Wastewater treatment in Finland

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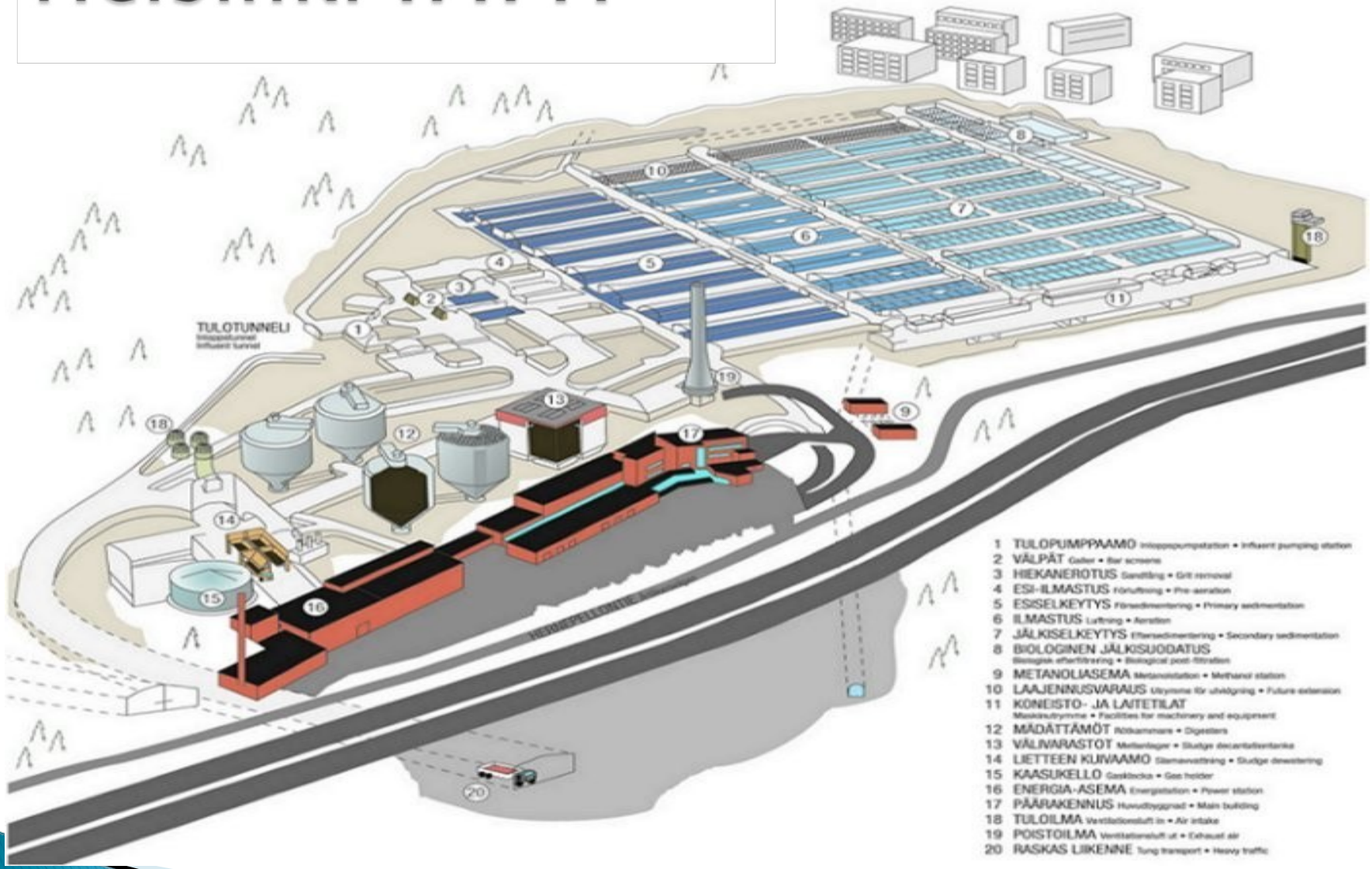
Waste Water Treatment

- Helsinki WWTP
- New WWTP project in Tampere
- Applications
- Cooperation of communes
- Scattered settlement wastewater treatment regulation
- Co-operative water society
- Sludge treatment

Helsinki WWTP



Helsinki WWTP

- The biggest WWTP in Finland (800 000 habitants & Industry waste water)
- Total flow 270 000 m³/d
- Build inside the rock
- Effluent to the sea, 20 m under sea level through rock tunnel

