Water Management in Riga and in Copenhagen

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Abstract

This report presents the drinking water and wastewater management today in two cities, Riga and Copenhagen. Riga supplies water for its 800,000 inhabitants. The drinking water production in 1998 was around 98.5 millions m^3. In Riga water losses in the network are some 30 %. One half of the drinking water is produced from surface water sources and the other half from groundwater sources. The main surface water source is the river Daugava, whose water quality is not very good. Copenhagen supplies water for about half a million people. The drinking water production in 1998 was 67 million m^3. Losses in the pipes are minimal. Copenhagen uses virtually only groundwater for its water production. The quality of drinking water in Copenhagen is good. The water treatment processes differ, the main difference being in the use of chlorine. In Copenhagen, groundwater is aerated and filtrated. UV desinfection is also occasionally used. In Riga, refinement is partially based on chlorination and then filtration. A project is underway to replace the chlorination with a charcoal filtration stage and ozone desinfection. In Riga the main problem is the deterioration of water quality in the network. The quality of water is in general good after treatment but decreases in the pipelines, and when it reaches the consumer the quality is poor.

In Copenhagen two wastewater treatment plants, Lynetten and Damhusåen, treat annually 90 million m^3 wastewater from Copenhagen and its adjacent communities. The first central WWTP started operating in 1972. The treated wastewater is discharged into the Sound. In Riga the central WWTP was put into operation in 1991. Today the Daugagriva wastewater treatment plant takes in 138 million m^3 of the wastewater produced in Riga, of which almost 50 % is discharged untreated into the Gulf of Riga. In Copenhagen only heavy rainfall causes some wastewater to be discharged into the sea without purification. In Riga numerous projects have been started to improve both the network and the technology of the treatment plants with financial support from the EU. In Riga several improvements have to be made before water management is adequate.

Introduction

In Riga, like in the other Baltic countries, industrial plants had their own wastewater treatment facilities, and efficient municipal wastewater treatment plants were not completed until after restoration of independence in 1991. According to the Soviet policy, wastewater treatment facilities were first built in industrial plants, factories and smaller communities. In larger towns factories had their own wastewater treatment facilities while the municipality itself did not have treatment plant. In Copenhagen, environmental awareness emerged earlier and a few small wastewater treatment plants were built before the first central WWTP. The first central WWTP started operating in 1972.

Water and wastewater treatment plants in Riga are under development with similar advanced technology as is used in Copenhagen. Riga has the financial support needed for these improvements. Copenhagen on the other hand has to keep close control over its nearby waters to ensure clean water reservoirs for the future. As pesticide residues have been found in some of the well fields in Copenhagen, use of this water has been limited.

1 RIGA

1.1 Map of the city, water resources and technical network

Figure 1. Map of Riga [1].

Table 1. Facts about Riga [2], [3].

Population (1999)	796,700
Average temperature in July	17°C
Average temperature in February	-4°C

The municipal enterprise Riga Water (Rigas Udens) is in charge of all water supply and sewerage systems in Riga.

Information

http://www.rw.lv

1.2 Source of raw water

In the vicinity of Riga there are several lakes which serve as drinking water reservoirs. The groundwater resources are good and of high quality [4]. The Daugava is the most important river in Latvia, serving as a source of energy and drinking water for Riga. Its total length is 1005 km, and 39% of the total watershed belongs to Latvia [5]. The other surface water source is Jugla Lake.

1.3 Drinking water

The pump station Daugava, completed in 1979, is the largest drinking water purification complex in Riga [4]. In 1998 a major reconstruction project was begun in order to improve drinking water quality. The Daugava pump station takes its water from the reservoir of the Riga Hydropower Station with pumps built in the dam at the first elevation. It then forces the water under pressure to the purification plant through two pipelines, 14 km long and 1200 mm in diameter. The designed efficiency of the plant at the start in 1979 was 220,000 m^3 d^{-1}, but was lowered in the mid-1980s to meet higher standards for purity of the drinking water. In 1997 water intake from the Daugava was stopped three times because of the low water quality.

In 1998 50.4% of the water production was from surface water sources and 49.6% from groundwater sources. In September 1998 the supply from the surface water treatment plant was reduced, which increased the capacity of groundwater stations [6]. The beneficial geological conditions and hydrogeological processes ensure that the groundwater is of high enough quality to drink without any additional purification. The total water supply for the city could be pumped from the underground sources [7]. The drinking water sources are shown in Figure 2 with the amount of water they supply. The total production was in 1998 was 98,535,200 m^3 [6].

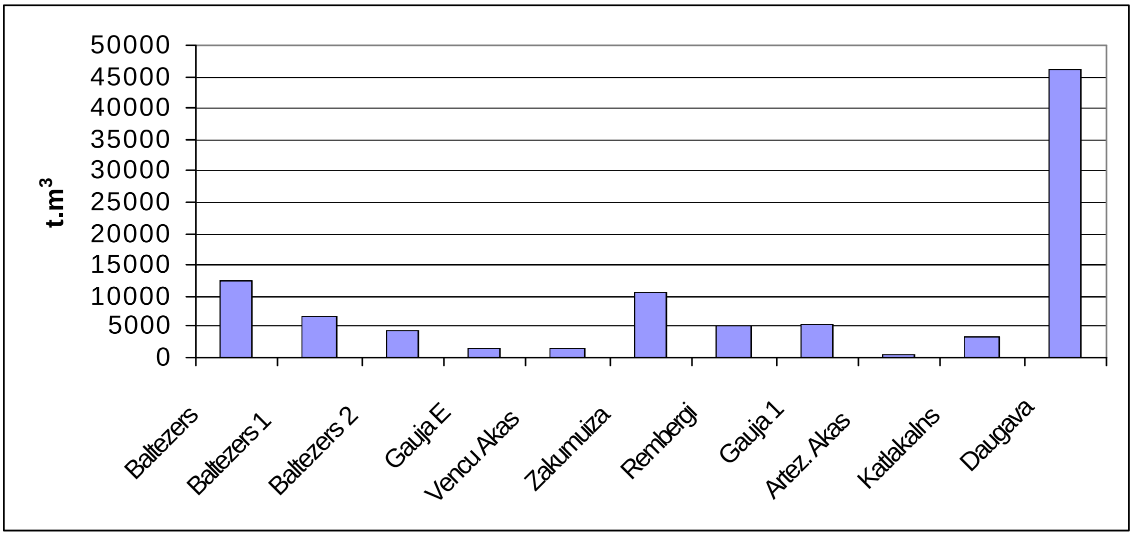

Figure 2. Total Water Supply to the City in 1998 [6].

