monitoring as well as several provisions on water works.

The Land Use and Building Act (2000) emphasizes the significance of environmental issues. The Act makes it easier to consider the conditions for organizing water and sewerage services.

Municipalities are obligated to chart the need for protection of waters and the

environment. They issue environmental protection orders for the building and maintenance of waste water systems.

### Water Services Act

The legal and institutional environment for water and sewerage utility operations in Finland is defined in the new Water Services Act (119/2001) (Ministry of Agriculture and Forestry, 2001).

The Water Services Act (119/2001), which conforms to the EU Water Framework Directive (2000/60/EC), contains provisions for the organisation of the water supply as well as for waterworks and charges. The Water Services Act repeals the earlier Act on Public Water and Sewerage Systems (1978) and the Act on Wastewater Rates (1974). Necessary minor revisions were made in the Health Protection Act (1993), Water Act (1961), Land Use and Building Act (1999), and in the Act on Assistance for the Community Water Supply Measures (1980).

Water Services Act harmonises the regulation of the water supply and sewerage and the related contract procedures and payment systems between the waterworks and their customers. According to the Water Services Act all contracts and charges related to water supply will be governed by the private law. According to the earlier act, the relationship between the utility and the customer was ambiguous, partly governed by the public law and partly a contractual relationship based on private law. The delimitation and procedures were also not fully clear, which could not be considered satisfactory in terms of the legal protection of neither the customer using the water nor the waterworks.

Water Services Act also contains provisions on consumer protection related to water services similar to those laid down in the Consumer Protection Act, in order to guarantee a minimum level of consumer protection in water issues. The purpose is to secure a minimum level of water services so that everyone will have access to healthy, high-quality household water at reasonable cost and that sewerage and purification of wastewater is appropriately organised in terms of health and the environment.

Water Services Act provides a more accurate definition of the relationship between the utility and customers in order to secure the availability and quality of services in changing conditions, such as the incorporation of municipal waterworks, and to clarify the responsibilities of municipalities, waterworks and real estates. Efforts are also made to improve the availability and level of water services in the population centres and sparsely populated areas outside the current territories of the waterworks.

The new Water Services Act regulates all water supply services for population and connected productive or leisure activities, whereas the former act was concerning only (public) water utility operations. The new act clarifies the roles and responsibilities of various stakeholders so that the municipality, water utility, households and regulatory authorities have better defined responsibility areas.

Municipalities have the responsibility to develop all water service within their area

according to the principles of the new act, and the water utility is responsible for utility services in their operational area. Household owners are responsible for their water supply by connecting to the utility's network and by taking care of their water supply equipment. Regulatory authorities are responsible for controlling that households connect to the network. The new act aims at harmonising the regulations in drinking water supply and wastewater disposal, and improving transparency of water utility economy and charges, and customer protection.

### Three main types of water and sewerage services

Finnish WSS utilities can be classified into three main categories based on the organisational and functional model:

1. Small private water associations serving country communities and sparsely populated areas within municipalities.
2. Municipal utilities serving population centres and municipalities.
3. Supra-municipal utilities.

In 2001 the total number of the two first categories including those serving more than 50 people was some 1970. The small systems, water associations can be partnerships, water cooperatives, or joint-stock companies owned mainly by municipalities. There were about 1 000 associations in 1988 and the number has increased in dispersed rural areas. The number of municipal water utilities in 1998 was about 500 and some 460 in 2001, slightly over the total number of municipalities. The small water associations, mainly cooperatives, usually provide water supply services, whereas sewerage services are provided by municipal utilities.

The water and sewerage utilities of bigger municipalities have been merged, although many of them still call themselves 'water utility'.

### Institutional development stages of the case study utilities

In the following the development stages of the three case study utilities are described more in detail, to give an idea of the impact of (i) overall policy and legal framework and (ii) local level decisions and issues (Tables No 10 a-e).

**Table No 10a:** Development stages of legislation and administrative changes in Finland and the case study utilities.

Year	Legislation	Lahti	Kangasala	Lapua
1951	The first Financing Act			
1953			Kangasala Water and Sewerage Cooperative	
1955			Central Village Waterworks Company joins Kangasala Water and Sewerage Cooperative.	
1957				Lapua Water and Sewerage Ltd
1959			Municipal water and sewerage utility established. Water supply committee changed to the Management Board of the water utility.	
1961	Water Act	The committee for technical and real estate affairs changed to a technical committee.	Public works committee established. Management Board of the water utility abolished.	
1968	Regional planning covers the entire country		The position of a Municipal Engineer established.	

**Table No 10b:** Development stages of legislation and administrative changes in Finland and the case study utilities.

Year	Legislation	Lahti	Kangasala	Lapua
1969		Water and sewerage operations centralised by establishing a water and sewerage works under the technical department. The WS works has its own director (previously under the Town Engineer; sewerage and wastewater treatment was under the construction department).		
1970	Water administration (National Water Board established)			
1971		Electricity committee established. Electricity works under the electricity committee.	Sewerage works are separated as an autonomous part of the water utility	
1972				Lappavesi Ltd established
1973	Act on the Water Protection Measures for Communities			Lapua Sewerage Ltd established
1974	Act on the Waste-water Rates.			

**Table No 10c:** Development stages of legislation and administrative changes in Finland and the case study utilities.

Year	Legislation	Lahti	Kangasala	Lapua
1976			Ilkko and the central village water cooperatives join the municipal water utility	
1977	Act on the public water utilities			
1978	Cabinet decision of the water supply works. Customer Protection Act.			
1980	Act on Assistance for the Community Water Supply Measures.			
1981			Technical committee established.	
1989		Water supply works became an autonomous municipal enterprise as Water and sewerage works. Transferred together with the electricity works under the new municipal enterprise committee and technical deputy mayor.		

**Table No 10d:** Development stages of legislation and administrative changes in Finland and the case study utilities.

Year	Legislation	Lahti	Kangasala	Lapua
1990	MAF decision on the terms of loans for water supply and water protection measures.	Lahti Energy Ltd is established and the committee for the public utilities is abolished. Water and sewerage utility back under the technical committee.		
1991	EU Urban Wastewater Treatment Directive.			
1992	Competition Restriction Act. Public Procurement Act. EU Directives on Public Procurement: 92/50/EEC			
1993	Health Protection Act. EU Directives on Public Procurement: 93/36/EEC and 93/38/EEC			
1994		LV Lahti Water Ltd: Managing Director, Management Board, Supervisory Board.		
1995	Finland joins EU. Local Government Act amended. Decree on Assistance for the Community Water Supply measures.		O&M of storm water sewers is transferred from the road board to the water utility	

Table No 10e: Development stages of legislation and administrative changes in Finland and the case study utilities.

Year	Legislation	Lahti	Kangasala	Lapua
1998	EU Urban Wastewater Treatment Directive. EU Drinking Water Directive.			
1999	Land Use and Building Act.			
2000	Environmental Protection Act. EU Water Framework Directive.			
2001	Water Services Act. Land Use and Building Act. Water Act amended. Health Protection Act amended.	Supervisory Board is abolished.		
2002			Water utility becomes an autonomous municipal enterprise.	

## Economic and financial aspects

### Financing and economy of the Finnish water services sector

The government financing in water services sector increased in real terms until the 1980s, but was never more than 10 percent of total investments. In the 1970s and 1980s, the government provided finance for groundwater investigation and, especially, larger WSS and water protection projects to foster the establishment of supra-municipal cooperation. The government's share has been rather small, and it has been used solely for the advancement of common projects. The water and sewerage utilities together with the municipalities have assumed main responsibility for the projects.

Initially, municipalities financed projects through taxation, but, especially in the 1980s and 1990s, the finance has come increasingly through water and wastewater charges. The new Water and Sewerage Services Act interestingly stipulates that WSS charges can include no more than a reasonable rate of return for investments.

Most water utilities of the largest cities in Finland are economically very profitable,

and they have applied commercial bookkeeping already since the late 1980s. Most large urban water utilities adopted a water-pricing system during the last decade that made the earlier used 'hidden taxation' more visible. Although these municipal utilities originally aimed at reasonable cost recovery, many of them earned excessive profits for the owner organisations. Tariffs were not always based on full cost recovery but on the need to subsidise other public sector activities or to finance activities of the municipal central administration. Some of these utilities have annually gained profit to their owner municipalities as high as 8-15 per cent as a rate of return on capital and 30-40 per cent of the annual turnover. Water charges were used to repay again for the infrastructure investments that already have been paid for, and eventually reimburse the returns to the municipality. Customers in Finnish water utilities pay on average EUR 17-35 per capita per annum as return on capital to the municipal owner of utility. Some of these large utilities will in the future face high pressure of reducing their charges.

According to the Water Services Act, all municipal water utilities should have adopted the commercial bookkeeping principles by the end of 2001. Thus, they would all become autonomous municipal enterprises. In practice the transition period seems to become longer. Water utilities should clearly separate their economy from the general municipal economy. Utilities should use capitalised costs based on the original purchase values as the book value of their fixed assets, as stated in the bookkeeping act and decree. Utilities should annually make their own financial statement and balance sheet.

### Water and wastewater charges and pricing

Water charges in Finland are in general reasonable, and form only a small portion of the overall living costs. The relationship between the price and the quality of service is so strong that it cannot be significantly changed. Better possibilities to lower charges are with utilities that have set their tariffs rather according to the average national tariffs than according to their own real costs. It is easier to reduce water charges in the short-term by neglecting maintenance and by increasing risks. One alternative is to compensate volumetric consumption charges with basic charges. Large utilities seem to charge higher tariffs than necessary for cost recovery purposes, because they have been able to bring substantial profits to their owner municipalities. On the other hand, the smallest municipal utilities overrate heavily at loss, and need municipal subsidies through tax revenue.

