Water sector governance

Case: Helsinki Region Environmental Services Authority HSY

Aalto YO 5.2.2019

Jyrki Kaija, HSY

Jyrki Kaija, M.Sc. (Tech.)

- Maa ja Vesi Oy / Soil and Water Ltd
  - Assistant designer → deputy CEO
  - 20 years
- LV Lahti Vesi Oy
  - CEO
  - 2 years
- Pöyry Environment Oy
  - CEO
  - 4 years
- Tuusula municipality
  - Technical Director
  - 4 years
- HSY, Water Services
  - Head of Economy and Management Unit
  - Now 4 years…

- Countries professionally visited: Australia, Austria, Czech Republic, Cyprus, Denmark, England, **Estonia, France**, **Germany,** Greece, Japan, **Kameron**, Latvia, **Libya**, **Lithuania**, Malta, Norway, **Russia**, Sweden, Switzerland, Thailand, USA, **Vietnam**
- FIWA, chairman of the board and chairman of the board's working committee
- EurEau, member of the committee 3 (economics and management)

HSY

Governance by The Oxford Dictionary

- Governance: ”The action or manner of governing a state, organization, etc”
- Govern: “Conduct the policy, actions, and affairs of (a state, organization, or people) with authority.”
- Conduct: “The manner in which an organization or activity is managed or directed.”

→ Utility point of view

HSY

Topics

1. **Water Services in Europe**
   i. **EurEau or European Federation of National Associations of Water Services**
2. Water Services in Finland
3. Helsinki Region Environmental Services Authority (HSY)
4. HSY Water Services
5. From strategy into actions: Energy Efficiency
6. Development plans
7. Something to discuss…