There are 500 groundwater bore holes and 8 pump stations for groundwater in use [8]. Most of the bore holes reach into the Quaternary geological formation rocks no deeper than 50 m. In 1996 some deeper aquifers (90 to 150 m) were also being exploited. The bore holes are vulnerable to pollution [8]. Therefore a large-scale programme was launched to protect the abstraction sites from anthropogenic pollution.

The artificial groundwater replenishing system was completed at the "Baltezers" pump station in 1953. The raw water is pumped from Lake Mazais Baltezers into 17 infiltration ponds with a total daily capacity of 90,000-120,000 m^3 [8]. The water is naturally purified while percolating through the porous layers of ground, which also recharges groundwater resources, and about 40% of the water returns to the wells. This system has not only allowed an increase in the production of the "Baltezers" station but has also provided water to the newly built pump station "Baltezers 2".

New water metering equipment US-24 has been installed to control the pumping of water from Lake Mazais Baltezers for the "Baltezers" plant [6]. As a result, with some other measures and a new mode of supplement infiltration in 1998, the capacity of the "Baltezers" plant has increased from 7000 to 10 000 $m^3\ d^{-1}$.

1.3.1 Water treatment

Only surface water is treated, the groundwater is distributed directly. The treatment process includes chlorination, coagulation, sedimentation, filtration and a second chlorination [8]. First, to remove the interference of the organic matter chlorine is added into the raw water, and it is then mixed with a coagulant in two contact cells. The largest suspended particles and biological objects are mechanically removed in a sedimentator. In the second step, water is filtered through quartz sand filters and chlorinated for disinfection (see Figure 3).

The planned reconstruction and modernisation of the water treatment process includes an additional activated charcoal filtration stage and ozone desinfection [6]. Riga Water has signed a contract with a Swiss company to provide equipment. The project is financed with a Swiss grant.

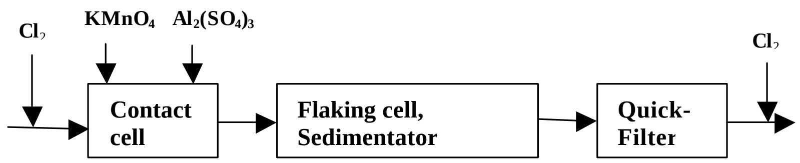

Figure 3. Daugava water treatment process [8].

1.3.2 Water quality

The reported parameters for the quality of the water from the Daugava are shown in Table 2, and the parameters for the groundwater quality in Table 3. The groundwater quality is good before distribution to the network. Due to the bad condition of the water supply network, the water quality decreases on its way to the consumers.

Table 2. The comparison between reported Daugava water quality (1998) and the raw water classification in Latvia [6].

Parameter	Observed Values in Daugava, before treatment mg/l	Observed Values in Daugava, after treatment mg/l	The present Latvian standard mg/l
Arsenic	<0.01	<0.01	0.05
Lead	<0.01	<0.01	0.03
Nitrates NO_3^-	3.4	2.9	45.0
Nitrites NO_2^-	0.21	-	-
Cyanides	-	-	-
Aluminium	-	0.30	0.5
Ammonium NH_4^+	0.55	-	-
Chlorides	9.0	14	350
Copper	<0.02	<0.02	1.0
Manganese	0.09	<0.08	0.1
Iron	0.34	0.07	0.3
Zinc	0.02	<0.02	5.0
Sulphates	14	73	500.0
pH	7.8	6.7	6.0-9.0
Fluoride	0.21	0.07	1
Turbidity (NTU)	4.4	1.8	5
Colour (º)	116	11	20
Total bacteria in 1 ml	86	3	100
E.coli index	565	<3	<3

Table 3. The actual groundwater quality in Riga (1996), and the Latvian and the EU raw water standards [8].

Parameter	Observed Values mg/l	The present Latvian standard mg/l	EU standard mg/l
Arsenic	0	0.05	0.05
Lead	0.01	0.03	0.05
Nitrates	0.11	45.0	50.0
Cyanides	-	-	0.05
Chlorides	12.97	350	
Copper	0	1.0	
Manganese	0.06	0.1	0.05
Iron	0.14	0.3	0.2
Zinc	0.03	5.0	
Sulphates	15.3	500.0	
pH	7.5	6.0-9.0	
Total firmness	2.46 mg eg./l	7.0 mg eg./l	
Fluorine	0.07	1.2	
Turbidity	0.12	1.5	
Colour (^{o})	7	20	

1.3.3 Water network

The length of the city water network is being increased steadily (Figure 4). The same may be said for leaks caused by old and worn out pipes that have been maintained by other organisations. The amount of new pipes laid in 1998 was only 0.8 km [6]. In January 1999 the total length of network was 1240.7 km.