In principle, most municipal water utilities in Finland aim at the Full Financial Cost Recovery (FFCR). According to the new Water Services Act, charges should on the long run cover all water supply investments and operation and maintenance costs. Charges may include only a reasonable rate of return on capital investment. Water supply investments can be subsidised by the municipality, the state, and the European Union.

According to the new Water Services Act (119/2001) the municipality decides also on the service charges of the water and sewerage utility. In practice, this does not anymore mean that in all cases the municipal councils would decide on the water and sewage charges as it used to be earlier. All municipal water utilities should (gradually) become autonomous municipal enterprises. Thus, their Board would decide on the charges. In

joint-stock companies – whether municipality or privately owned – the Board decides on the charges. In all types of private operators, including water cooperatives, the Board decides on the charges. The charges of all water utilities are now based on private law. Thus, there are no judicial differences in the charges between municipal utilities, joint stock companies and cooperatives.

The guidelines and recommendations for water utility charges were renewed recently. The guidelines aim at harmonising the principles of charging and tariff structures, but certainly not the tariff levels. These guidelines include a proposal on how the regulations of the Water Services Act are applied in practice. These guidelines are an internal tool for the utility and municipality and they are not distributed to the customers. Instead, the revised tariff and service charge schedules are distributed to the customers when new service agreements are being made or agreements are being amended. Water utilities that are organised in form of joint-stock companies or cooperatives have flexibility to define their tariff structures, but in practice they follow the same principles as the municipal water utilities.

The new Water Services Act enables the utilities better to renew their tariff structures to comply with their actual cost structure. According to the Act the tariffs and charges now always consist of:

1. (Volumetric) user charges, which can cover all types of operational costs
2. (Fixed) basic charges (if relevant separately on water and sewerage), which can only cover fixed operational costs
3. Connection charges, which can cover investment costs
4. Other charges, such as various service charges.

Water utility must charge a user charge, which is based on the amount of water used and on the amount and quality of wastewater discharged. In addition, the utility can charge a connection fee, a basic charge, and other charges for its services. Other charges except the (volumetric) user charge can be different in different areas within the utility's operational area.

These service charges include e.g. water meter inspection fee, meter reading fee (in case that the customer has not submitted the meter reading to the utility in time), construction charges for service lines and opening charges of blocked sewers. Other service charges include fees for the use of fire fighting equipment, closing and opening charges for valves at the request of the customer, and other services that customers may order from the utility.

The new Water Services Act also enabled the utilities to collect fixed charges on sewerage. Earlier sewerage charges were mainly volumetric, and were based directly on the quantity of water used. According to the recommendations, fixed charges should not usually exceed one third of the total amount of fixed and user charges. Utilities can also justify fixed charges, if they do not intend to apply connection charges.

The revision of the pricing structure in Finland was justified also to correct the previous discrepancy in the cost recovery practice. In most water utilities the bulk of the revenue (over 90 per cent) used to come from variable income (revenue based on volumetric charges according to water use) and only a small portion (less than 10 per cent) from other (fixed) revenue. On the other hand, the actual cost structure in water utilities is practically just the opposite. Majority of the costs (80-90 per cent) are fixed and fairly independent on the volume of operations, such as capital costs, maintenance and depreciation of fixed assets, and personnel costs and administration. The recent amendments aim at increasing the share of revenue from fixed charges to 25-35 per cent of all water revenue income.

Finland applies the common EU principles of “polluter pays” also in water services. Wastewater charges are typically environmental taxes, and in Finland they are applied fully according to the polluter-pays-principle. Sewerage charges are collected by water utilities as customer charges, including volumetric user charges, basic charges, and connection charges.

#### Charges in the case-study utilities

Table No 11: Water and wastewater tariffs in LV Lahti Water Ltd from 1996 to 2001.

TARIFF	Unit	1996	1997	1998	1999	2000	2001
Water charge	EUR/m <sup>3</sup>	0.76	0.76	0.76	0.76	0.76	0.76
Wastewater charge	EUR/m <sup>3</sup>	1.03	1.03	1.19	1.19	1.19	1.19

Table No 12: Water and wastewater tariffs in Kangasala water and sewerage utility from 1996 to 2002.

TARIFF	Unit	1996	1997	1998	1999	2000	2001	2002
Water charge	EUR/m <sup>3</sup>							1.05 (0,86)
Wastewater charge	EUR/m <sup>3</sup>							1.55 (1,27)

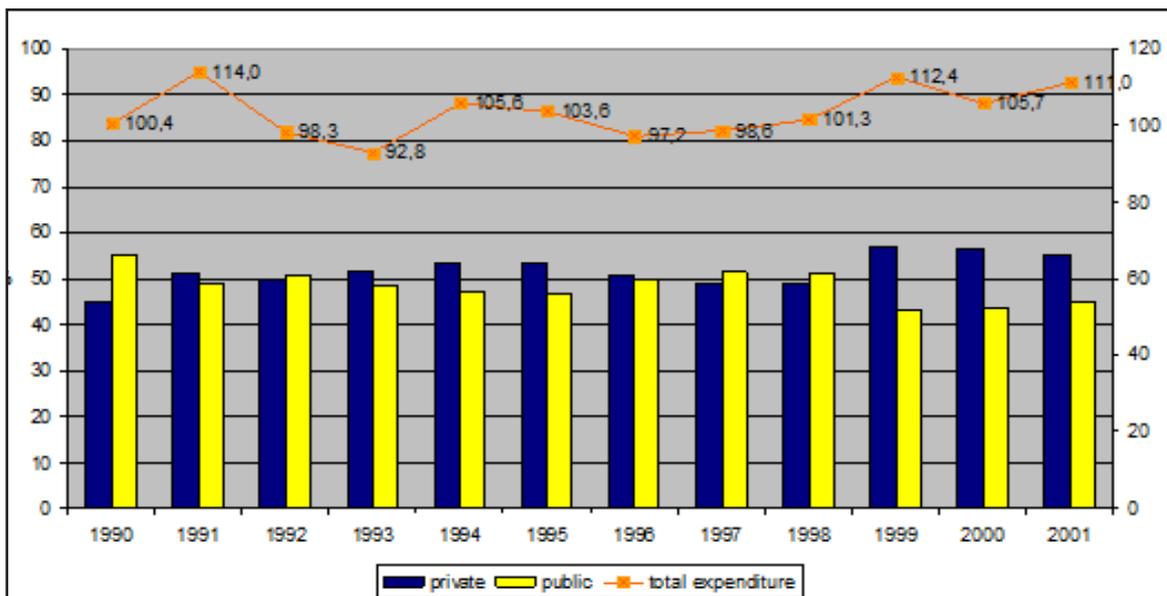
Lappavesi Ltd sells bulk water to municipalities at a rate of 0.24 c/m<sup>3</sup>. The same bulk water rates are applied to all municipalities. Municipal water tariffs for domestic customers are on average 0.8-1.0 EUR/m<sup>3</sup>. Water cooperatives mainly apply the same water tariffs as the municipalities (at least in Lapua town).

Financial and economic analysis of the Finnish case-study utilities

*LV Lahti Water Ltd*

The annual turnover of LV Lahti Water Ltd is about EUR 14 million. Total expenditure of LV Lahti Water Ltd has varied in the 1990s between FIM 92,8 million (EUR 15,6 million) and FIM 114,0 million (EUR 19,2 million) (Chart No 1).

Chart No 1: LV Lahti Water Ltd, total expenditure and the share of private and public sectors in 1990-2001.



The annual turnover (in 2001) is divided so that the share of water sales is 33,5 per cent, wastewater charges 58,5 per cent, and other services 8.0 per cent (LV Lahti Water Ltd, 2003). The profit in 2001 was FIM 3,0 million (about EUR 0,5 million). In 2000 the profit was FIM 4,0 million (EUR 0,67 million).

The company had debts for FIM 3,8 million (EUR 0,64 million) at the end of 2001. The closing figure in the balance sheet (2001) was FIM 420,3 million (EUR 70,7 million). Liabilities were 0.7 per cent of the closing figure in the balance sheet. The rate of self-financing based on income financing of investments was 109.4 per cent. The company did not need loan capital to finance investments in 2002. (LV Lahti Water Ltd, 2003).

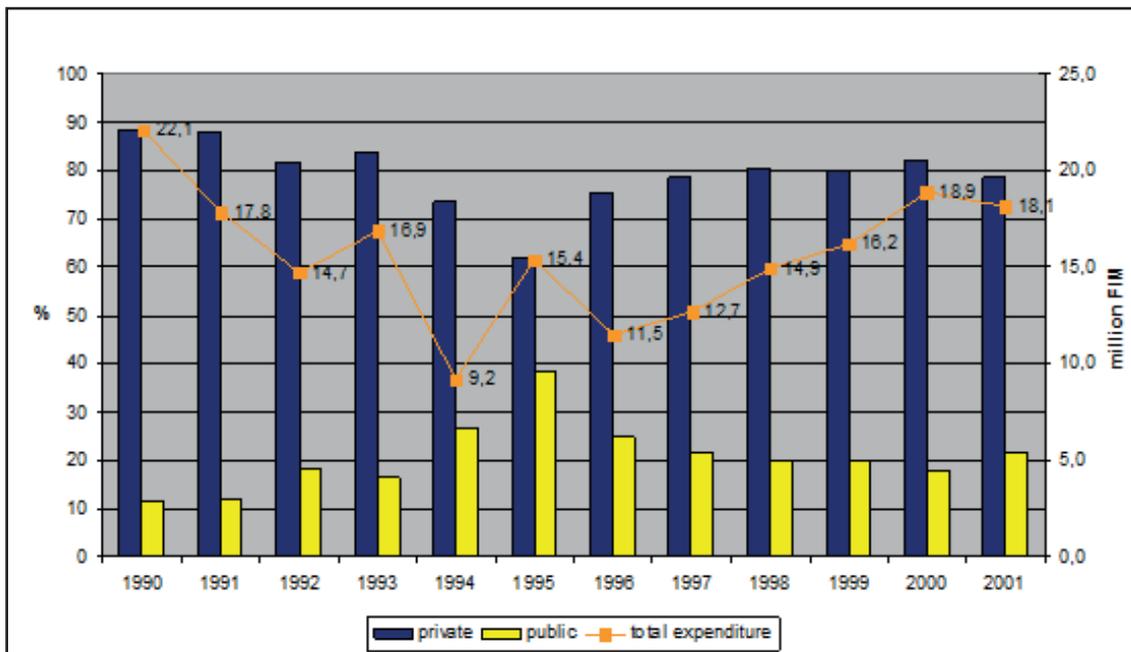
The costs of fixed assets in 2001 were FIM 30,4 million (EUR 5,1 million), of which the personnel costs were about 4 per cent (FIM 1,2 million). Costs of purchasing and rehabilitating buildings and related machinery and equipment were FIM 24,6 million. New equipment were purchased for FIM 1,3 million.