HSY

Water Services in Europe

Population connected

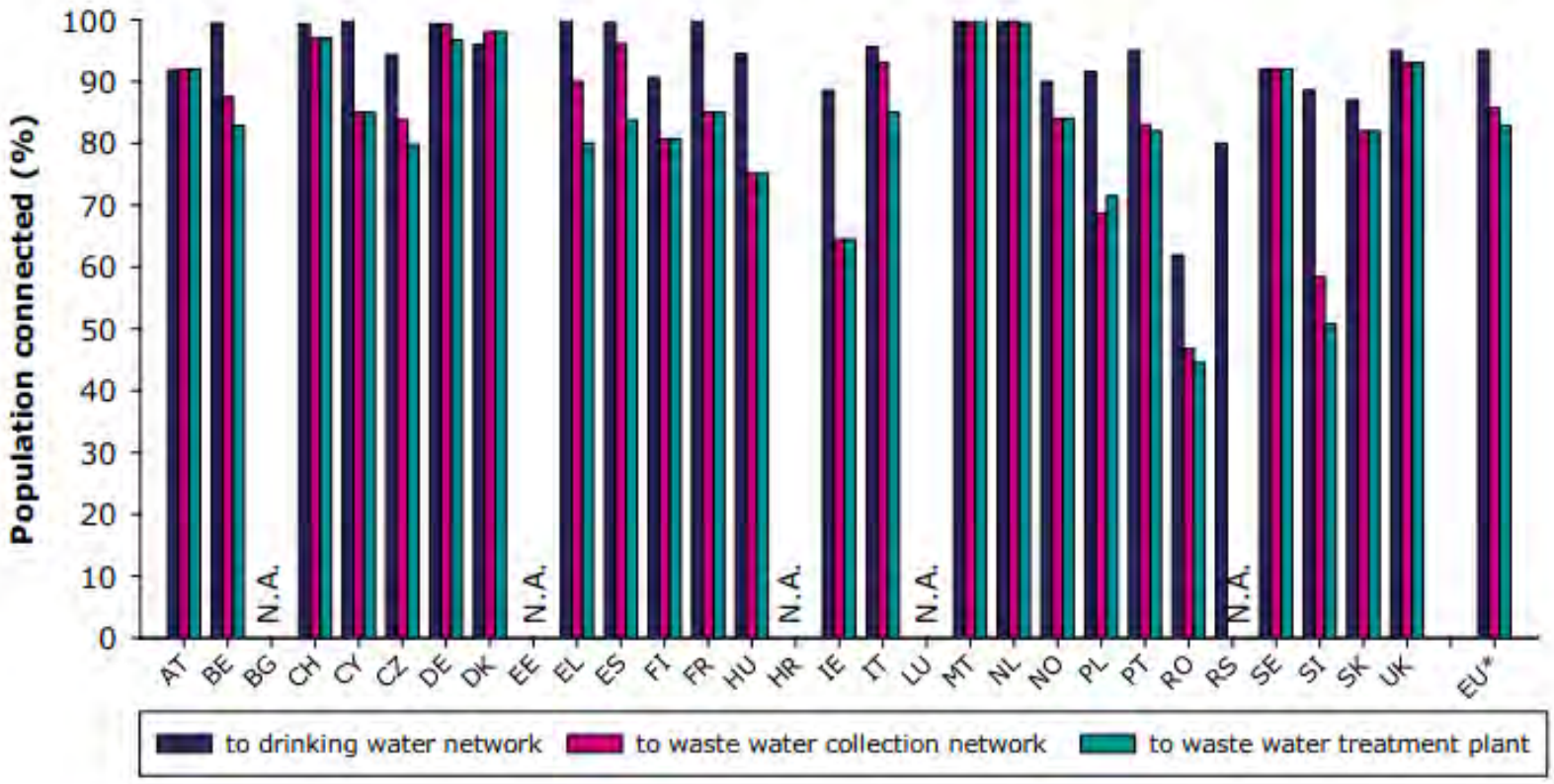


Figure 1: Population connected to a network

HSY

Investment rate

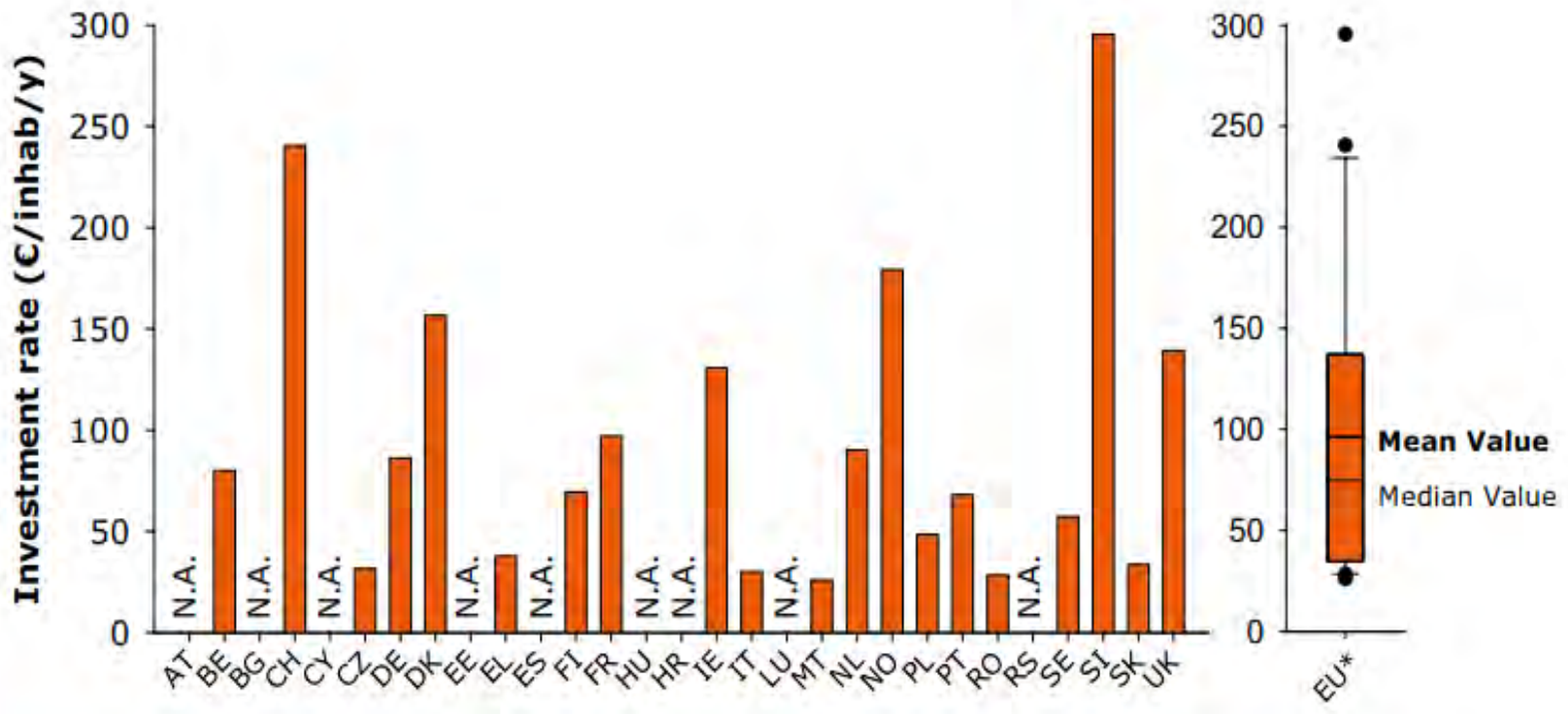


Figure 4: Annual investment rate by water