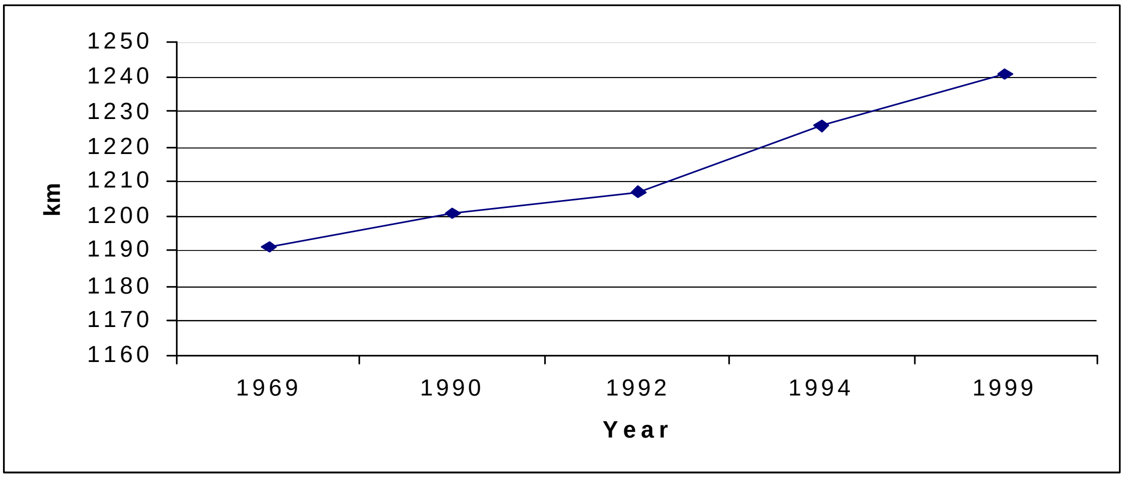

Figure 4. The total length of the water pipe system [6], [8].

Table 4. The length of pipes with different diameters in 1994 [8].

Diameter (mm)	Length (km)
>700	220
300 to 700	241
100 to 250	732
<100	32
Total	1225

The flat terrain of Riga makes it necessary to equip the water supply network with 20 pressure pump stations to ensure definite zones of high pressure [6]. Fluctuating water consumption is compensated for with the help of reservoirs and water towers with a total volume of 77,700 m^3. The pressure in the water supply network has been increased in the central part of the city, which has eliminated the old problem of providing water to the top floors of buildings, although this increases leaks in the old pipes. The numbers of emergency situations affecting the water supply network in 1995 and 1998 are shown in Figure 5.

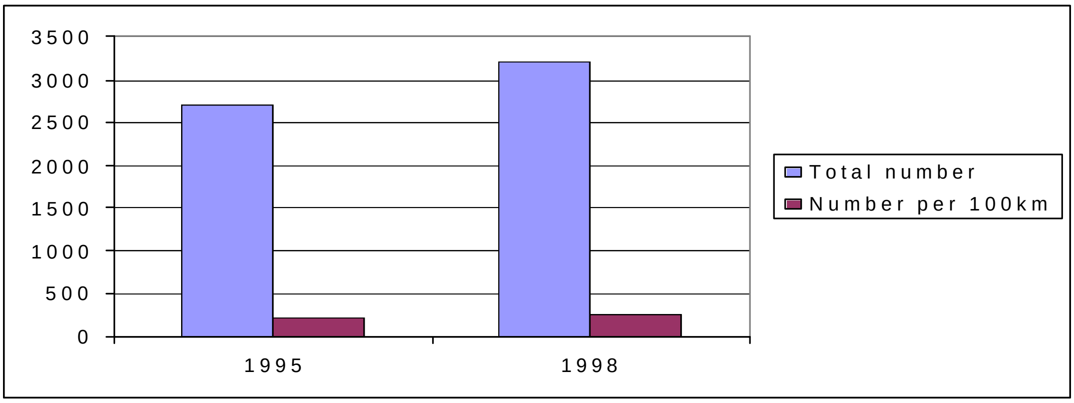

Figure 5. Number of emergency situations in the water networks in 1995 and 1998 [6].

Water pipes are mainly of cast iron, but some steel and concrete pipes are in use. The frequent breakdowns can be explained by the poor technical condition of about half of the pipes, and the high groundwater levels, which make repairs difficult. Riga Water and its Environment Project have launched a network rehabilitation programme to detect and reduce leakage, rehabilitate the most important sections of the network and ensure a safe and uninterrupted supply of water [6].

1.3.4 Water consumption

Water consumption is equalised by 20 booster stations, reservoirs and water towers [6]. The newest tower was taken in use 13 years ago, and the oldest in the 1930s. The volume of the reservoirs is 98,100 m^3. Modernisation of production process controls using the latest technology is needed.

In 1998 the volume of water supplied from the pumping stations was 98,535,000 m^3 but only 67,191,000 m^3 was supplied to consumers [6]. This means that the lost volume of water due to leakages was 31.8% of the total water supplied to the network due to the leakages.

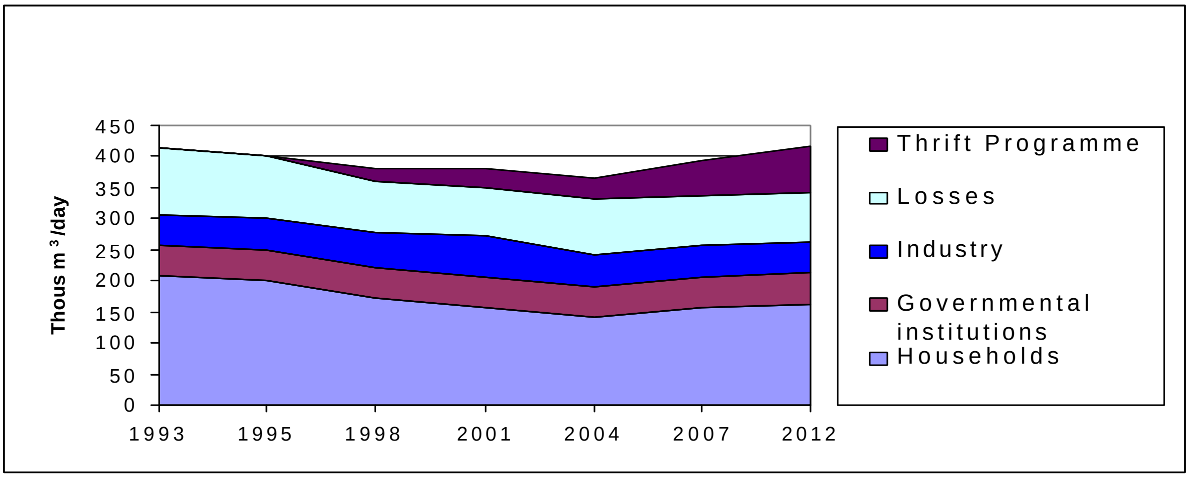

Figure 6. Projected water consumption in Riga [8].