The economic performance of LV Lahti Water Ltd in 2001 was even slightly better than planned, and it was achieved without any increments in the water and wastewater tariffs, which yet were very reasonable when compared to the average tariffs in Finland (LV Lahti Water Ltd, 2003).

### *Kangasala*

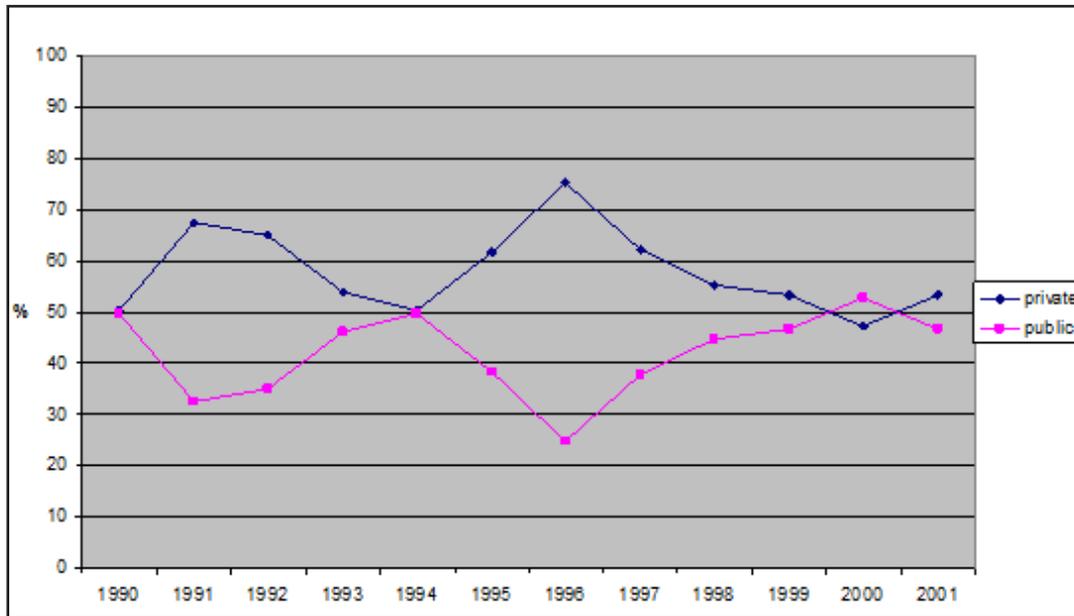
The annual turnover of Kangasala water and sewerage utility is about EUR 2,8 million. Total expenditure of Kangasala water and sewerage utility has varied in the 1990s between FIM 9,2 million (EUR 1,5 million) and FIM 22,1 million (EUR 3,7 million) (Chart No 2).

Chart No 2: Kangasala water and sewerage utility, total expenditure and the share of private and public sectors in 1990-2001.



Kangasala water and sewerage utility is outsourcing services and activities substantially from the private sector (Charts No 2 and 3). The share of the private sector of the total expenditure varies between 45 and 70 percent on an average.

Chart No 3: Kangasala water and sewerage utility, services purchased from the private sector in 1990-2001.



Operational costs in 2000 were about FIM 8,0 million (EUR 1,3 million). In addition there were FIM 0,6 million of water utility expenditure which was recorded as expenditure in other municipal departments. The biggest single expenditure item was the wastewater treatment fee to Tampere City, about FIM 3,7 million.

Water sales revenue in 2000 was FIM 12 million. The operating margin in year 2000 was 33 per cent, which was rather good. This means that about FIM 4 million per annum of the water sales revenue will remain available for investments and as return on investment (ROI).

The book value of the fixed assets of the water utility in 2000 was FIM 37 million. The cumulative acquisition value of the fixed assets is over FIM 100 million, which means that the book value is about one third.

The oldest part of network has been constructed almost 50 years ago. The biggest part of network has been constructed in the late 1960s and in the 1970s. This means that a substantial part of the network is soon reaching its reasonable operational life time. Rehabilitation and replacement investment needs for networks are emerging. The utility has estimated that the annual replacement investments (for networks and plants) in the coming years will be about FIM 3,9 million (EUR 0,5 million). Total cumulative rehabilitation and replacement investments since 1989 have been about FIM 7 million (EUR 1,2 million), which means annually only FIM 600.000 (EUR 100.000).

Based on the rapid population growth and increase of customers, the need for new investments has been estimated at FIM 2,5 million annually. There will be large seasonal variation in the new investments. New investments are mainly covered by connection fees and operational margin of the utility. Only if these will not be adequate to cover

investment costs, the owner (municipality) will have to spend additional capital to the utility. Another possibility is that the utility takes additional loans from the municipality or from external borrowers. The utility had liabilities in 2000 for about FIM 3 million, with interest payable for about FIM 30.000.

The gross investments of Kangasala municipality in 2000 into water and wastewater services were as indicated in Table No 13.

Table No 13: Kangasala municipality, gross investments in water supply, 2000.

INVESTMENT	FIM total	FIM / inhabitant
Water distribution network	2,965,076	133
Sewerage network	4.353.709	198
Sewerage equipment	7,000	0
<b>TOTAL</b>	<b>7,325,785</b>	<b>331</b>

*Lappavesi Ltd*

The annual turnover of Lappavesi Ltd has been during the recent years about 1 million euro. Total expenditure of Lappavesi Ltd has varied in the 1990s between FIM 4,2 million (EUR 0,7 million) and FIM 15,1 million (EUR 2,5 million) (Charts No 4 and 5).

Lappavesi Ltd is outsourcing services and activities substantially from the private sector. The share of the private sector of the total expenditure varies between 60 and 80 percent on an average.

Chart No 4: Lappavesi Ltd, services purchased from the private sector in 1990-2001.

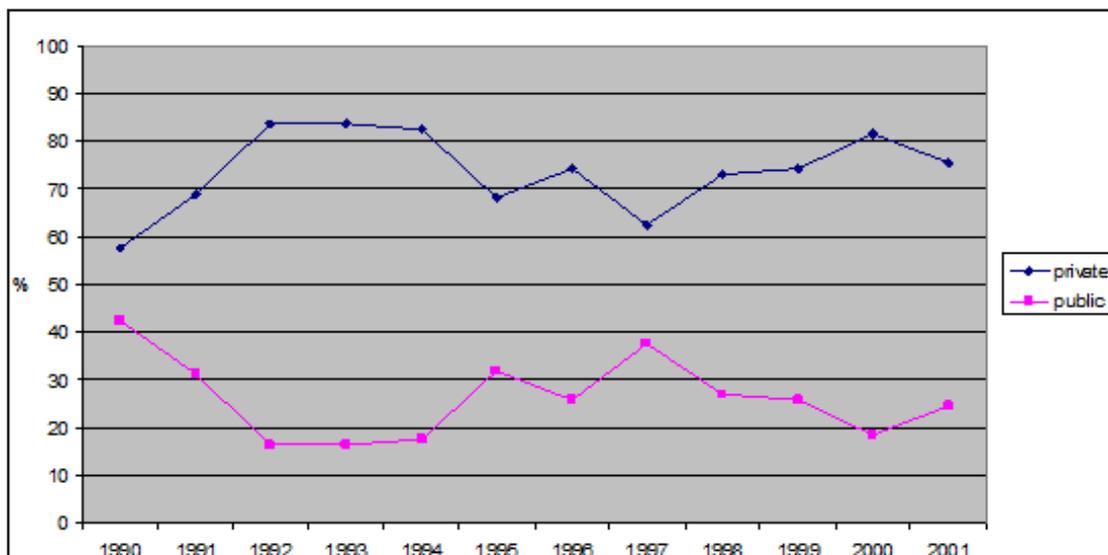
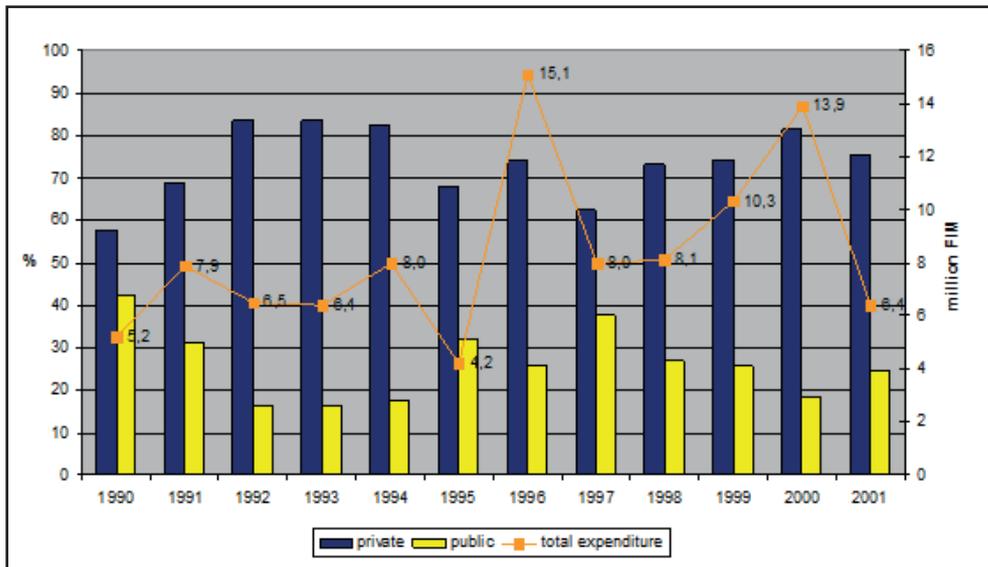


Chart No 5: Lappavesi Ltd, total expenditure and the share of private and public sectors in 1990-2001.