service providers in both drinking water and waste water infrastructure

HSY

Management, drinking water

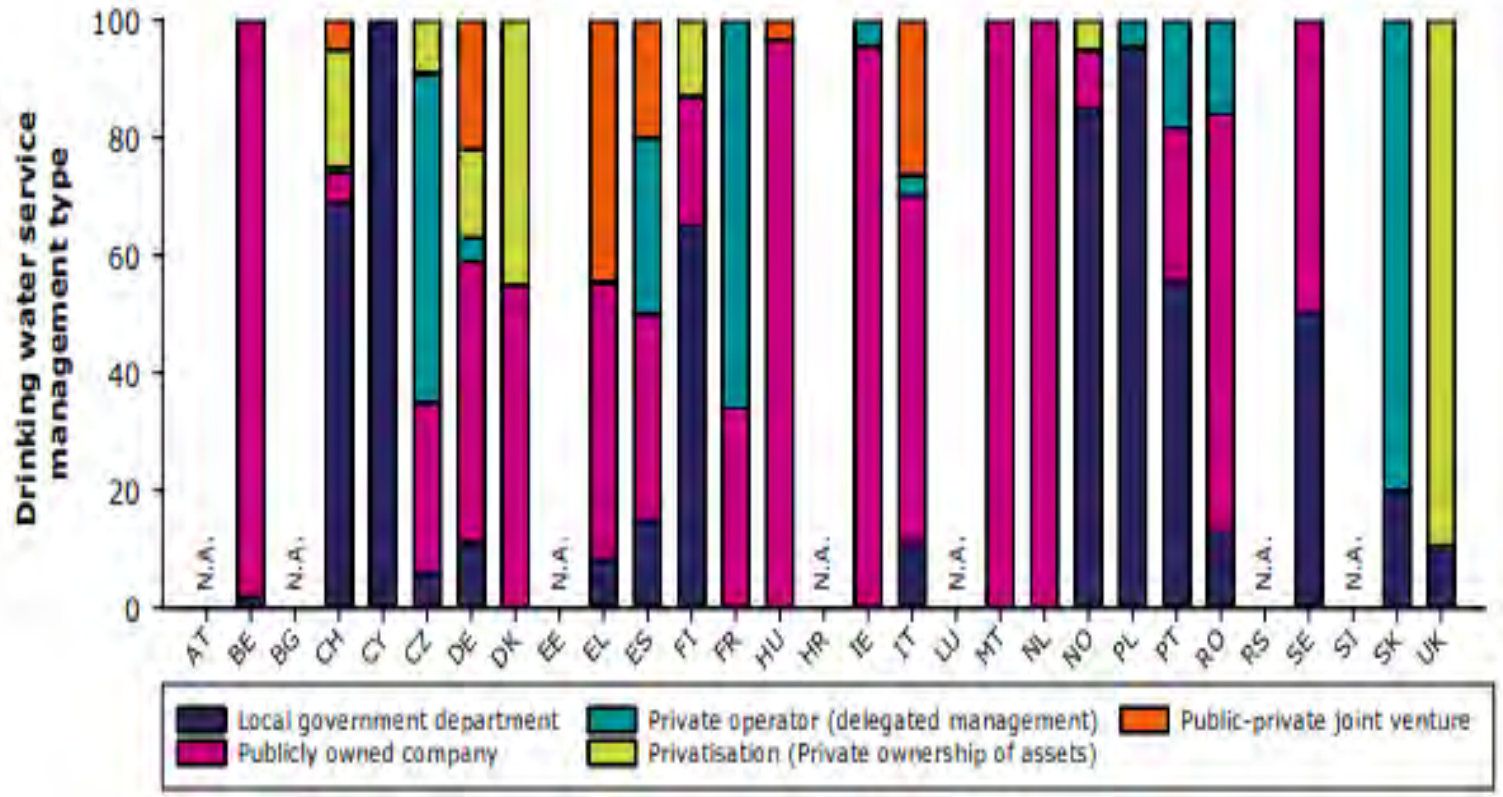


Figure 6: Percentage of the population served by drinking water services for different management types