1.4 Sewerage system

The wastewater of Riga is mechanically and biologically treated in the biological treatment plant Daugavgriva. The wastewater treatment plant started to operate in 1991 with a capacity of 350,000 m^3/d [8].

1.4.1 Wastewater network

The total wastewater network in 1999 was 851 km long [6], consisting of:

- Collectors 167 km
- Street sewers 386 km
- Block sewers 197 km
- Pumping stations 35

As the number of old sewers is high, the need for repairs is growing. The increase of wastewater emergency calls in the 1990s is shown in Figure 7.

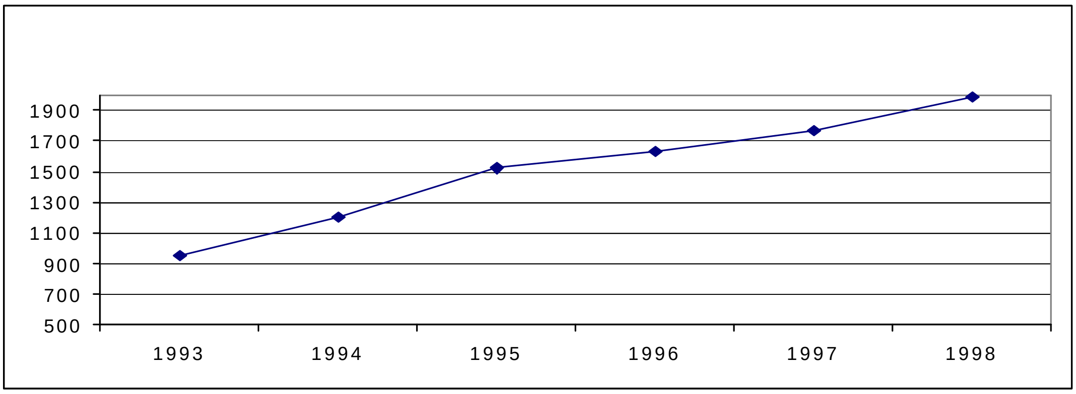

Figure 7. Wastewater emergency calls in 1993-1998 [6].

1.4.2 Wastewater treatment

The treatment process begins with mechanical filtration through screens. After sand sedimentation the wastewater is directed to mechanical treatment in radial sedimentation pools that have a volume of 16,000 m^3. Biological treatment is based on an anaerobic-anoxic-aerobic treatment chain; first, the wastewater enters into the anaerobic zone for anaerobic bacteria treatment. Then it is directed to the anoxic zone with aerobic bacteria. In the last stage, aerobic treatment takes place in artificially aerated ponds with so-called activated sludge and aerobic bacteria. After the biological treatment the wastewater is directed into secondary sedimentation ponds [8].

The amount of chemicals in the treated wastewater is shown in Table 5. After the Soviet era the industrial production has decreased, and wastewater loads have decreased accordingly [4].

Table 5. Wastewater quality, mean value in 1998 and quality standard [6].

Item	Effluent	Local quality standard	Reduction, %
BOD_5, mg O_2/l	7.03		94.32
Nitrogen, mg/l	14.1	-	47.35
Phosphorus, mg/l	2.55	-	52.89
Suspended solids, mg/l	16.6	12	89.54

Allowed amounts of cadmium and lead are 0.02 mg/l and 0.05 mg/l, respectively. Contents of these ions in the treated wastewater are very low, under 15% of the maximum acceptable standard.

In 1998 the total volume of wastewater was 137,851,400 m^3, of which 54 %, 74,200,000 m^3 was treated. In addition the plant produced 960,475 m^3 of biogas and 37,000 m^3 of dehydrated sludge, including 30,000 m^3 supplied to consumers and 7,000 m^3 (18.9%) transported to sludge fields. The aim is to treat all wastewater, improve the treatment technology and enlarge the capacity of the plant [6].

1.5 Recipient

The treated wastewater is discharged into the Gulf of Riga 3 km off the shore [4]. The Gulf of Riga is a semi-closed basin that has become considerably entrophicated. As a result it is essential to improve the wastewater treatment facilities and cut the loads into the Gulf.

2 Copenhagen

2.1 Map of the city, water recources and technical network

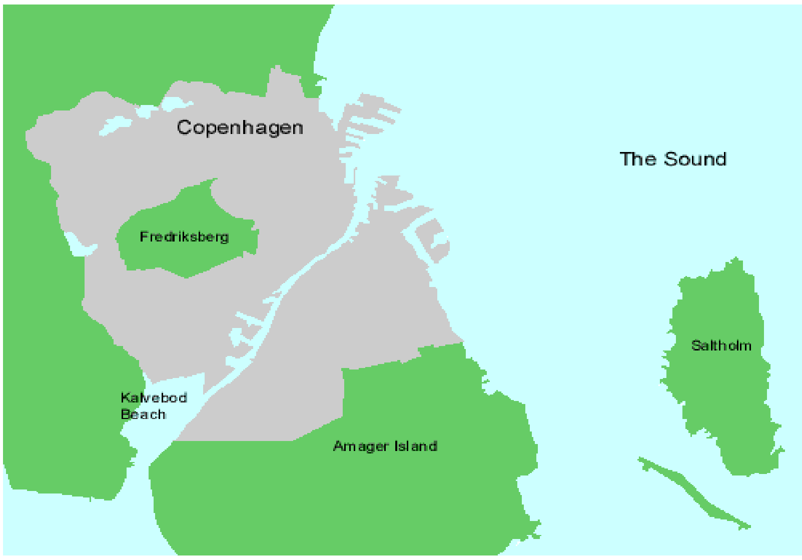

Figure 8. Map of Copenhagen [1].

Table 6. Facts about Copenhagen, 1998 [3].

Population in Copenhagen	487,969 (1998)
Population in Frederiksberg	89,507 (1998)
Average temperature in July	16°C
Average temperature in February	0°C

Copenhagen Water supplies water for Copenhagen in co-operation with the neighbouring counties where water is extracted. It is also responsible for the municipal sewerage system. Copenhagen Water and Copenhagen Energy are also engaged in reducing water and energy consumption in the Copenhagen area.