	Environmental permit	EU requirement	Result 2008
BHK7	< 10 mg/l > 95 % > 70 %	< 30 mg/l 97 %	6,7 mg/l
Total P	< 0,3 mg/l > 95 %	< 1,0 mg/l > 80 %	0,22 mg/l 96 %
NH4-N	< 10 mg/l > 70 %	> 70 %	87 %

Helsinki WWTP

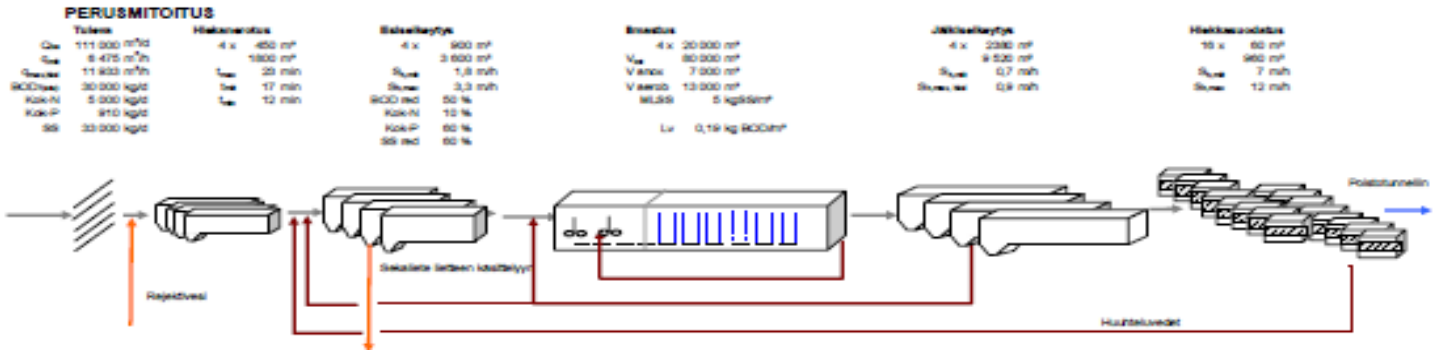
- From biogas to energy
  - Digestion → methane → Energy
  - >20 GWh/a biogas, >30 GWh/a heat
- From sludge to eco mould
  - Hygienication -> Composting → Landscaping
- Heat and cooling energy from waste water
  - The world biggest heat pump plant which produces in the same process both heat (90 MW) and cooling (60 MW) energy
  - In winter: Heat energy from effluent by heat pumps, Cooling energy from sea by heat transfers
  - In summer: Heat energy from return of cooling water

WWTP project in Tampere

- WWTP inside the rock for several communes
- Influent: 111 000 m3/d
- Efficiency of waste water treatment

	mg/l	Reduction
BOD7	< 8	> 96%
Total P	< 0,3	> 96 %
NH4-N	< 4	> 90 %

Process steps in Tampere WWTP



- Screening
- Pre coagulation
  - Ferrous sulphate (solid)
  - Ferric sulphate (liquid), Optional
- Aeration (nitrification)
  - Methanol as a carbon source
  - Soda to rise pH after pre coagulation
- Post coagulation
  - Polymer as option to make a process more effective
- Sand filtration
- Sludge removal-> Biogas for energy plant

Applications

- Odor controlling
  - To remove H2S for drainage and pipes -> removes bad smell
- Bulking sludge & Foam control
  - Reduced costs related to foam disposal
  - Cost control - stabilized operation
  - Avoidance of biocide use
- Disinfection of waste water
  - To achieve EU swimming water directive
    - UV treatment
    - Chemical treatment

Co-operation of communes in Finland

- From the 1990s the number of cities' WWTPs has decreased -> Centralization
- Bigger WWTP can be used more effectively than small one.
- More economical to combine WWTPs than renovate old WWTPs
- Longer drainage pipes, even 40 km.
- Contractual cooperation is usually a first step to closer inter-municipal cooperation
- The amount of wastewaters led to the other municipality is either very low (>10%) or high (100%)