HSY

Management, waste water

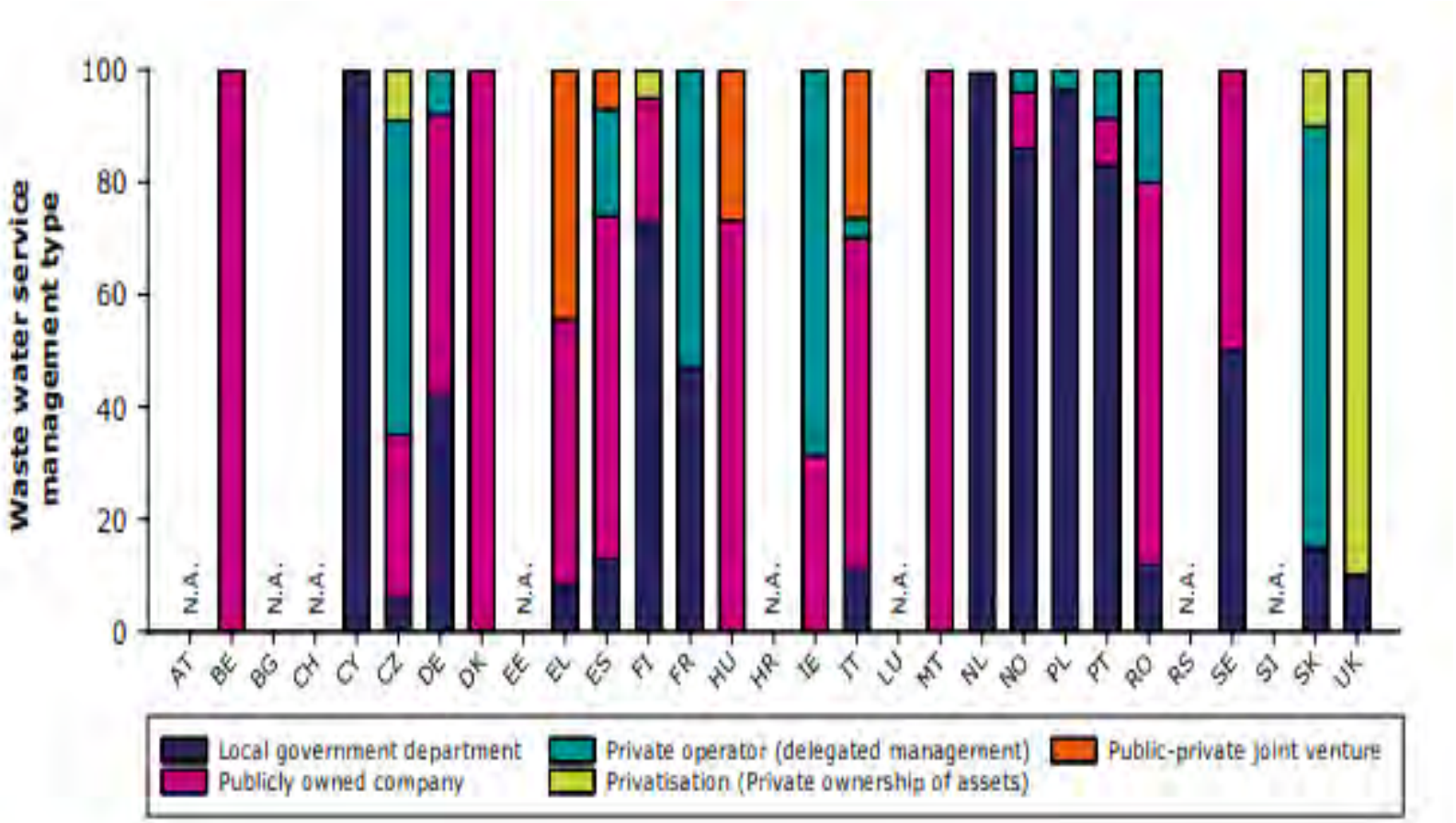


Figure 7: Percentage of the population served by waste water services for different management types