Contact information

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2.2 Drinking water

There are seven water plants in Copenhagen [9], of which six use groundwater as a raw water source and one that uses groundwater and surface water. Virtually all drinking water is generated from groundwater resources (see Figure 9). The total water production is 67 million m^3.

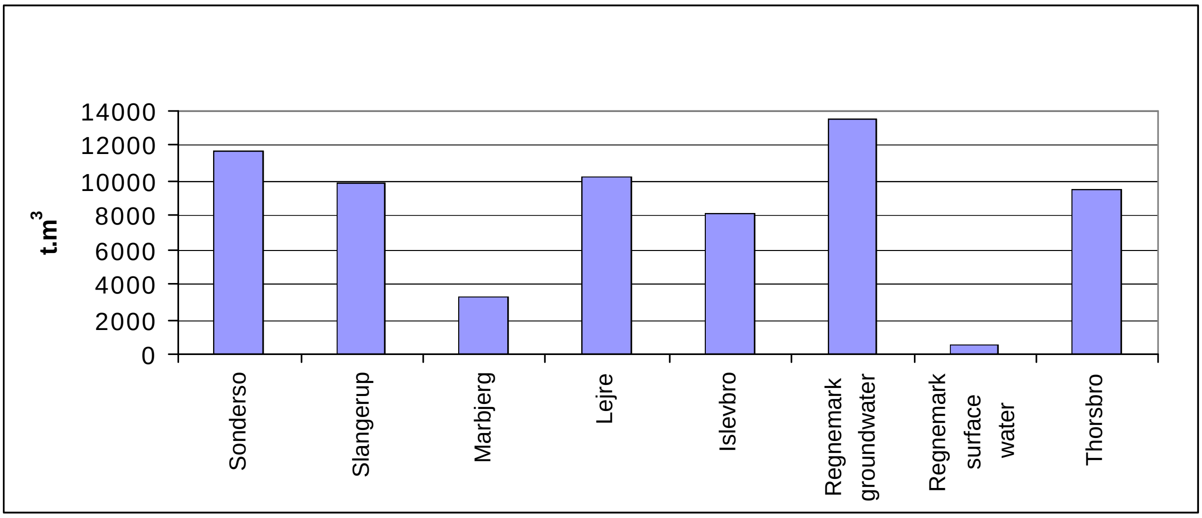

Figure 9. Total Water Production in 1997 in Copenhagen [9].

The catchment and production of the seven waterworks are listed in Table 7 and Table 8 [9].

Table 7. Catchment and production of waterworks in 1997 [9].

	Sonderso	**Slangerup**	**Marbjerg**	**Lejre**
Year of construction	1941-43 and 1947-51	1950-54	1932-34	1934-39
No. of bore holes	85	112	29	158
Licenced capacity m^3	19,000,000 (3,400,000)*	17,000,000	4,000,000	18,000,000
Yielding capacity m^3	17,400,000	14,000,000	4,000,000	17,500,000
Catchment m^3	11,890,000	9,920,000	3,400,000	10,290,000
Production m^3	11,660,000	9,870,000	3,370,000	10,230,000
Energy consumption per 100 m^3 kWh	32.43	30.52	24.45	24.84

Table 8. Catchment and production of waterworks in 1997 [9].

	Islevbro	**Regnemark**	**Thorsbro**	**Total**
Year of construction	1918-23	1960-64	1905-13	
No. of bore holes	158	119	105	766
Licenced capacity m^3	17,125,000	16,000,000 (15,000,000)*	14,875,000	124,400,000
Yielding capacity m^3	12,000,000	16,000,000 (14,500,000)*	15,000,000	110,400,000
Catchment m^3	8,150,000	14,220,000 (930,000)*	9,570,000	68,370,000
Production m^3	8,070,000	14,080,000 (590,000)*	9,520,000	67,390,000
Energy consumption per 100 m^3 kWh	37.88	24.89	21.66	28.09

* Figures in brackets represent surface water

2.2.1 Water treatment

Copenhagen's water treatment ensures quality that meets all requirements. The standard treatment consists of aeration and double filtration. At the Thorsbro Waterworks, approx. 7,800,000 m^3 is treated solely by aeration, while at the Thorsbro plant water is desinfected with UV treatment [9].

The groundwater at the Æbeholt well field contains methane, which is removed by a vacuum deaeration method [9]. At the Regnemark plant, post-desinfection is carried out by dosing with monochloroamine (MCA), which enables the treated groundwater to be mixed with the treated surface water.

2.2.2 Water quality

Copenhagen Water has closed some well fields in recent years because of pesticide residue pollution [9]. Nevertheless, the quality of drinking water in Copenhagen has remained good (Table 9). The risk of pollution is high and many programmes have been started to improve the condition of nearby waters [10].

Table 9. Chemical examinations of fully treated water in 1997 in the Regnemark plant. The values are average for groundwater and surface water [9].

Parameter	After treatment at the Regnemark plant	From pipe network	Highest permitted values
Oxygen, mg O_2/l	8.4	8.7	
Nitrates NO_3^-, mg/l	4.5	3.0	50
Nitrites NO_2^-, mg/l	<0.003	0.011	0.1
Total phosphorus, mg/l	<0.005	<0.005	0.15
Ammonium NH_4^+, mg/l	0.13	0.008	0.5
Permanganate $KMnO_4$, mg/l	6.2	5.9	12
Magnesium, mg/l	22	20	50
Calcium, mg/l	125	122	
Sodium, mg/l	59	46	175
Potassium, mg/l	5.3	4.1	10
Manganese, mg/l	<0.005	0.009	0.05
Nickel, mg/l	0.001	0.004	0.02
Iron, mg/l	<0.008	0.020	0.2
Sulphate, mg/l	103	93	250
Chloride, mg/l	94	70	300
Fluoride, mg/l	0.47	0.42	1.5
pH at 12ºC	7.48	7.51	8.5
Turbidity (FTU)	0.14	0.33	0.5
Colour value, mg/l	4	5	15
Temperature ºC	10.3	11.2	12
Conductivity at 12ºC, mS/m	73,5	67.8	

Water quality is subject to strict control. Raw water quality is checked at the abstraction sites and at the well fields. The treated water is examined at the outlet from the waterworks and at selected tap points. Surface water is also under strict control and has so far never exceeded tolerance limits [9].

