Clean Water Services in Finland

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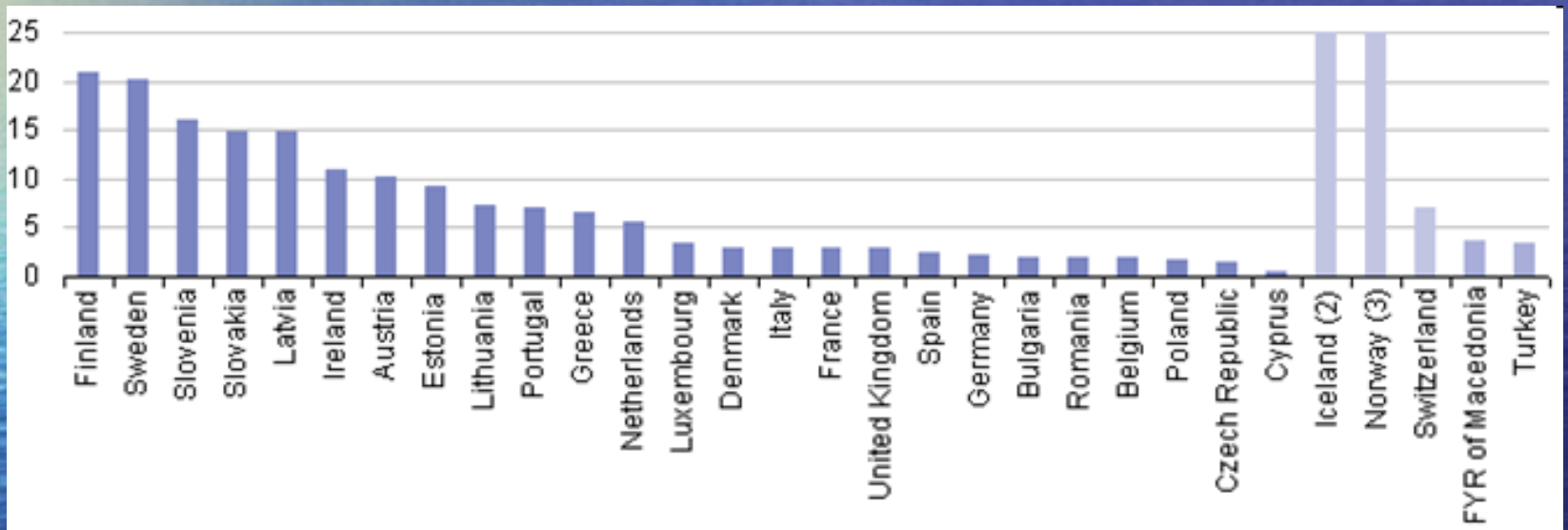
Europe's freshwater resources per capita in 2007 – long term average

- Finland has excellent freshwater resources



(1) The minimum period taken into account for the calculation of long term annual averages is 20 years; population data are as of 1 January 2007; Hungary and Malta, not available.
(2) Y-axis is cut, 552 500 m³.
(3) Y-axis is cut, 83 200 m³.

Source: Eurostat (ten00001 and tps00001)

References: European Commission, Statistics Explained
http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Water_statistics

Consumption

- Clean water usage per person:

- Households 166 l/day
- Industry 1018 l/day
- Agriculture 33 l/day

Household water consumption

- The specific household water consumption has gradually decreased in Finland
- Water consumption was highest in 1972, totalling 335 litres/capita per day. In 2001 consumption was 242 litres/capita per day.
- The household share of the water consumption is approximately 60%