HSY

Water bill

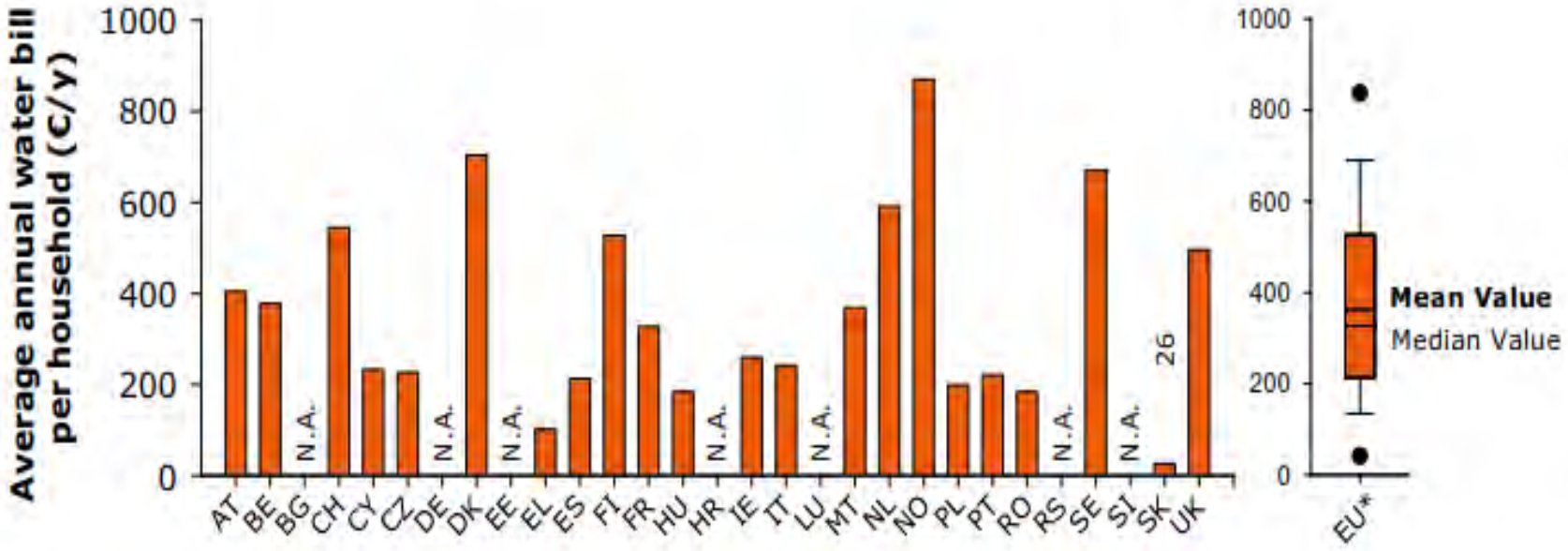


Figure 8: Average annual water bill per household (depending on the country, the figures provided are from between 2012 and 2015)[1]