### Lapua Sewerage Ltd

The annual turnover of Lapua Sewerage Ltd is about 1,8 million euro. Total expenditure of Lapua Sewerage Ltd has varied in the 1990s between FIM 2.4 million (EUR 0,4 million) and FIM 11.4 million (EUR 1,9 million) (Charts No 6 and 7). Lapua Sewerage Ltd is outsourcing services and activities substantially from the private sector. The share of private sector of the total expenditure has been about 90 per cent on an average.

Chart No 6: Lapua Sewerage Ltd, services purchased from the private sector in 1990-2001.

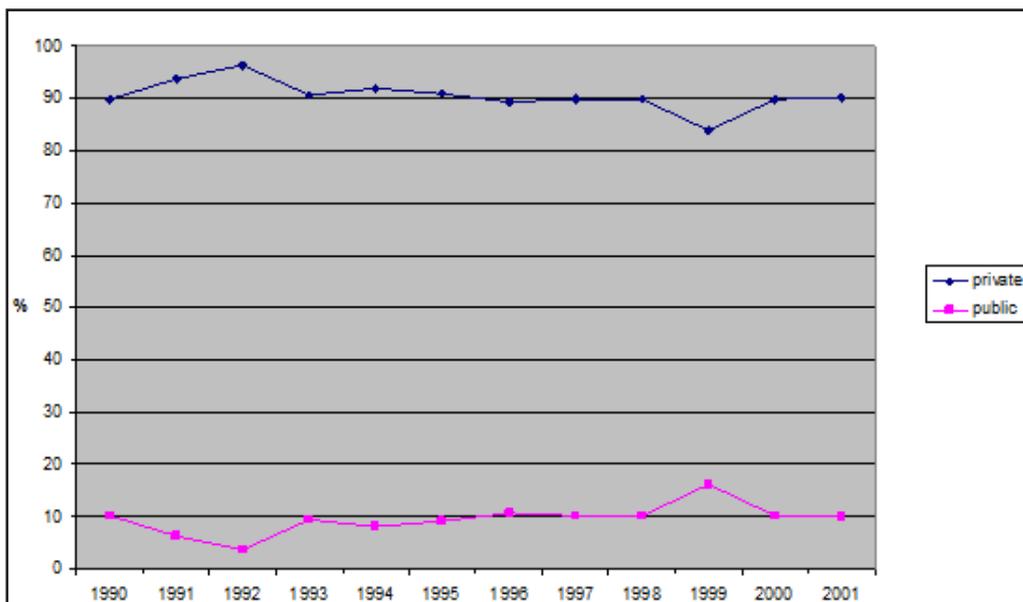
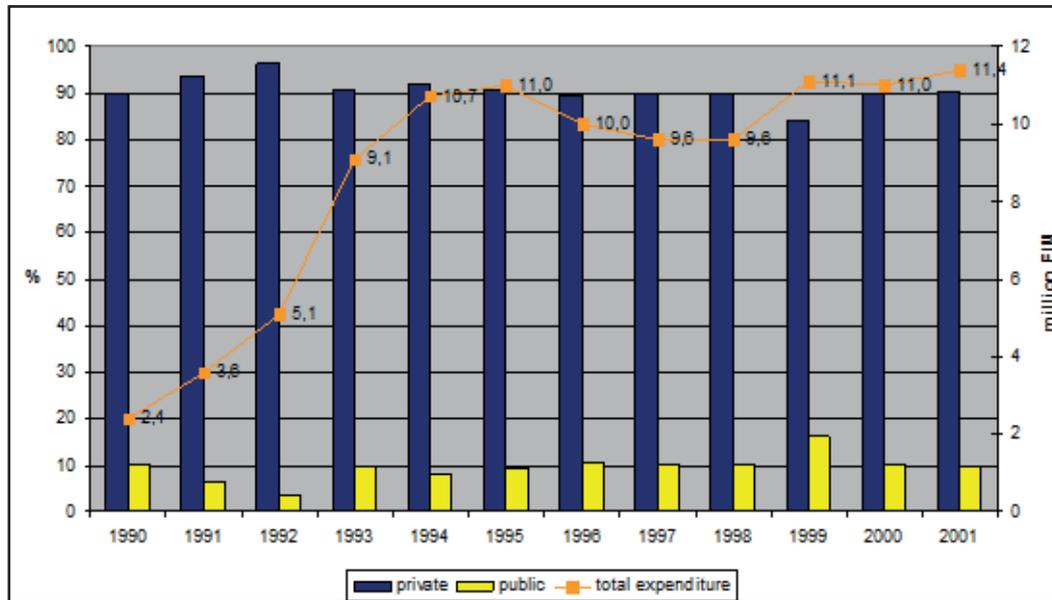


Chart No 7: Lapua Sewerage Ltd, total expenditure and the share of private and public sectors in 1990-2001.



These figures are based on the income statement of the companies. Therefore, they may contain even rough estimates. However, the figures have partly been cross-checked through personal communication with the Managing Director.

Lappavesi Ltd used to have very low debt rate in the past, but during the recent years it has increased its debt financing and invested more. Bulk water tariffs have been kept reasonably low due to increased debt financing. The amount of debts is currently about EUR 1 million, which is roughly equivalent to the annual turnover. The operational margin of Lappavesi Ltd is currently about 40 to 50 per cent. Since 1997 Lappavesi Ltd has been taxed for its annual income.

Lappavesi Ltd’s annual turnover (expenditure) is roughly divided to the following:

- Personnel about EUR 0,23 million
- Equipment and materials about EUR 2,3 million
- Depreciations about EUR 0,33 million
- Financing costs about EUR 0,05 million
- Other costs about EUR 0,05 million.

For the last five years the investment level of Lappavesi Ltd has been about EUR 0,67...0,83 million. Lappavesi Ltd applies personal securities for the loans, which keeps loan servicing costs low. The company can decide independently on its investments.

This ensures dynamic operation. Even in the case of debt financing the total time required for availing the funding after investment decision may be maximum 1,5-2 months. The flexibility of the joint-stock company is much bigger than it would in the case of municipal water works subjected to municipal council decision-making process.

### **Socio-cultural and political aspects**

Water services are discussed fairly little in Finland. The debate is mainly concentrated among the sector professionals. The public and customers are not much involved in the discussion. Water services function traditionally well, which may explain why there is not much public debate on it. It seems, however, that majority of the Finnish citizens still prefer that water and sewerage services would be retained as a municipal service (KTV, 2003). In a recent survey (KTV, 2003), 51 per cent of the interviewees consider that water services are essential basic services that should be provided by the municipalities also in the future.

There is a current heated debate in Finland about the number of municipalities. Finland has still over 400 municipalities (448 in 2002), but there is an ongoing debate whether the number of municipalities should be reduced and to what extent. Municipalities have during the recent years had increasing economic problems. Especially small municipalities have difficulties in carrying out all their service obligations. This is caused by: (1) the growing number of duties and obligations set to the municipalities, (2) the reducing number of inhabitants and taxpayers in small municipalities, and (3) decreasing state subsidies for municipalities.

The smallest municipalities have increasing difficulties to manage their water utilities in an efficient and economically self-sufficient manner. On the other hand, larger municipal water utilities are doing economically well, and actually have earned substantial profits to their owner municipalities. In most cases these profits have not much been used to develop water services, but they have been used as "hidden taxes" to finance municipal services in other – less profitable – sectors.

There are no actual "social tariffs" in use in Finland, meaning that in domestic use water tariffs would be progressive or be based on increasing-block rates. Basically, all domestic customers within the same utility pay equal volumetric charge per m<sup>3</sup> of water used, independent on the quantity. Also the new Water Services Act states that the volumetric user charges should be uniform throughout the utility's service area, but other (fixed) charges may vary. Block rates may be used for commercial and industrial customers in some cases.

## Summing up

Finland has abundant resources of high quality raw water. About 60 per cent of drinking water is derived from groundwater, of which some 10 per cent is artificially recharged groundwater, and it usually requires little or no treatment. The rest of the drinking water is obtained from surface waters, i.e. from rivers and lakes.

Finnish water and sewerage utilities can be classified into three main categories based on the organisational and functional model:

1. Small private water associations serving country communities and sparsely populated areas within municipalities.
2. Municipal utilities serving population centres and municipalities.
3. Supra-municipal utilities.

Municipalities are responsible for the general development of water and sewerage services in their jurisdiction. The municipal council makes decisions concerning the general bases for charges for municipal and other services. The water and sewerage utilities, which are mainly owned by the municipalities, produce water and sewerage services in their service territory. Utilities are monitored and controlled by the municipal health protection and environment protection authorities.

In the Finnish case, private sector involvement is understood in a broad manner, including also outsourcing non-core and support services and goods, incorporation of utilities, commercialisation of utilities, (small) private water associations and co-operatives, etc.