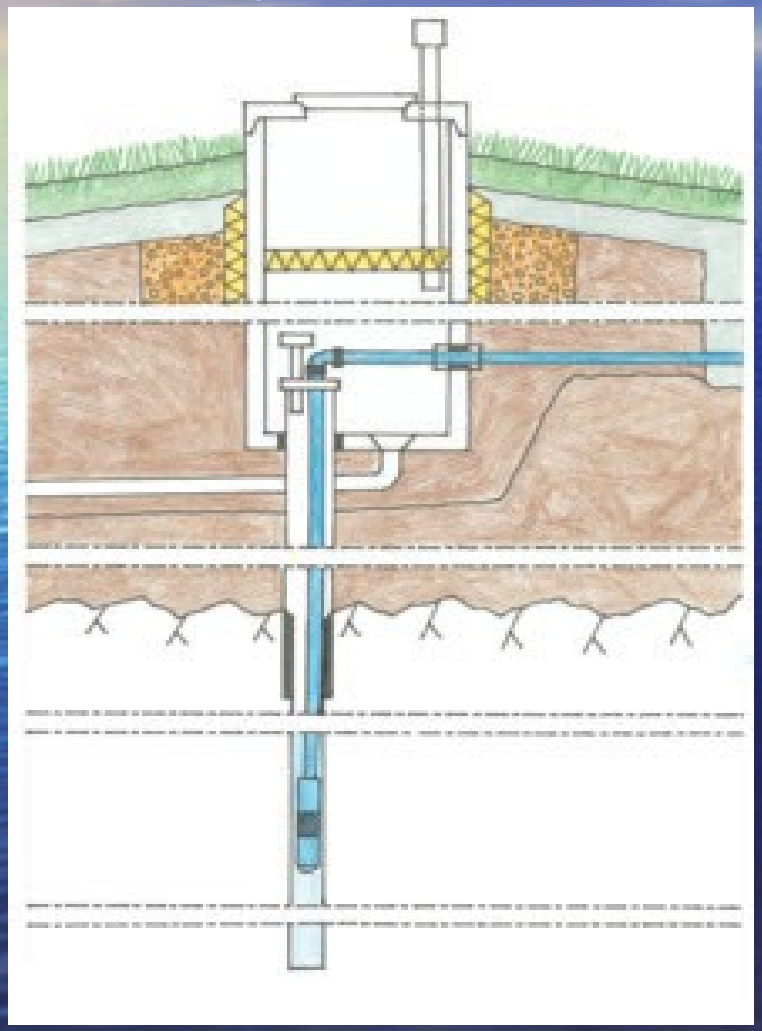
Household water consumption in Helsinki Region

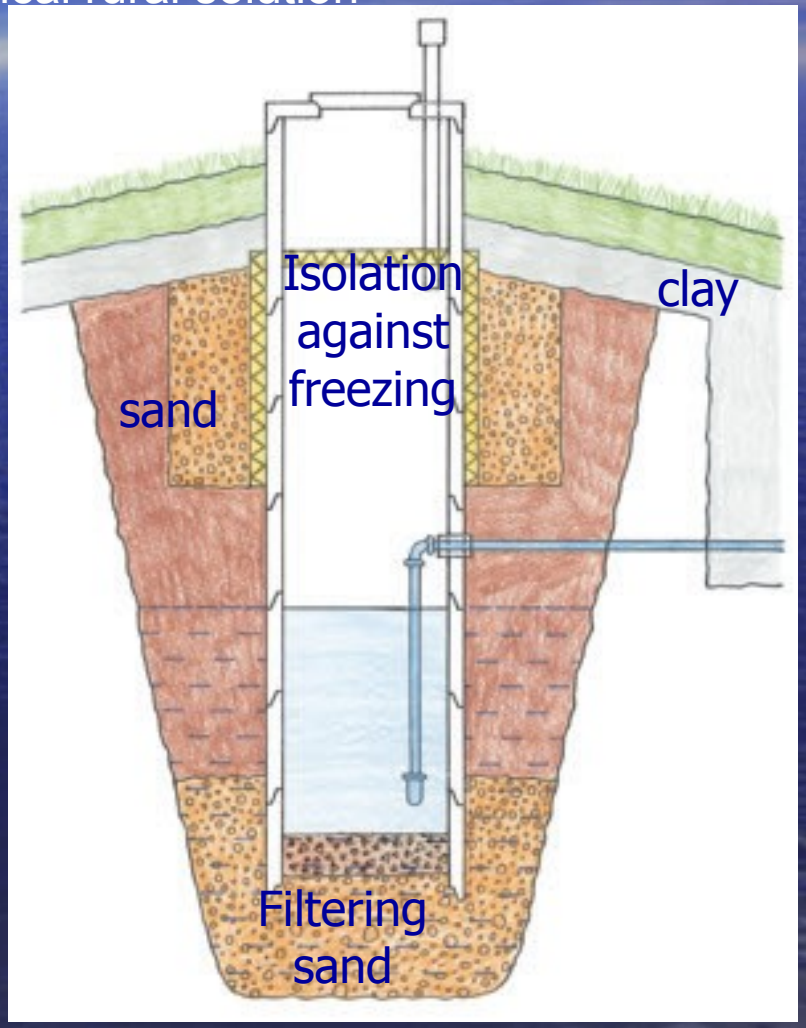
Household water consumption [litres/capita/day]	Residential type
158 (average)	
149	row house
123	detached house