HSY

Waste water treatment

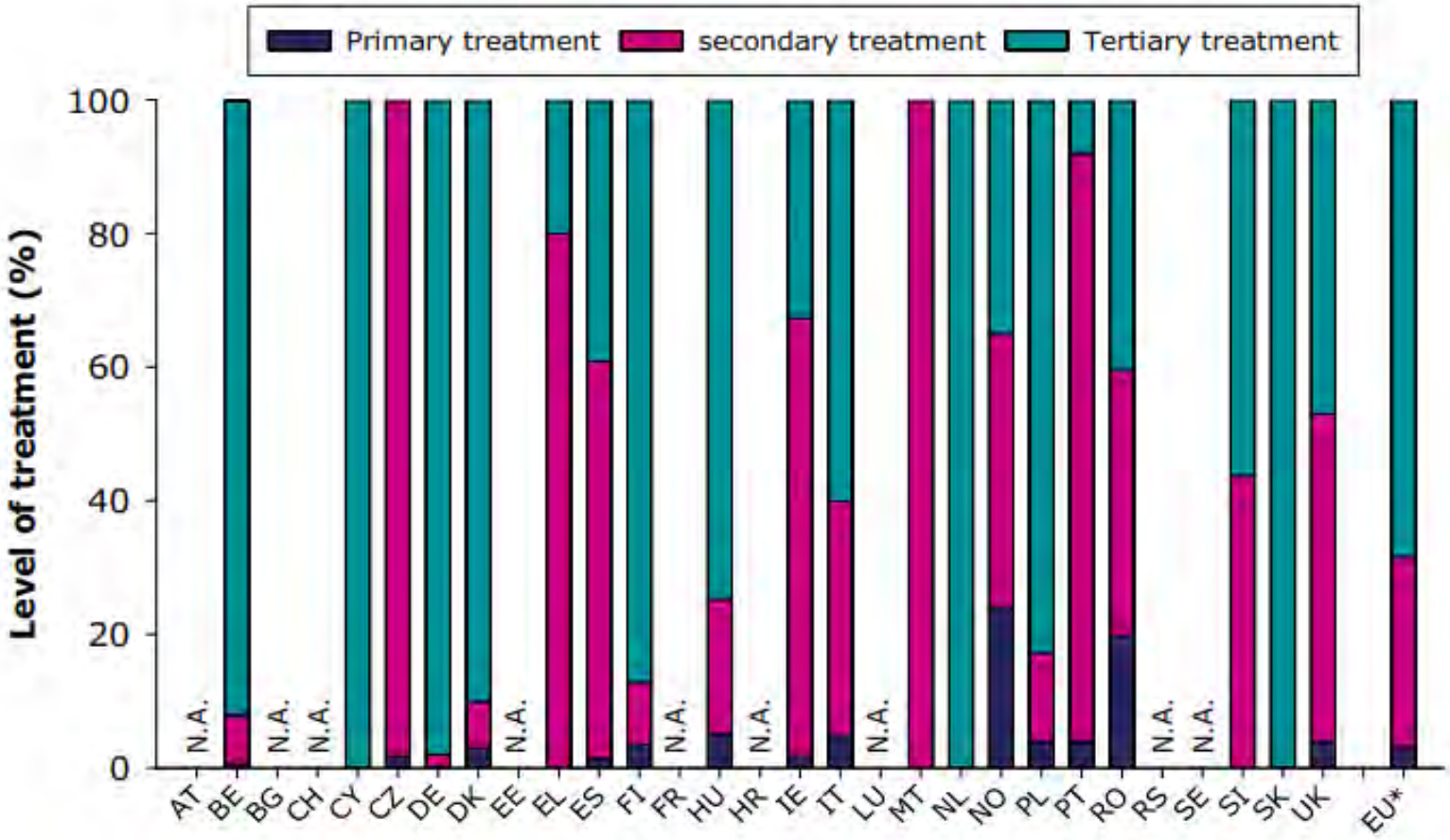


Figure 24: Level of treatment in percentage of load entering waste water treatment plants

HSY

Asset renewal rate, waste water and drinking water

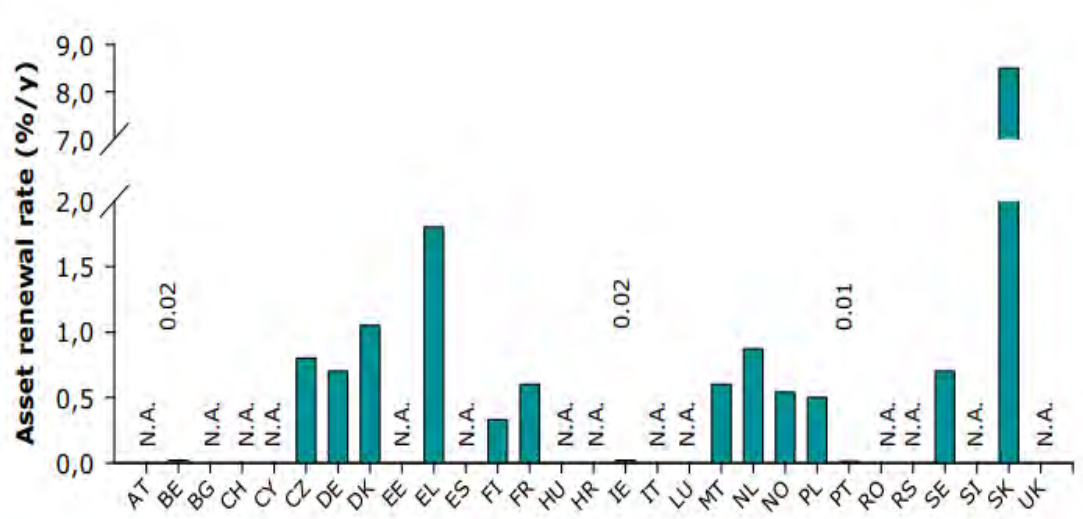


Figure 27: Asset renewal rate for waste water infrastructure (data from 2012 to 2015 depending on the country)