Finland has a long and extensive experience in public-private cooperation in the water supply and sewerage sector, although perhaps not in the sense that public-private partnership is often understood (i.e. private finance initiative). Outsourcing of services – especially non-core services – of public water utilities in Finland is very extensive. Outsourced services can form as much as 60-80 per cent of the utility's turnover (cash flow) in many utilities.

The selected Finnish case studies (LV Lahti Water Ltd, Kangasala municipal water and sewerage utility, Lappavesi Ltd and Lapua Sewerage Ltd) all clearly follow this common trend of substantial outsourcing of non-core services and goods from the private sector. The share of private operations in the annual turnover or cash flow of these water utilities has varied between 45 and 90 per cent. Since most of these private services are procured on the basis of competitive tendering usually on a rather short-term basis, this model has provided for high efficiency and competition within the publicly owned utilities. The largest Finnish water utilities are doing rather well in economic and financial terms. This applies also to the case study utilities, which are economically healthy and profitable.

The "Finnish type of public-private cooperation" has worked well over a long period of time, and thus there has not been high pressure towards other types of private sector

involvement, such as private ownership of utilities or operational concession contracts. There have also been substantial efforts in improving the efficiency and transparency of the municipality owned water utilities in the recent years. These have included adoption of commercial operational principles and net-budgeting towards increasing autonomy from the municipality, and enforcement of new water services legislation which has enabled diverse types of service provision and management. Incorporation of municipal water utilities has gradually increased, and there is also a strong trend towards regional cooperation on a supra-municipal basis – often involving establishment of stock companies owned by several municipalities. Direct private sector involvement in operations and management of water services is also emerging, but currently at a reasonably low key.

### Synthetic analysis of results

The Finnish case study was looking into the key principles and practices of public-private cooperation in water services based largely on local government (municipality) owned utilities which cooperate with the private sector. Such systems have a long tradition in larger Finnish cities and townships though many of them are fairly small compared with other European countries. In any case, this is the most common management model of water services in the EU member countries. It is important to note that the public involvement includes not only the state level, but also the regional and municipal (local) level.

In the Finnish case, private sector involvement is understood in a broad manner, including also outsourcing non-core and support services and goods, incorporation of utilities, commercialisation of utilities, (small) private water associations and co-operatives. This option of municipality-owned utilities has several alternatives like the traditional municipal utility, an autonomous utility, a company owned by the municipality or an inter-municipal utility. In sparsely populated areas, joint water service systems are managed by private water cooperatives whose funding and operation are nevertheless in most cases supported by municipalities. Consumer-managed water and sanitation cooperatives in dispersed rural areas and small villages are largely private of their nature. Supra- and inter-municipal cooperation of water utilities is an increasing trend in Finland.

From Finland three case study utilities were selected:

1. LV Lahti Water Ltd is a joint-stock full service water company owned by the city of Lahti in the southern part of Finland (population about 100,000).
2. Kangasala municipality water and sewerage works is a municipal water and sewerage utility, which has been reformed as an autonomous municipal enterprise in 2002. It is responsible for drinking water supply and distribution, wastewater sewerage, and storm water drainage. The utility serves about 19,000 people within the area of Kangasala municipality.
3. Lappavesi Ltd is a bulk water supply (joint-stock) company owned by the municipalities of Lapua, Nurmo, Kuortane and Kauhava in the region of Southern

Ostrobothnia in Western Finland. The population within the service area of Lappavesi Ltd is about 35,000. Lapua Sewerage Ltd is a joint-stock sewerage company owned by the municipalities of Lapua and Nurmo, and the Atria Oyj food processing company.

This report highlights the key findings from the Finnish case study in the first section. These are based on the three case study utilities and also on other relevant studies done by the CADWES research group at TUT/IEEB. In the second section, 3 tentative scenarios for alternative futures for WSS services in Finland are presented, with a view to the role of PSP in future WSS services. Section three provides a brief conclusion of the key findings from case studies and developed scenarios.

### **Key findings of the Finnish case study**

The key findings from the Finnish case study are based on the PRINWASS case study report and other relevant studies carried out by the CADWES research group. The key findings are structured around the three key analytical dimensions of PRINWASS:

- Policy-institutional dimension
- Economic-financial dimension
- Socio-political and cultural dimension.

In brief, the main findings from the Finnish case study are the following:

- Water services in Finland are still predominantly owned and managed by municipalities (local authorities), which have been recently transformed into autonomous municipal enterprises, operating with commercial and self-financing principles.
- Private sector involvement is still mainly limited to extensive outsourcing of non-core services and goods from different types of private companies (consultants, contractors, suppliers, etc.). Private operation of water utilities is emerging, but is currently still at a low level.
- Regional cooperation is increasing. Municipalities look for increased cooperation in providing water services, and also some regional water and sanitation companies – owned by several municipalities – have been established recently.
- The Finnish legislation on water services was renewed in 2000/2001. The new legislation treats both public and private water service providers equally. There is not yet, however, any detailed economic regulatory system in place.

### Policy-institutional aspects

Finnish water and sewerage utilities can be classified into three main categories based on the organisational and functional model:

1. Small private water associations serving country communities and sparsely populated areas within municipalities.
2. Municipal utilities serving population centres and municipalities.
3. Supra-municipal utilities.

In Finland municipalities are responsible for the general development of water and sewerage services in their jurisdiction. The municipal council makes decisions concerning the general bases for charges for municipal and other services. The water and sewerage utilities, which are mainly owned by the municipalities, produce water and sewerage services in their service territory. Utilities are monitored and controlled by the municipal health protection and environment protection authorities.

In the Finnish case, private sector involvement is understood in a broad manner, including also outsourcing non-core and support services and goods, incorporation of utilities, commercialisation of utilities, (small) private water associations and co-operatives. Finland has a long and extensive experience in public-private cooperation in the water supply and sewerage sector, although perhaps not in the sense that public-private partnership is often understood (i.e. private finance initiative). Outsourcing of services – especially non-core services – of public water utilities in Finland is very extensive. Outsourced services can form as much as 60-80 per cent of the utility's turnover (cash flow) in many utilities.

The "Finnish type of public-private cooperation" has worked well over a long period of time, and thus there has not been high pressure towards other types of private sector involvement, such as private ownership of utilities or operational concession contracts. There have also been substantial efforts in improving the efficiency and transparency of the municipality owned water utilities in the recent years. These have included adoption of commercial operational principles and net-budgeting towards increasing autonomy from the municipality, and enforcement of new water services legislation which has enabled diverse types of service provision and management. Incorporation of municipal water utilities has gradually increased, and there is also a strong trend towards regional cooperation on a supra-municipal basis – often involving establishment of stock companies owned by several municipalities. Direct private sector involvement in operations and management of water services is also emerging, but currently at a reasonably low key.

Finnish regulations and laws related to water and sewerage services can be categorised into four main groups: water services legislation, health protection legislation, water and environmental protection legislation, and other related legislation. EU directives are put into effect by the Finnish legislation. Thus, directives as such are not directly binding on a Finnish citizen, only on the State of Finland.

The national legislation related to water resources and services in Finland was to a large extent renewed in the beginning of the 2000s. The most important law regarding water services provision in Finland is the Water Services Act (119/2001), which was enacted in 2001. It is based on the EU Water Framework Directive (2000/60/EC) and it contains provisions on the development of the water services as well as organisation of water services and rates. Other important laws affecting water services are the Environmental Protection Act (86/2000), amended Health Protection Act (120/2001), the Local Government Act (365/1995), and the amended Water Act (121/2001). The Water Act is currently under review and the new Water Act is expected to be enacted in 2004. The Government Decree on Treating Domestic Wastewaters in Areas Outside Sewer Networks (542/2003) was enacted in 2004. This Decree imposes substantial changes for wastewater treatment in rural areas.

Water Services Act clarifies the liabilities of the municipality, and defines that municipalities have the responsibility for overall development and organising of water and sewerage services in their jurisdiction. In practice, this means that the municipality has to make water services development plans to cope with the municipality development. On the other hand, the water and sewerage undertaking is responsible for taking care of the water services management within its water services area. Water Services Act is applied to all water and sewerage undertakings regardless of their ownership or management model.

Water Services Act also defines that the key principle is that charges should cover all the investment and operating costs. In principle all types of water service undertakings are treated on equal basis. Municipal water undertakings should separate their budgeting and accounting from the general municipal budget. In practice, most of the larger utilities have already reformed their utilities to autonomous municipal enterprises.

Water Services Act does not stipulate in details the roles and responsibilities of the different regulatory authorities, and thus their powers and general and based on the statutory powers of the respective authority (the Regional Environment Centre, the municipal health protection authority and the municipal environmental protection authority). The Consumer Ombudsman will control the compliance with the law of the general supply conditions in respect of consumer protection (Ministry of Agriculture and Forestry, 2001 and 2002).

### Economic-financial aspects

The municipality-owned and managed water and sewerage utilities in Finland perform on average fairly well in economic and financial terms – especially the largest utilities. On the other hand, the smallest municipalities have increasing difficulties to manage their water utilities in an efficient and economically self-sufficient manner. Because many municipalities in Finland have had severe economic and financial constraints – partly due to continuously increasing service obligations and decreasing state subsidies – they have considered selling their utilities to generate funds and easy cash flow. Some municipalities have already sold their electricity utilities, but none have sold their water utilities, although some municipalities have considered it.