2.2.3 Water network

In general the pipes are old, but owing to maintenance and repair their actual condition is good (Figure 10).

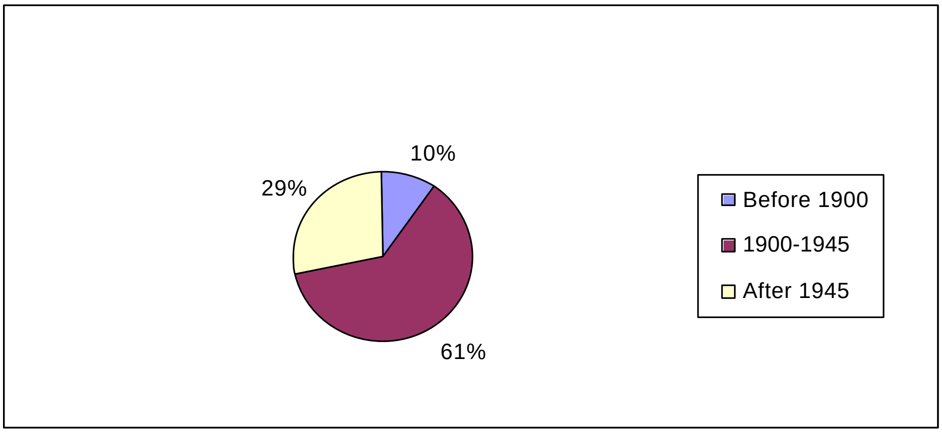

Figure 10. The age distribution of the water network of Copenhagen [9].

The water loss from the pipeline network shows a declining trend in the recent years and is small [9] (Figure 11 and Figure 12).

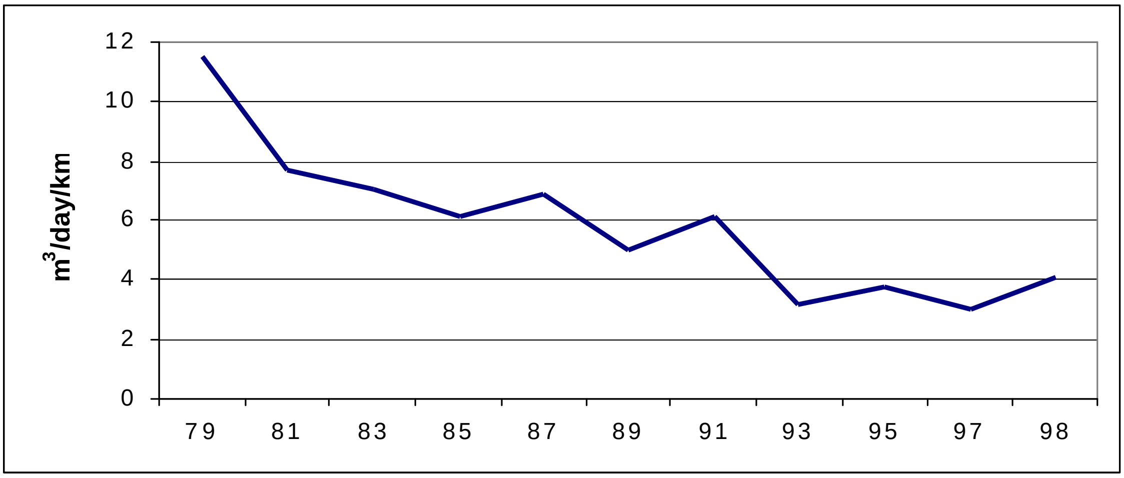

Figure 11. Water loss in pipeline network [11].

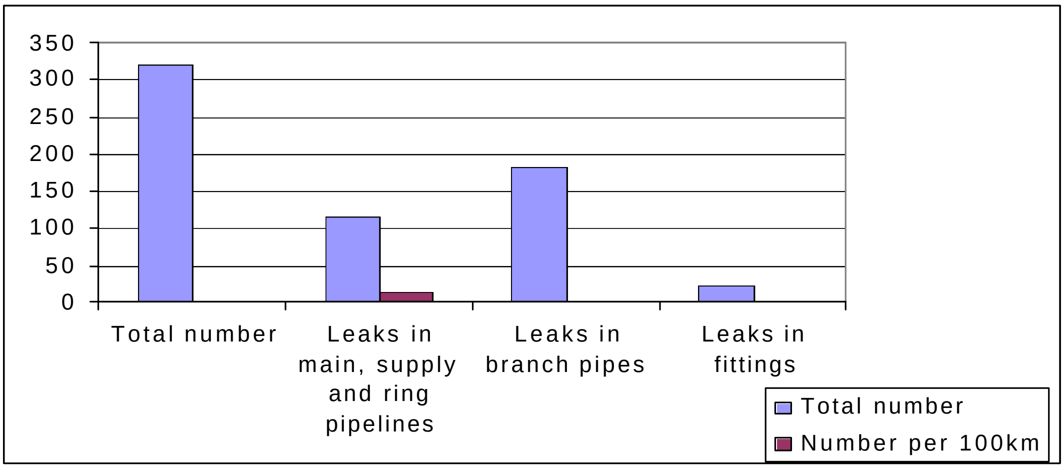

Figure 12. Leaks in the water network in 1997 [9].

Water pipes are mainly cast iron [11]. The total length of the network in 1998 was 1112 km, and it has been expanding slowly (Table 10).

Table 10. Length of the pipes [11].

	1997 (km)	**1998** (km)
Trunk Mains 1200-305 mm	152.7	156.5
Distribution Mains 292-50 mm	744.9	763.6
Service Connections	191.5	191.5
Total	**1089.1**	**1111.6**

2.2.4 Water consumption

During recent years water consumption has decreased despite the growth of industrial production and the population (Figure 13). One reason is decreased water loss in the network, but the water use of industry and institutions has also decreased, whereas daily household consumption remained unchanged, 133 litres per capita.