References: The website of Finland's environmental administration
http://www.ymparisto.fi/default.asp?node=560&lan=fi
HSY Helsinki Region Environmental Services Authority
http://www.hsy.fi/vesi/palvelut/juomavesi/kulutus/Sivut/default.aspx

Ground water supplies

Usually no disinfection needed, typical rural solution





Finnish Water and Waste Water Works Association (FIWA)

- Co-operation and member association of the Finnish water and wastewater utilities, established in 1956
- Aims at influencing the government, in order to facilitate enabling policy, economic and operational environment for water utilities.
- Includes over 300 Finnish water utilities which cover about 90 % of water services in Finland
- FIWA also has about 130 collaborating members (companies, institutes, etc.)
- Works to safeguard and promote the interests of its member utilities and to enhance their professional skills.

National water supply and severage law (Vesihuoltolaki 9.2.2001/119) obliges the municipalities to take part in the regional planning of water supply by co-operating with all the water works and other municipalities in the region.

Reference: The website of Finnish water and waste water works association
http://www.vvy.fi/in_english

Production & treatment of raw water

- About 4,7 million Finnish people among water supply network
- 1900 waterworks that supply water to at least 50 people (surface water 39%, groundwater/artificial groundwater 61%)
- Often a public service – price is regulated – cost level about the same in the whole of Finland, year 2010 level 2 eur/m3
- Treatment process depends on the quality of the raw water
- The water supply system consists of following:
  - raw water intake
  - water treatment at waterworks
  - pumping water to storages
  - delivering water through the supply system

Surface water treatment 1(2)

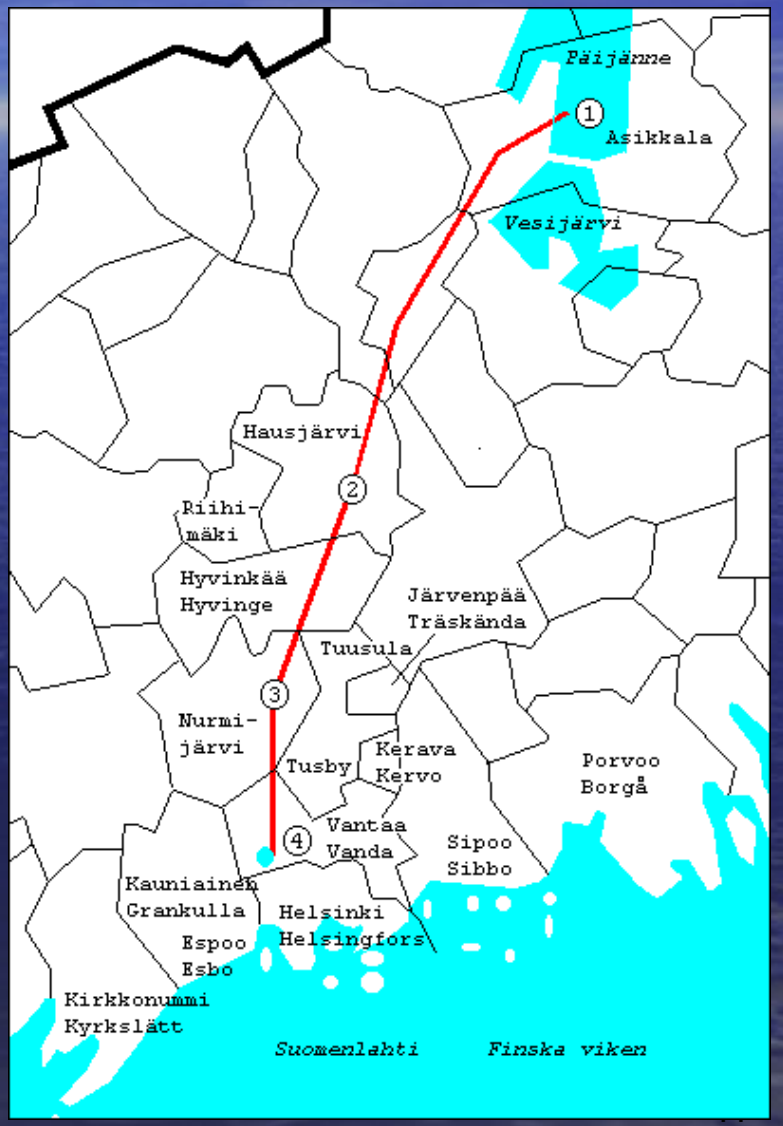
- Surface water treatment is a complex process
- Usually starts with making artificial groundwater, but water from a lake or river can also be pumped to waterworks for treatment as such