The selected Finnish case studies (LV Lahti Water Ltd, Kangasala municipal water and sewerage utility, Lappavesi Ltd and Lapua Sewerage Ltd) are economically healthy and profitable, and actually have earned substantial profits to their owner municipalities. In most cases these profits have not much been used to develop water services, but they have been used as “hidden taxes” to finance municipal services in other – less profitable – sectors. The fact that the larger utilities in Finland have been able to produce high rates of return to investment to their municipal owners is an indication that water and sewerage charges in many cases have been set at a higher level than would have been necessary for self-sustaining operations. The new Water Services Act (2001) touches the high rates of return by stating that utilities can only impose a “reasonable rate of return”, which however is not clearly specified. The Competition Authority also has not been able to interpret the term “reasonable” clearly.

The case study utilities follow the common trend of substantial outsourcing of non-core services and goods from the private sector. The share of private operations in the annual turnover or cash flow of these water utilities has varied between 45 and 90 per cent. The share has been high especially during periods of large investments, since municipalities and their utilities use extensively private companies in planning, design and construction of WSS infrastructure. Since most of these private services are procured on the basis of competitive tendering usually on a rather short-term basis, this model has provided for high efficiency and competition within the publicly owned utilities.

Regional cooperation between municipalities and utilities has increased in Finland in recent years. Cooperation is seen as a means of improving efficiency and ensuring adequate resources especially in the case of small municipal water utilities, which have had difficulties with their economy.

### Socio-cultural and political aspects

Water services are discussed fairly little in Finland and they do not raise a lot of attention among the general public and customers. Water services function traditionally well, which may explain why there is not much public debate on it. It seems, however, that majority of the Finnish citizens still prefer that water and sewerage services would be retained as a municipal service (KTV, 2003). In a recent survey (KTV, 2003), 51 per cent of the interviewees consider that water services are essential basic services that should be provided by the municipalities also in the future.

### *Participation mechanisms*

The Constitution of Finland (731/1999, Finlex 2004d) stipulates that the powers of the State in Finland are vested in the people, who are represented by the Parliament. Democracy entails the right of the individual to participate in and influence the development of society and his or her living conditions. The exercise of public powers shall be based on an Act. In all public activity, the law shall be strictly observed.

In accordance with the Local Government Act (365/1995), the municipal council has to take care of that the inhabitants and the users of the services have the possibilities to participate in and influence the activities of the municipality. The participation and influence can be enhanced particularly, among other issues:

1. by nominating representatives of the service users into the municipal bodies;
2. by notifying about the municipal matters and by organising the hearings;
3. by finding out the inhabitants' opinions before the decision-making;
4. by arranging cooperation in the municipal duties management;
5. by assisting the inhabitants' spontaneous action regarding the management, preparation and planning of activities; and
6. by arranging municipal referendums.

In practice, many municipal water and sewerage undertakings have actively advocated the inhabitants living outside the water services area of the water and sewerage undertakings, how to establish and organize water services associations, their management, and given advice about the planning, construction and operations and maintenance of the undertakings. The municipalities can also nominate the representatives of the service users to the board of the directors of the undertakings, and normally they have nominated the members only on political grounds.

The inhabitant also has the right to take the initiatives to the municipality concerning its activities in accordance with the Local Government Act. The municipality has to notify the inhabitants on the matters under preparation in the municipality, on the corresponding plans, on the decisions made and on the subsequent impacts. The municipality has to prepare, if deemed to be necessary, the briefs concerning the municipal services, economy, environmental protection and land use. The inhabitants have to be informed also, how the questions and opinions can be expressed to the municipal officials and the decision makers.

In accordance with the Water Services Act (119/2001), the municipality must make sure that appropriate measures are taken to establish a water and sewerage undertaking to meet the needs, to expand the water services area or to otherwise secure the availability of sufficient water services. Before taking the measures, the municipality must reserve an opportunity for property owners and occupiers in the area to be heard. A municipality will approve the water services area of water and sewerage undertaking operating within its territory and, when necessary, will amend an approved water services area on the submission of the undertaking or, if the undertaking has presented no such submission, after hearing the undertaking. Before the approval or amendment of the water services area, a statement on the matter must be requested from the control authority, and an opportunity must be reserved for the property owners and occupiers

in the area to be heard. Furthermore, the Water Services Act stipulates that a water and sewerage undertaking must notify the customer well before: i) any modifications to the general conditions of water services contract; ii) how and when the charges and other conditions will change; and iii) what is the reason for the modification.

## **Scenarios for the development of water services in Finland and the role of PSP**

Scenarios for the alternative futures of water and sanitation services sector in Finland have been developed utilising several previous studies and findings from the Finnish case studies of PRINWASS. An important starting point was the preliminary study done in the late 1990s for the National Technology Agency (Tekes) about the future of Finnish water services sector in the 2000s (Vikman, 1999). The CADWES research group at IEEB/TUT has thereafter carried out a number of futures-oriented studies, which have produced useful background material for scenario development. In connection with the strategy development for Vaasa water utility, relevant scenario material was developed in cooperation between IEEB/TUT and Vaasan Vesi (Vaasa Water) (Hahto, 2004).

The Management and Economic Committee of the Finnish Water and Waste Water Works Association (FIWA) prepared a publication "Development and survival strategy of water and sewerage utilities" (FIWA, 2003) to be used as a guideline for its member utilities in their strategic development. The publication does not include any scenarios for alternative futures of Finnish water utilities or WSS sector, but it discusses thoroughly the changing operational environment and includes a SWOT analysis. Thus, it can be effectively used as a tool in developing scenarios and strategies for the Finnish WSS sector. The publication includes a concise appendix showing the strategic goals and objective for water and sewerage utilities up to the year 2020.

In the following, a general SWOT analysis is presented on the current situation with water services in Finland. This SWOT analysis is a combination of contributions from several sources.

**Table No1:** SWOT analysis of the water services in Finland (modified from Vikman, 1999; Katko et al, 2000; FIWA, 2003).

STRENGTHS (S)	WEAKNESSES (W)
<ul style="list-style-type: none"> <li>• Abundant and high quality water resources.</li> <li>• Covering and high quality water services in population centres.</li> <li>• Stable institutional environment (legislation, permit procedures, authorities, ownership).</li> <li>• High technology and professional skills. Utilities have experienced and knowledgeable staff.</li> <li>• Water infrastructure is in general fairly new and in good condition.</li> <li>• Drinking water quality is good in international comparison.</li> <li>• Wastewater treatment is at a very high level.</li> <li>• Customers appreciate and value water services and utilities.</li> <li>• Water services are considered one of the most important municipal services, together with basic education and health care services.</li> <li>• Financing of water services operations can be well covered by customer charges. Good willingness- and ability to pay and stable revenue base.</li> </ul>	<ul style="list-style-type: none"> <li>• Outside the organised water and sewerage systems there are problems with drinking water quality and wastewater treatment.</li> <li>• Small size of systems / utilities limits technological and economic development.</li> <li>• Political interference in municipalities affects decision making and development in water utilities (although autonomy is increasing).</li> <li>• Bureaucratic and conservative culture within the authorities.</li> <li>• Unclear ownership policies.</li> <li>• Inadequate attention to strategic and visionary management in water utilities. Poor preparedness for institutional changes.</li> <li>• Inadequate preparedness for exceptional situations and crises.</li> <li>• Inadequate investments to rehabilitation and replacement of infrastructure.</li> <li>• Low interest towards water services among general public and politicians, because service is good.</li> </ul>
OPPORTUNITIES (O)	THREATS / LIMITATIONS (T/L)
<ul style="list-style-type: none"> <li>• Increasing efficiency and productivity by (1) merging utilities, (2) promoting regional cooperation, and (3) outsourcing and competition.</li> <li>• Utilisation of new technologies (ICT, GIS, etc.).</li> <li>• Successful “capturing” of competent and motivated young water sector professionals.</li> <li>• Promoting export and international trade through the image of high quality water services (e.g. foodstuff industries).</li> <li>• New potential for companies specialising in O&amp;M of small water and wastewater treatment facilities (rural and peri-urban areas).</li> <li>• Networking of actors in water services.</li> <li>• International and foreign companies may bring additional resources and capacity to the decreasing Finnish market in water services.</li> </ul>	<ul style="list-style-type: none"> <li>• Deterioration of raw water sources and/or other exceptional situations.</li> <li>• Lack of competent and experienced sector professionals (current staff is ageing).</li> <li>• Inadequate or inappropriate education and training systems in water services.</li> <li>• Increasing competition for economic and other resources.</li> <li>• Increasing uncertainty about future operational environment (decreasing predictability).</li> <li>• Changes in the municipal administration may cause unpredictable changes in water services.</li> <li>• Uncontrolled monopoly situation.</li> <li>• More stringent requirements by the EU and other authorities. Expansion of EU.</li> <li>• Intrusion of large multinational companies into the Finnish water services market. Opening of markets.</li> </ul>

Four overall scenarios have been built based on the SWOT analysis and various material related to the analysis of the Finnish water and sewerage services sector. These scenarios have the following working titles and main features:

<b>S1 : "Business-as-usual"</b>	<b>"BAU"</b>
<b>S2 : "Public sector predominance"</b>	<b>"IN THE PUBLIC INTEREST"</b>
<b>S3 : "Diversified and balanced"</b>	<b>"INSDIVERSITY"</b>
<b>S4 : "Private sector predominance"</b>	<b>"PRIVATE EFFICIENCY"</b>

The four scenarios have the following common features:

- Environmental issues become important
- Discharge limits and drinking water quality requirements become more stringent
- Legislation, including "reasonable ROI", privatisation is legally allowed
- Financing is based on revenues from customer charges
- Demand for transparency
- Population is ageing
- Development of information society sets increasing requirements for education

The scenarios have the following main differences between them:

- Set of values
- Influence of economic life and business society
- Hard competition in commercial and industrial life
- The role of EU in water services regulation and legislation
- Economic situation of Finland and its municipalities
- Regional cooperation
- Concentration vs. dispersion of population / settlements
- Ownership and operation of water utilities, private vs. public
- Competition for employees
- Quality and coverage of services

In the following, some main features and key driving forces of these scenarios are presented.