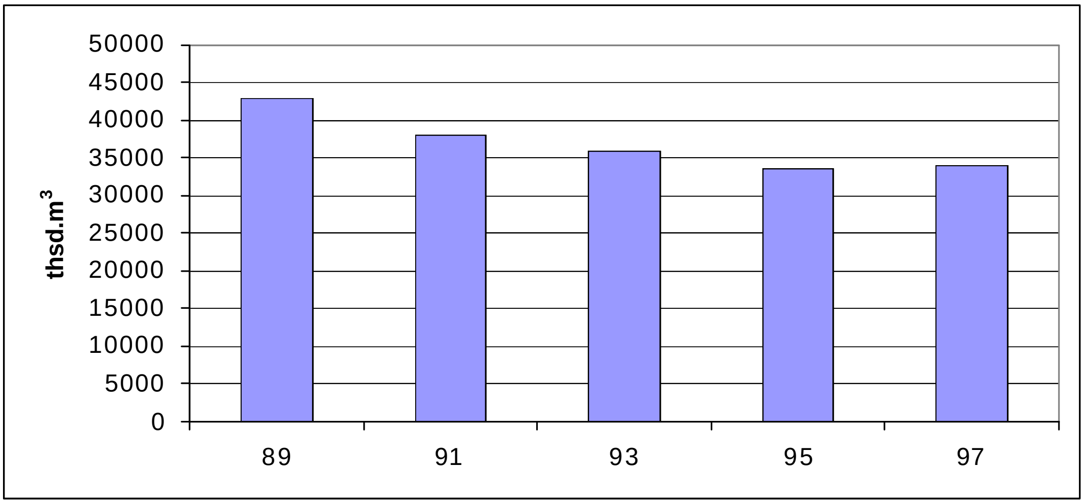

Figure 13. Water consumption in Copenhagen [9].

Table 11 presents the distribution of water produced in 1997. Distribution of consumption is shown in Table 12.

Table 11. Water use parameters in 1997 [9].

Production	67.39 Mm^3
Loss during transport etc.	0.74 Mm^3
Supply from waterworks	66.65 thsd.m^3
Equalisation in service reservoirs	-0.11 Mm^3
Total water supplied	**66.54 Mm^3**
Measured water consumption	34.10 Mm^3
Unaccounted-for water use (fire extinguishing, pipeline work, meter defects, leaks, etc.)	1.60 Mm^3
Total water consumption	**35.70 Mm^3**

Table 12. Distribution of consumption in 1997 [9].

	%	Mm^3
Domestic	66.0	23.6
Industrial	22.0	7.8
Institutions etc.	6.3	2.2
Recreational	1.3	0.5
Unaccounted-for water use	4.4	1.6
Total	**100**	**35.7**

2.3 Wastewater

The first wastewater treatment plant was built in 1910 in Valby and the second in 1933 at the Damhus Lake, later rebuilt and renamed the Damhusåen plant. In 1964 a pump station was built on the Amager having an outlet 2.2 km out into the sea. The Lynetten wastewater treatment plant was put into operation in 1972. It has both mechanical and biological treatment processes and is today the main water purification plant in Copenhagen. The ”new” Lynetten plant was completed in 1997 [12].

The Damhusåen plant treated wastewater only mechanically, and the water was led to Lynetten until a new biological plant was completed in 1997 [2].

The Lynetten and Damhusåen plants treat the wastewater of the eight municipalities of the Lynettefællesskabet: Copenhagen, Frederiksberg and Gentofte, as well as parts of Lyngby-Taarbæk, Gladsaxe, Herlev, Rødovre and Hvidovre [12].

Table 13. Lynetten and Damhusåen treatment plants [12], [13].

	Lynetten	**Damhusåen**
Capacity	750,000 PE*	350,000 PE
Wastewater flow, m^3/d	220,000	100,000
Catchment area, km^2	over 76	over 47
Population	approx. 500,000	approx. 226,000
Maximum capacity of the influent, m^3/h	41,500	28,000
Maximum capacity of the biological unit, m^3/h	23,000	10,000

*Population equivalent (PE) is the total load of households and industry per capita.

The plants treat annually more than 90 million m^3 of industrial and domestic wastewater, equivalent to a pollution load from a population of approximately 1.1 million PE [12].

The sewerage system becomes overloaded during the periods of heavy rain [10]. In order to avoid flooding basements and roads, excess wastewater and rain water are discharged directly into nearby waters.

2.3.1 Wastewater network

The length of sewer network was 1280 km in 1998 [11].

2.3.2 Wastewater treatment

In primary treatment the wastewater first passes through mechanical screens with 10 mm mesh [12]. Large solids, such as rags, paper, pieces of wood etc., are removed and transported for incineration. The wastewater flows into an aerated grit and grease chamber, where grit and grease are removed. Impurities are removed in a washer, and the grit is led to an incinerator and subsequently to an ash disposal site. The grease is pumped to digesters for decomposition, which produces biogas. The wastewater is then conveyed and distributed to the primary settling tanks (eight in the Lynetten plant and seven in the Damhusåen plant), where heavy sludge particles settle, reducing organic matter content by 40-50% [13].

Biological treatment consists of an activated sludge unit that removes nitrogen and phosphorus using the BIO-DENIPHO® process (Figure 14) [12]. The process increases the content of phosphorus in the sludge three fold compared to normal biological sludge. The residual phosphorus in the wastewater is removed by chemical precipitation with iron salts in the aeration tanks.