Surface water treatment 2(2)

- The treatment process can include for example:
  - straining
  - adjusting pH for the flocculation
  - flocculation: organic matter is flocculated with aluminium or iron salt
  - sedimentation, flotation
  - filtering
  - disinfection (chlorine, chloramines, chlorine dioxide, ozone, UV-light)

Päijänne Water Tunnel

- Fresh lake water for Helsinki area
- 120 km long, 30 m deep in the bedrock
- Provides water for million people
- Usually drinkable without processing
- Low transfer temperature ensures high quality during transport



Monitoring, legislation and quality requirements

- In Finland the quality of household water has been monitored regularly since the 1960's
- The municipal health care authorities responsible for the monitoring
- The ministry of social affairs and health is responsible for the common regulation concerning household water → Decree of the Ministry of Social Affairs and Health Relating to the Quality and Monitoring of Water Intended for Human Consumption (461/2000) gives the frames to the household water quality (the Decree based on the Directive 98/83/EY). In the Decree the quality requirements and recommendations include 8 pages.
- The information about water quality and monitoring are reported to the European Commission every three (3) years → concerns water works which deliver water over 1000 m^3 per day or for over 5 000 users
- Household water must not contain any micro-organisms, parasites or chemical substances in such amounts or concentrations which could be harmful for human health

Reference: HealthFinland http://demo.seco.tkk.fi/tervesuomi/item/ktl:3094

Summary of the household water quality in Finland in 2007 (large waterworks)

Parameter	unit	mean
Coliform bacteria	pmy/100 ml	<1
Escherichia coli (initial recognition)	pmy/100 ml	<1
Arsenic	As, µg/l	0,2
Cadmium	Cd, µg/l	0,05
Chromium	Cr, µg/l	0,3
Lead	Pb, µg/l	0,1
Fluoride	F^-, mg/l	0,37
Nitrate	NO^-_3, mg/l	2,0
Nitrite	NO^-_2, mg/l	0,07
Mercury	Hg, µg/l	0,02
Nickel	Ni, µg/l	0,6
Aluminium	Al, µg/l	22,4

Parameter	unit	mean
Ammonium	NH_4^+, mg/l	0,01
Sulphate	SO_4^{2-}, mg/l	26,8
Chloride	Cl^-, mg/l	14,9
Chemical oxidation demand	COD_{Mn}, mg/l	0,71
Copper	Cu, mg/l	0,03
Manganese	Mn, µg/l	4,4
Iron	Fe, µg/l	37,5
Natrium	Na, mg/l	11,9
pH		7,9
Conductance	µS/cm	207
PAH compounds	µg/l	<0,001