SI: *"Business-as-usual"*

No major changes in the overall situation of water supply and sanitation and the general organisation of basic services in the country until 2025. The overall scenario is characterised by the following driving forces and trends:

***Dynamic driving forces and trends in this scenario:***

- Economy is an important factor in politics
- Global and liberal economy, hard economic competition, sensitive to economic cycles
- Overall concentration: population, jobs, companies, ...
- Hard competition for (educated) labour
- Work is a mean of self-fulfilling, career is important
- Retirement age will be raised
- High technology
- Finnish primary production competes with purity
- No major changes in attitudes and practices
- Polarisation of society
- Imbalanced development of the country
- Competition between municipalities (and regions)
- The influence of municipalities in politics decreases, but their responsibility for financing increases
- Municipal mergers are common
- Citizens are selective customers, but their influence is limited
- Municipalities change from service producer to service facilitator, trend for privatisation through competitive bidding for services
- Social services are financed by customer charges
- Ownership of water infrastructure remains with municipalities, but operations are delegated and outsourced from private sector
- Some (largest) incorporated water utilities do well in competition and expand their services to other municipalities
- Competition includes also international companies and multi-utilities, e.g. some energy companies
- Due to increased competition economic regulation is increased
- Achieving more stringent wastewater treatment standards complicated systems and processes are needed, which leads to large, supra-municipal treatment plants
- Charges are clearly increasing due to more complicated and expensive treatment and ICT technologies

In WSS, this scenario means that municipalities continue owning water utilities, but private sector still has an important role as the producer of goods and services through outsourcing and competitive bidding. The requirements set by the European Union will have an increasing impact on the regulatory framework, and competition will increase over the national borders.

S2: "Public sector predominance"

WSS will continue being predominantly in public hands – i.e. owned by the municipalities and controlled by public authorities – until 2025. The overall scenario is characterised by the following driving forces and trends:

***Dynamic driving forces and trends in this scenario:***

- Scattering, localisation: power, jobs, education, housing, culture
- Networking, cooperation; the network is flexible and diversified
- Information and communication networks become increasingly important
- Social and cultural issues become important, weekly working time gets shorter
- Second homes" become common
- Difference in lifestyle between rural and urban areas: e.g. independent initiatives vs. organised services; citizens' activity and demands are an important driving force
- Changing ways of life: sustainable development, decreasing consumption patterns
- Environmental awareness and problems become more important
- "Think globally, act locally"
- Differentiation of continents, key trading markets of Finnish companies are Europe and Russia
- Companies are deciding their location based on logistical reasons
- Decelerating economic growth – emphasis on quality instead of quantity
- Interest towards privatisation fades out in the EU; opening up water services for market stops; municipalities retain ownership and operation of water services
- Outsourcing of non-core services from the private sector remains extensive
- Staff of utilities establish their own companies e.g. for network maintenance and sell their services for several utilities
- Regional water service companies and/or regional cooperation of municipal water utilities become common – yet regional companies remain rather small; more cooperatives established in rural areas
- More stringent environmental standards (nitrogen removal, chemicals, etc.); better raw water quality due to gradually decreasing pollution and easier treatable wastewaters; sludge reclamation increases; separating and composting toilets become more common (both in urban and rural areas)
- Charges for water abstraction and wastewater disposal will be imposed; water consumption will decline; water reuse and recycling increases; dual water systems
- Increasing risk of terrorist attacks also in water supply even in Finland

In WSS, this scenario means a slightly more determined and informed decision to develop basic services along the public service domain than in the BAU scenario (which is based on a more undetermined development).

*S3: "Diversified and balanced"*

In this scenario the organisation of WSS will be characterised by a diversity of arrangements between the public and private sectors regarding ownership, operation and control of the systems. The overall scenario is characterised by the following driving forces and trends:

**Dynamic driving forces and trends in this scenario:**

- Finland's economy is doing well
- Yet, sudden structural changes may affect the economy and municipalities
- International economy and increasing international competition affects both the public and private sector
- Success of international organisations and companies boosts also the Finnish economy
- Water services sector is directly benefitting from the success of Finnish water sector companies
- Concentrating in key sectors, e.g. export of environmental technology
- Environmental policy and environmental values influence
- Division of power between the EU and the national parliament
- Municipalities have a high degree of self-government
- Citizens are active and have reasonably good avenues for influencing issues
- Development of the Nordic welfare model regains support; reorganisation of services
- Water services will be retained mainly in municipal ownership; yet the private sector may even own some WSS utilities, and outsourcing of goods and services from the private sector will be increased even from the present high level
- Instead of straight-forward competing, benchmarking of costs and quality will become important for water utilities
- Regional thinking and cooperation is important; regional water and sewerage companies become more common
- Resource banks are developed to alleviate lack of human resources in public utilities

In principle, this scenario continues and strengthens the ongoing trend of diverse institutional and management arrangements in the provision of WSS services in Finland. Experiences from different arrangements facilitate competition and efficiency among the utilities and lessons from the successful arrangements can be utilised in other areas. Flexibility and adaptation to local and regional conditions is a leading

principle. The regulatory framework will be developed to cope with the wide range of arrangements, but also the regulatory system will be rather lenient to allow flexibility and self-regulation to a certain degree.

*S4: "Private sector predominance"*

In this scenario, WSS will increasingly become managed and in many cases also owned by the private sector – until 2025. This development is mainly caused by the gradual failure of public (municipality owned and managed) water utilities to perform their service obligations properly. The overall scenario is characterised by the following driving forces and trends:

**Dynamic driving forces and trends in this scenario:**

- Global, tough competition, slow economic growth
- Decision-making power shifts from the national parliament to the EU – including budget decisions
- Finland continues being an "obedient student" in the EU, being among the first countries to act
- Internal subsidies of the EU decrease drastically
- New recession, increase of unemployment and reorganisation of welfare society
- Financial responsibility of municipalities increases and their self-government increases, but municipalities have severe difficulties to carry out their duties
- Small municipalities are forced to cooperate, rural areas become desolate
- Municipal infrastructure deteriorates due to inadequate maintenance funds
- Municipalities incorporate their technical services and some sell their utilities
- The employees of municipalities are ageing and staff is reduced
- EU tightens up its environmental policy and taxation, discharge standards, etc.
- Finland has to invest also in its neighbouring regions and especially in environmental problems in the Baltic Sea region
- Municipalities get more responsibility in environmental issues, for instance they raise environmental charges
- Citizens' possibilities to influence are limited (continued)
- Regulation and control of water services shifts to the EU
- A regulatory system similar to the energy sector will be established for water services
- Wastewater treatment is becoming more expensive due to stringent environmental requirements

(continued)

- Desolution due to migration causes water charges revenue to decline in rural areas, but yet old infrastructure requires rehabilitation and maintenance
- Municipalities sell their water utilities to incur cash in their poor financial situation; e.g. banks and pension schemes are interested buyers
- BOT contracts become common in larger towns, but they have typical problems with large multinational companies
- Vandalism against water systems increases as a result of declined socio-economic situation of some vulnerable groups

This scenario is characterised by an increasing and strong private sector entrance to WSS sector, both as operators and owners of utilities (Finnish and international companies). Economic efficiency gains determine most of the strategic decisions regarding technical services.

Some of the latest developments in Finland have signs that may be related to the last scenario (S4). In Lahti city, there have been proposals and discussion about arrangements with the municipality owned energy and water services companies that can be considered ethically questionable.

First, regarding LV Lahti Water Ltd, a couple of years ago there was discussion about cross-border leasing of utility assets (water supply networks) to USA with an aim to evade taxes. This plan, however, never materialised.

Second, in 2004, external corporate consultants made proposals to divide and re-incorporate the current municipality-owned companies (Lahti Energy and LV Lahti Water Ltd). Both companies would be divided into two separate companies: one for running the service operations and one for owning the network assets. In the next stage, Lahti city would sell the shares of its network assets owning companies to a newly established company (NewCo). The proceeds of this sale would be tax exempted for the city. At the same time, Lahti city would buy shares of NewCo and thus gain decision-making power (nomination of board of directors) in the network owning company.

The proposed arrangements have raised criticism among the municipality and other stakeholders. The arrangement also evades energy market regulations and the EU competition regulations. Besides tax evasion, this arrangement cannot create any fresh capital. Instead, the network owning company – which has no other source of income except its distribution network income – has to draw its costs from Lahti Energy and LV Lahti Water Ltd. This again, in the long run, may cause pressures to increase customer charges considerably.

## Conclusions

In Finland, water services are still predominantly owned and managed by municipalities (local authorities), which have been recently transformed into autonomous municipal enterprises, operating with commercial and self-financing principles. Private sector involvement is still mainly limited to extensive outsourcing of non-core services and goods from different types of private companies (consultants, contractors, suppliers, etc.). Private operation of water utilities is emerging, but is currently still at a low level. Recently, there have been different types of proposals to incorporate municipal water utilities or merge them with energy utilities, but yet very few of these proposals have been materialised.

Finnish water utilities are on average very small. The smallest municipalities and their water utilities are not doing well in economic terms. This is one of the reasons why regional cooperation between municipalities and their water utilities is increasing. Municipalities look for increased cooperation in providing water services, and also some regional water and sanitation companies – owned by several municipalities – have been established recently.

The Finnish legislation on water services was renewed in 2000/2001. The new legislation treats both public and private water service providers equally. There is not yet, however, any detailed economic regulatory system in place. It is expected that in a few years time an economic regulatory agency – most likely similar as has already been established for the energy market – will be established for the water services sector.