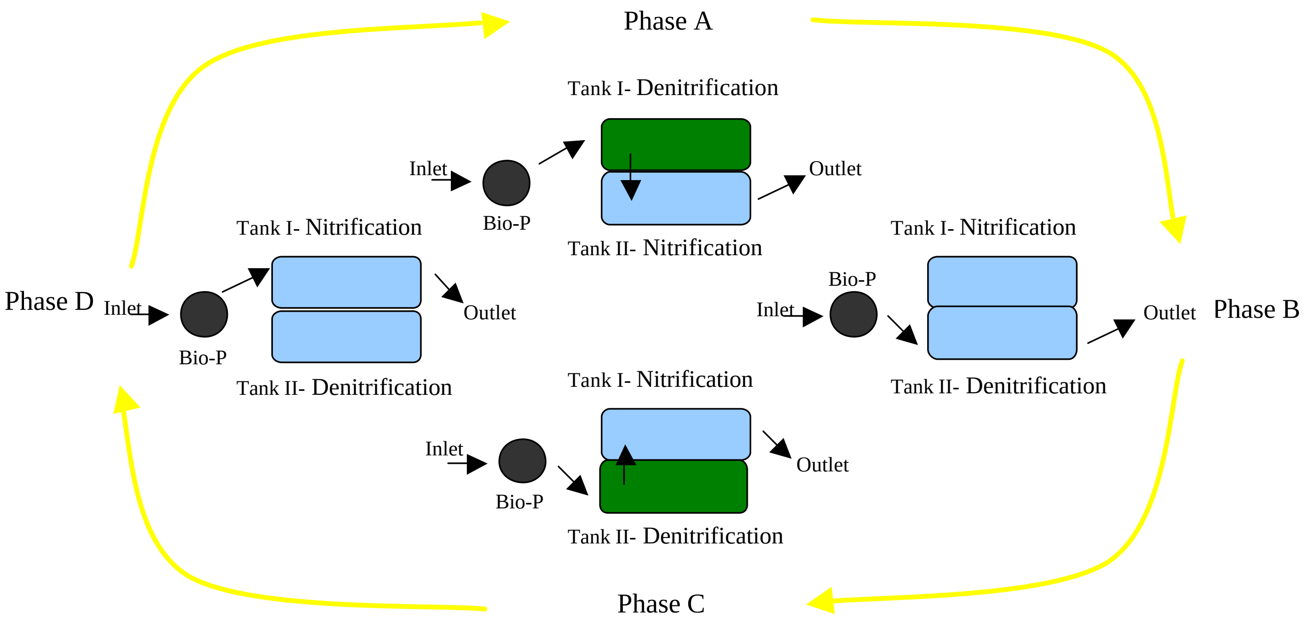

Figure 14. Bio-Denipho® process [12].

After the biological treatment, final settling takes place in 38 (Lynetten)/24 (Damhusåen) tanks where the treated water is separated from the sludge, which is recycled into the biological tanks [12], [13].

Table 14. The loads discharged from the Lynetten and Damhusåen plant into the Sound [12], [13].

	Lynetten, t/day	Damhusåen, t/day
SS	60	25
BOD_5	45	20
COD	87	44
Nitrogen	7.2	3.2
Phosphorus	1.5	0.8

2.4 Recipient

The Lynetten plant

The treated wastewater is led through two pipes, each 180 cm in diameter. The outlet is located 1500 m off the shore in the Sound. In order to ensure that the treated wastewater and the seawater are well mixed there are 22 vertical pipes that are placed along the top of the outfalls and provided with discharge nozzles (diffusers). The discharge point is at a depth of 8 m. [12]

The Damhusåen plant

The treated wastewater is discharged into the Sound via the Sjællandsbroen pumping station with a capacity of 18,000 m^3/h. The outlet pipe is 1200 m long [13].

The energy produced as a by-product is used in the treatment processes for sludge pre-drying, heating of digesters, buildings and staff facilities. The surplus heat is sold to Copenhagen's district heating company [12].

The annual pollution load from the wastewater treatment plants can be seen in Figure 15 [14].

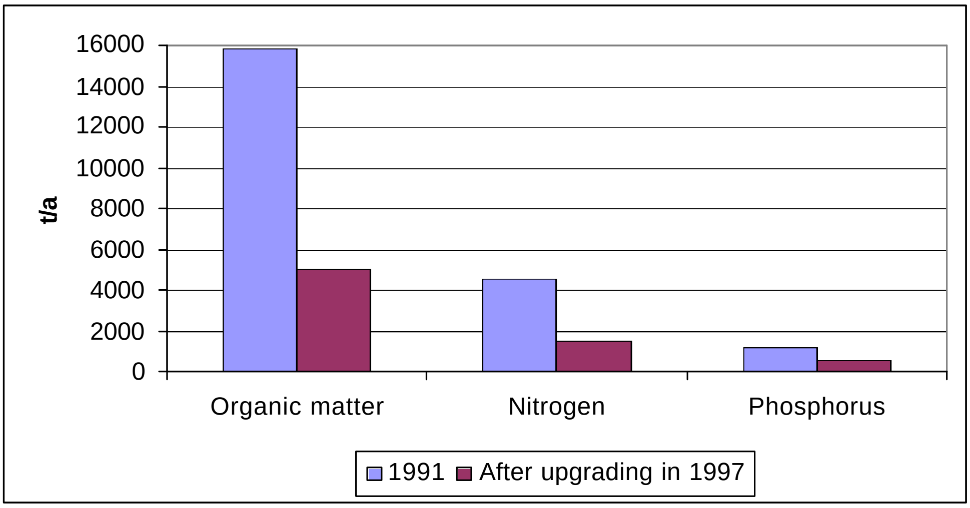

Figure 15. Annual discharges from Lynetten and Damhusåen [14].

3 Summary

Water pollution is a serious problem in the world today. In some places the lack of clean drinking water is already a fact. The waters near Riga and Copenhagen have suffered from pollution, the water quality of the Daugava River is poor and in Copenhagen some well fields have been closed because of pollution. The drinking water quality is good in Copenhagen, and the quality of treated water in Riga is also generally good. In Riga as well as in the other Baltic countries the main problem is the poor condition of the water distribution network. When the drinking water reaches the consumer its quality has decreased along the way. Currently there is great interest in Riga to reconstruct the pipe network, however this requires financial assistance.

In Copenhagen the main problems occur during heavy rains, when part of wastewater is discharged untreated into nearby waters. In general the wastewater treatment in the Copenhagen region is good. In Riga almost 50 % of the wastewater is discharged without treatment into the sea. In Riga several projects are running to improve and extend the wastewater treatment, most of them being funded by the EU. The technical and the financial support from the Scandinavian countries is also important as well.

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