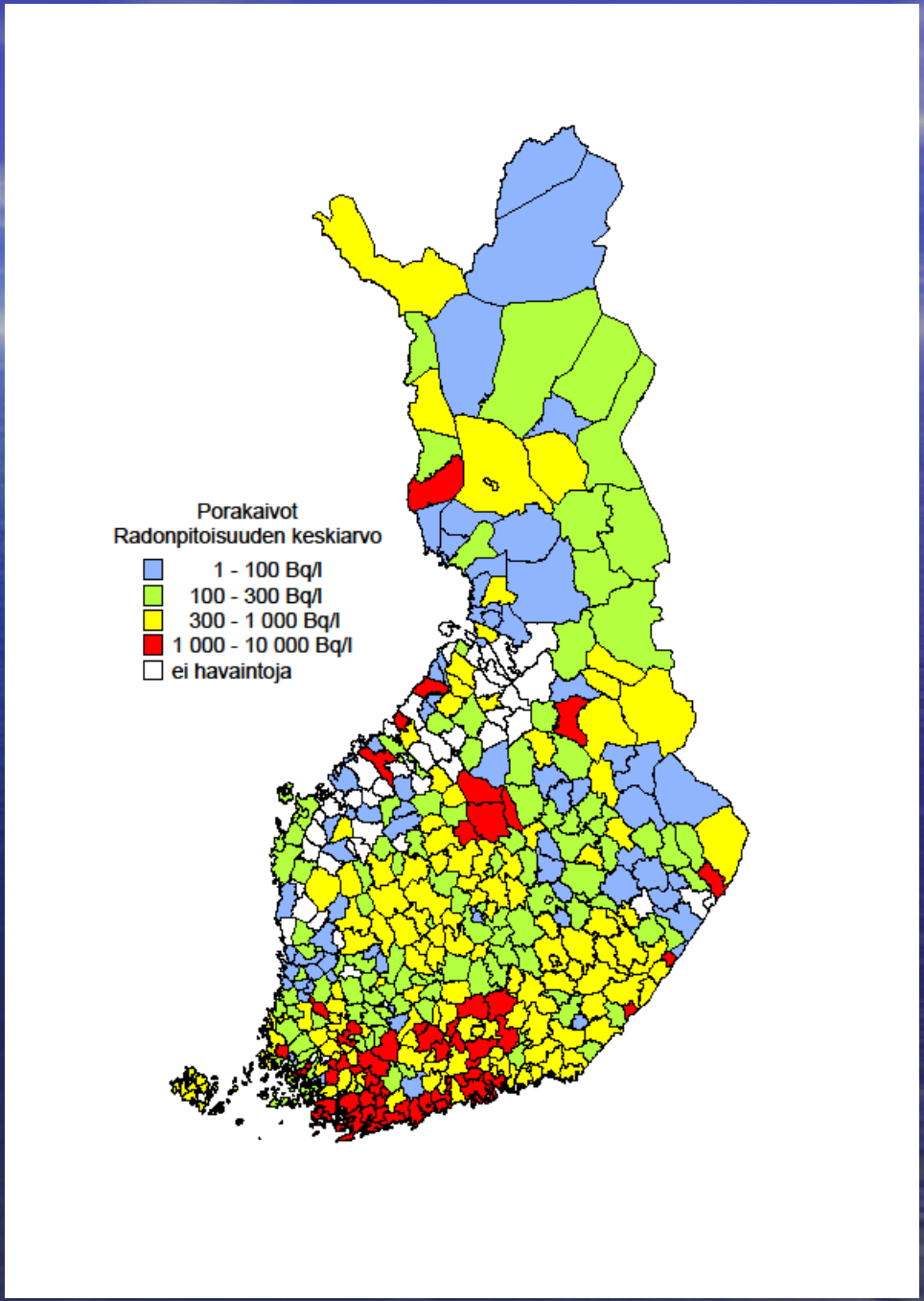
Reference: Valvira National Supervisory Authority for Welfare and Health
http://www.ktl.fi/attachments/osastot/ytos/2007.pdf

Risks with household water in Finland

- The purified water may stay in water systems over a long period of time before it is used.
- Human error
- Accidents, such as water pipe leaks
- Disinfection process can lead to impurities (often carcinogenic) when suitable organic matter, such as humus, is present
- Water quality of private wells is not controlled: Harmful substances, such as radon, can dissolve from rock or enter the wells with storm waters

Radon concentrations of drilled wells in Finland

- Action limit for radon is 1000 bq/l



Finnish clean water – one of the safest in the world

- Abnormal conditions or risky situations in Finnish household water production are very exceptional and rare → household water supply is secured both in quantity and quality

- According to a study (made by The National Institute for Health and Welfare) Finnish tap water has a better quality than bottled water → this is mainly due to storage and warming of the bottled water

Thank you!