The role of private sector in WSS in Finland has a long tradition and is extensive in the form of outsourcing goods and services. Different scenarios (S1-S4) have been developed to envisage the long-term future development of the WSS sector and the role of private sector in Finland. Two of these scenarios (S1 and S2) are still based on the assumption that municipalities continue having the main responsibility for owning and running WSS services in Finland, although private companies still have an important role as producers of goods and services. The third scenario (S3) is based on a wide diversity of management arrangements and flexibility in institutional framework. Municipalities continue being the key players, but also private operators and in some cases private owners of urban water utilities will get increasingly involved in WSS services. The fourth scenario (S4) is based on a strong market approach, assuming that private companies will become in many areas the main service producers of WSS services. Efficiency and profit gains also result in various arrangements to incorporate municipal water utilities, often involving even questionable arrangements to evade taxes.

Strategically, in the long run, the most successful and promising policy and institutional arrangements for the Finnish WSS sector could be found among the most diverse and flexible options. Thus, scenario S3 looks as the most encouraging way forward for Finland and could be adopted also by many other countries.

## Abbreviations

c/m <sup>3</sup>	coulomb per m <sup>3</sup>
cap	population
cap/km <sup>2</sup>	population per km <sup>2</sup>
EUR	Euro
EUR/m	Euros per meter
EUR/m <sup>3</sup>	Euros per m <sup>3</sup>
FIM	Finnish Markka (until 2001)
g/m <sup>3</sup>	gram per m <sup>3</sup>
km <sup>2</sup>	square kilometer
kWh/m <sup>3</sup>	kilowatts per m <sup>3</sup>
m <sup>3</sup>	cubic meter
m/customer	meters per customer
m <sup>3</sup> /d	m <sup>3</sup> per day
m <sup>3</sup> /a	m <sup>3</sup> per annum
Mm <sup>3</sup> /a	million m <sup>3</sup> per annum
l/cap,d	liters per capita per day
BOD7	Biological Oxygen Demand, 7 days
tn/a	tonnes per annum
kg/kWh	kilograms per kilowatt
P kg/Fe tn	Phosphorus kilograms per iron tonne
ROI	return on investment
UFW	unaccounted-for water

## Acronyms

CADWAS	Capacity Development in Water Services
EC	European Commission
EU	European Union
EUR	Euro
FEI	Finnish Environment Institute
FIM	Finnish Markka (until 2001)
FIWA	Finnish Water and Waste Water Works Association
IIEB	Institute of Environmental Engineering and Biotechnology
KTV	Kunnalliset työntekijät ja viranhaltijat (KTV Trade Union)
MAF	Ministry of Agriculture and Forestry
MDGs	Millennium Development Goals
MOE	Ministry of the Environment
MOSAH	Ministry of Social Affairs and Health
MTI	Ministry of Trade and Industry
PPC	Public-private cooperation
PPP	Public-private partnership
PSP	Private sector participation
SWOT	Strengths – Weaknesses – Opportunities – Threats
Tekes	National Technology Agency (Teknologian kehittämiskeskus)
TUT	Tampere University of Technology
UNESCO	United Nations Educational, Scientific and Cultural Organization
WSS	Water supply and sanitation

## References

- Äikäs, Kauko, Petri Juuti and Tapio Katko (2003), History of Kangasala Water and Sewerage Utility (19152-2002) (original in Finnish: Luonnollisesti Vettä. Kangasala, Vesilaitos 1952-2002). Saarijärvi: Saarijärven Offset Oy.
- Äikäs, Kauko (1999), "The water management strategy of the municipality of Kangasala by 2020" (original in Finnish: Kangasalan kunnan vesihuoltostrategia vuoteen 2020), MSc Thesis. Tampere: Tampere University of Technology, Institute of Environmental Engineering and Biotechnology.
- Hukka, Jarmo and Tapio Katko (1999), "Public-private partnership for competitive water and sanitation services". Pp 285-292. In: Proceedings for the ENTRÉE '99 Conference. Sustainable Use of Natural Resources – Cooperative Planning and Actions. Environmental Training in Engineering Education. November 10-13, 1999. Tampere, Finland.
- Katko, Tapio, Sirpa Sandelin, Osmo Seppälä and Tauno Skyttä (eds.) (2000), "Development of Finnish international activities in water supply" (original in Finnish: Suomen vesihuollon vientitoiminnan kehittäminen. Vesihuolto 2001-teknologiaohjelman selvitys). National Technology Agency, Tekes, Teknologia katsaus 86/2000.
- Metsälä, Ilkka (2001), "Public-private cooperation in water services" (original in Finnish: Julkisen ja yksityisen sektorin yhteistyö vesihuoltopalveluissa.) MSc Thesis. Tampere: Tampere University of Technology, Institute of Environmental Engineering and Biotechnology.
- Seppälä, Osmo T., Jarmo J. Hukka and Tapio S. Katko (2001), "Public-private partnerships in water and sewerage services: privatization for profit or improvement of service and performance?", Public Works Management and Policy. Vol. 6, No. 1, pp. 42-58.
- Vehmaskoski, Teemu, Pekka Pietilä and Osmo Seppälä (2002), "Regional operation of water and wastewater utilities" (original in Finnish: Vesihuollon alueellinen operointi), Report TKK-VHT-32. Helsinki: Helsinki University of Technology, Laboratory of Environmental Engineering.
- UNESCO (2003), The United Nations World Water Development Report: Water for People, Water for Life. Paris: UNESCO.

## Working papers and unpublished reports

- Hukka, Jarmo J. (1997), "Possibilities to make public water and wastewater utilities commercial and viable", in Towards Viable Water Services. Seminar on Water Supply and Sanitation Sector Policies and Strategies, Hanoi and Haiphong, Vietnam, 10-12 November 1997, pp. 21-32.

- Hukka, Jarmo J. and Tapio S. Katko (2003). "Water privatisation revisited – Panacea or pancake?", Occasional Paper Series, International Water and Sanitation Centre (IRC). Available at: <https://www.ircwash.org/sites/default/files/Hukka-2003-Water.pdf>.
- Hukka, Jarmo J. and Tapio S. Katko (1999), "Privatization in water supply?" (original in Finnish: Yksityistäminen vesihuollossa?), Kunnallisan kehittämissäätiön tutkimusjulkaisut, No 19. Available at: <http://www.kaks.fi/sites/default/files/Tutkimusjulkaisu%2019.pdf>.
- Hukka, Jarmo J. and Tapio S. Katko (1998), "Approaches to make water and wastewater utilities competitive and autonomous in Finland", Tampere: Tampere University of Technology.
- LV Lahti Water Ltd. (2003), "Annual Report 2001" (original in Finish: Vuosikertomus 2001, Lahti.
- Seppälä, Osmo (2002), Country Report – Finland, in European Water Management between Regulation and Competition (AQUALIBRIUM), Tampere: Tampere University of Technology.
- Seppälä, Osmo (2003a), "Country report – Finland", in in European Water Management between Regulation and Competition (AQUALIBRIUM), Tampere: Tampere University of Technology.
- Vehmaskoski, Teemu, Pekka Pietilä and Osmo Seppälä (2002), "Regional operation of water and wastewater utilities" (original in Finnish: Vesihuollon alueellinen operointi), Report TKK-VHT-32. Helsinki: Helsinki University of Technology, Laboratory of Environmental Engineering.
- Vikman, Hannu (1999), "Water services in the 2000s" (original in Finnish: Vesihuolto 2000-luvulla. Infraklusterin esiselvitys vesihuollon kehittämiseksi). National Technology Agency, Tekes, Teknologia katsaus 80/99.

#### Institutional sources

- Finlex (2004), The Constitution of Finland (731/1999) (original in Finnish, translation in French), Helsinki: Government of Finland.
- Finnish Environment Institute (2002a), "Statistics on water and sewerage undertakings in Finland". Helsinki: Finnish Environment Institute.
- Finnish Environment Institute (2002b), "Water supply and sewerage undertakings in Finland 1998-2000. Statistical book" (original in Finnish: Vesihuoltolaitokset 1998-2000. Helsinki: Finnish Environment Institute.

Finnish Environment Institute (2003), "Legislation related to water and sewerage services" (original in Finnish). Helsinki: Finnish Environment Institute.

Finnish Water and Waste Water Works Association (FIWA) (2003), "Development and survival strategy of water and sewerage utilities" (original in Finnish: Vesihuoltolaitosten kehittämis- ja selviytymisstrategia). Vesi- ja viemärlaitosyhdistyksen monistesarja No 11.

Kangasala Municipality (2003).

Kauhava municipality (2003).

Kuortane municipality (2003).

Lapua Town (2003).

LV Lahti Water Ltd. (2003), "Annual Report 2001" (original in Finnish: Vuosikertomus 2001). Lahti.

LV Lahti Water Ltd. (2003).

Ministry of Agriculture and Forestry (2001), Main contents of the new Water Services Act. Helsinki: Ministry of Agriculture and Forestry.

Ministry of Agriculture and Forestry (2002), Guidelines for the Water Services Act 119/2001. Helsinki: Ministry of Agriculture and Forestry.

Nurmo Municipality (2003).

TAVASE (2001), "Organization of water supply cooperation in the Tampere and Valkeakoski districts" (original in Finnish: Vedenhankinnan yhteistyön järjestäminen Tampereen ja Valkeakosken seudulla), Presentation by the Corporate Governance Working Group (Hallintomallityöryhmän esitys), 20 July 2001, Tampere.

### Interviews and personal communications

Hänninen, Riitta (2003), Personal communication, 9.1.2003. (LV Lahti Water Ltd).

Keski-Saari, Olli (2002a), Personal communication, 16.12.2002. (Lappavesi Ltd and Lapua Sewerage Ltd).

Keski-Saari, Olli (2002b), PowerPoint presentation, 20.3.2002.

Rätinen, Kari (2003), Personal communication, 9.1.2003. (LV Lahti Water Ltd).



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