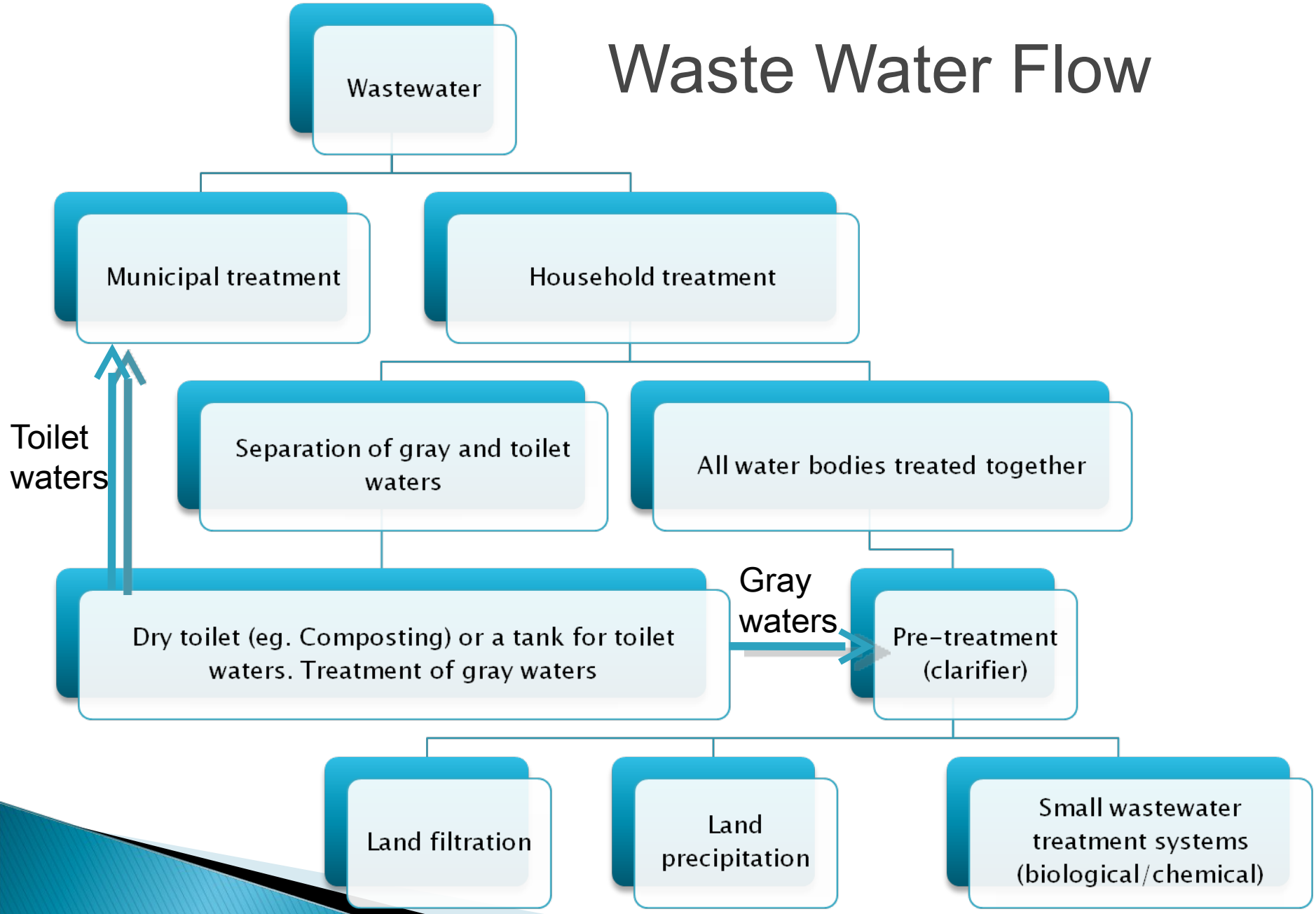
Scattered settlement in Finland

- About one million regular habitant
- Up to one million summer cottages
- Most of which do not belong to cities / communities wastewater network
- Pollutes water systems six times more than households which belong to the wastewater network
- Second largest phosphorous pollutant after farming

Scattered settlement wastewater treatment regulation

- Regulation 542/2003
  - Wastewater treatment of households outside the areas of the wastewater networks (valid from 1.1.2004)
  - All new houses has to meet the regulation immediatelly, old houses 10 year of transition period
- All household wastewaters has to be treated so that
  - BOD7 decrease 90 %
  - Phosphorous decrease 85 %
  - Nitrogen decrease 40 %

Waste Water Flow



Financing the household treatment

- The cost of the systems is payed by the house owner
- People with small incomes can apply financial support from ARA (Funding and improving centre of household living). The maximum support is 35 % of total investment cost