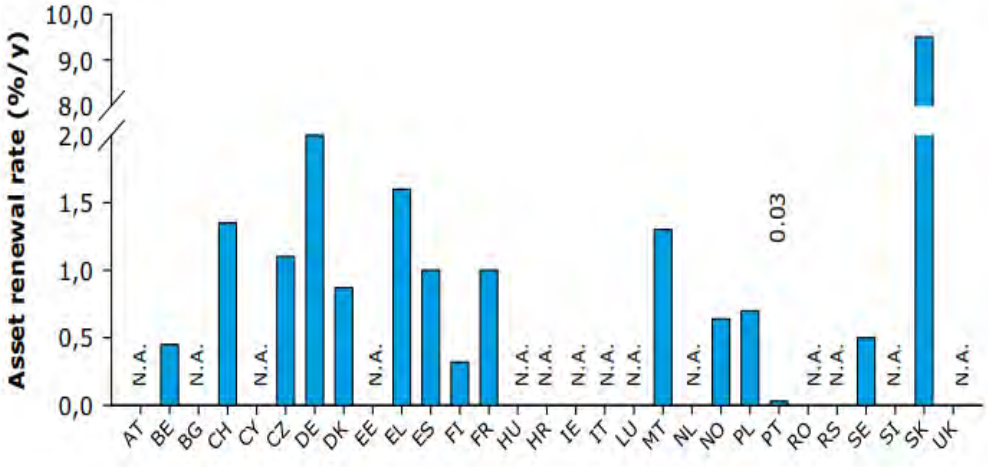


Figure 21: Asset renewal rate for drinking water infrastructure (data from 2012 to 2015 depending on the country)

HSY

Europe

- Europe is not homogenous but there is lots of variation from country to country
  - Western Europe vs. Eastern Europe
- Management: Finland vs. Netherlands
  - Water / Waste water
- Tariff – Tax – Transfer (TTT)
  - Ability to invest
  - Challenge of the future: Asset management
- Willingness to pay

HSY

Topics

1. Water Services in Europe
2. **Water Services in Finland**
    i. **FIWA or Finnish Water Works Association (member of EurEau)**
3. Helsinki Region Environmental Services Authority (HSY)
4. HSY Water Services
5. From strategy into actions: Energy Efficiency
6. Development plans
7. Something to discuss…