Co-operative water society

- Enables scattered settlement households to join in the municipal wastewater treatment
- Co-operative water society can be established with minimum of 3 households
- The co-operative water society constructs and maintain the pipelines to the municipial or a village community wastewater treatment plant

Co-operative water society

- The construction and maintenance of the pipelines and pumping stations are funded mainly by the society members (entry fee and yearly payment)
- Society can apply water treatment support from the environment centre and some special support from the government and local city
  - Water treatment support is maximum 30 % of total cost or in special case 50 %
  - Total support may not overcome 75 % of total investment

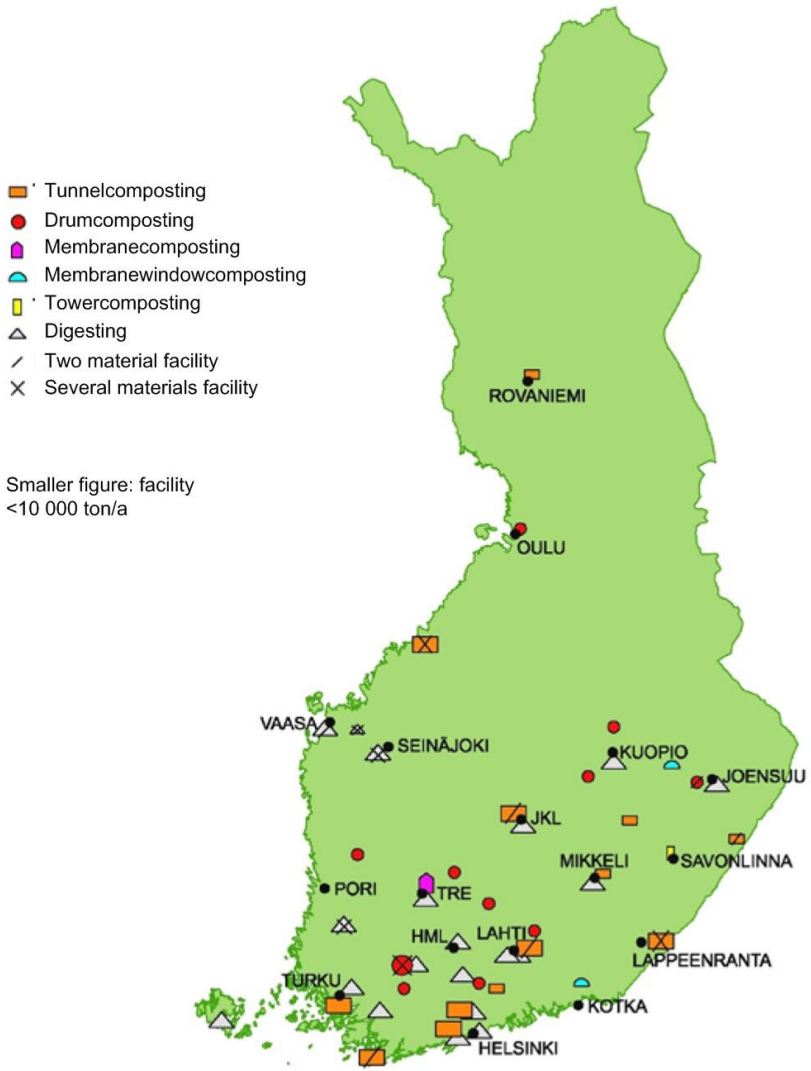
Sludge – basic facts

- Total amount produced in Finland 23 million t/a; mainly from agriculture (93%), food- and small-scale industry and scattered settlement
- 840 000 ton sludge/a comes from waste water treatment (4% of total)
- The amount of sludge from waste water treatment relatively stable during the last years

Sludge treatment

- The sludge might depending on origin and pre-treatment contain heavy metals, viruses and bacteria, nutritients: N, P as well as organic matter
- Sludge-treatment reduces organic material, volume, odour, and improves the hygiene
- Gives opportunity for further utilization and soil improvement
- Most common sludge treatment techniques used in Finland are digestion and composting

Largest composting and digesting sites in Finland



Trends

- Political decisions and a general interest in effective use of resources affect
- A combination of different technologies probably used in Finland also in the future
- Sludge utilized for energy-production: less composting, but still important as a after-treatment process
- Increased thermal (sun, wind) drying to granulates: products used as fuel or fertilizer
- Sludge-burning in areas where there are no other ways to utilize it. However, ash goes to landfill
- Chemical treatment: e.g. Kemicond which give a product suitable for soil improvement

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