HSY

Water Services in Finland

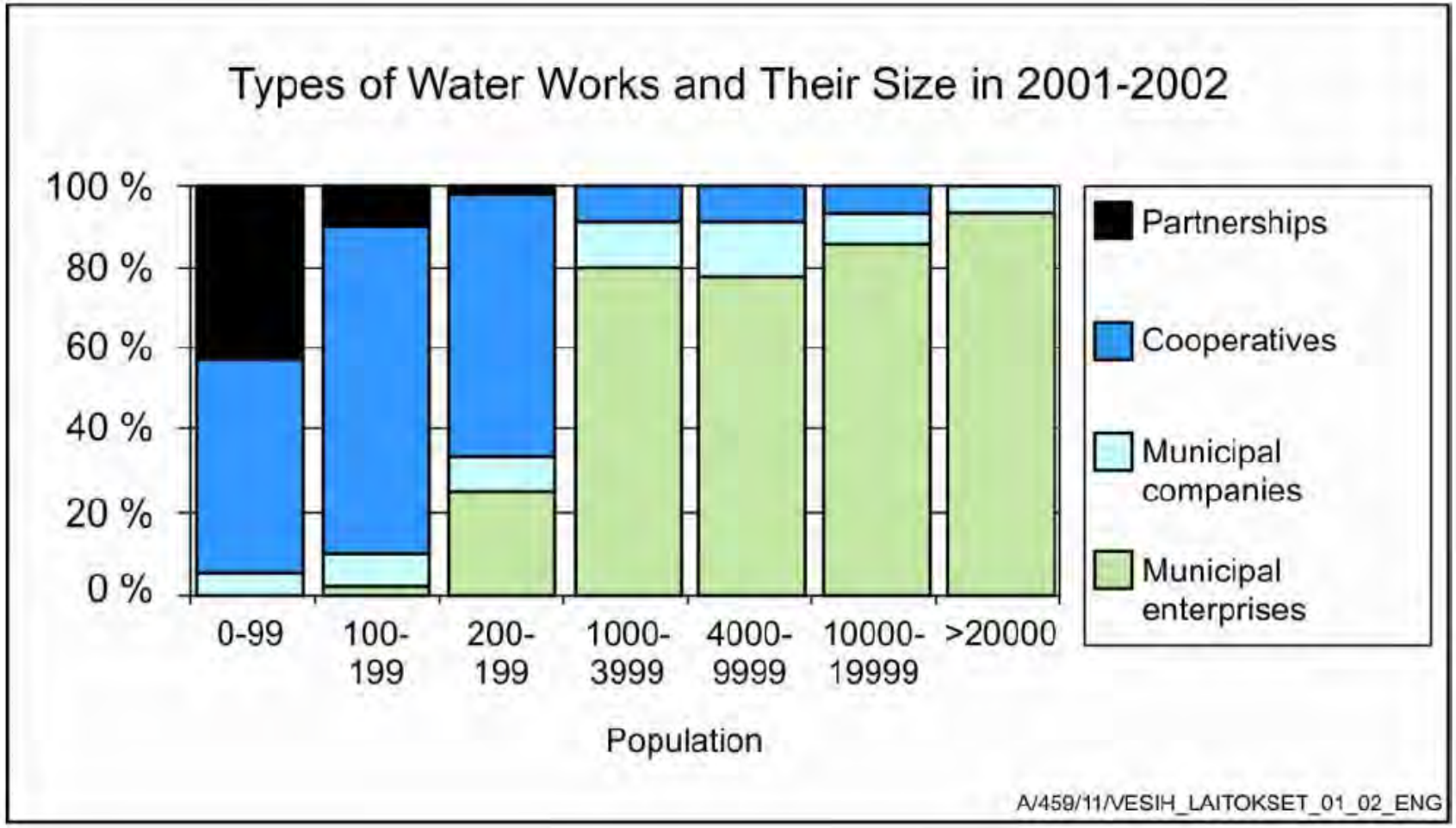
(Information provided by Finnish Water Works Association (FIWA) expect where indicated)

Water resources in Finland

- Renewable water resources over 20 000 m^3/person/a of which 2 % is used
  - *Some areas lacking raw water (Helsinki, Turku, Kotka,…)*
- No *(or very limited)* need for irrigation
- Quality of waters is good
  - *Thanks to environmental protection*
- Area under cultivation 10 %
- Population density ~ 15 inhabitants/km^2

Features of WSS sector in Finland

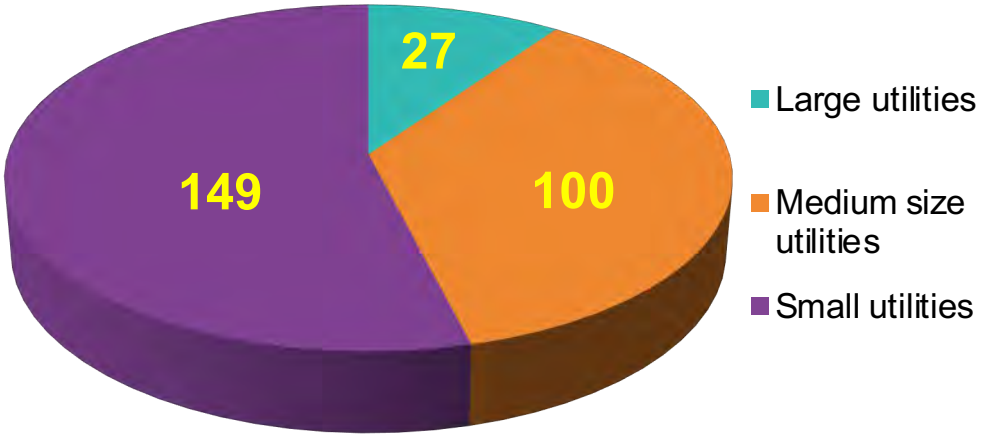
(Note: amount of municipal companies is today 20+%)



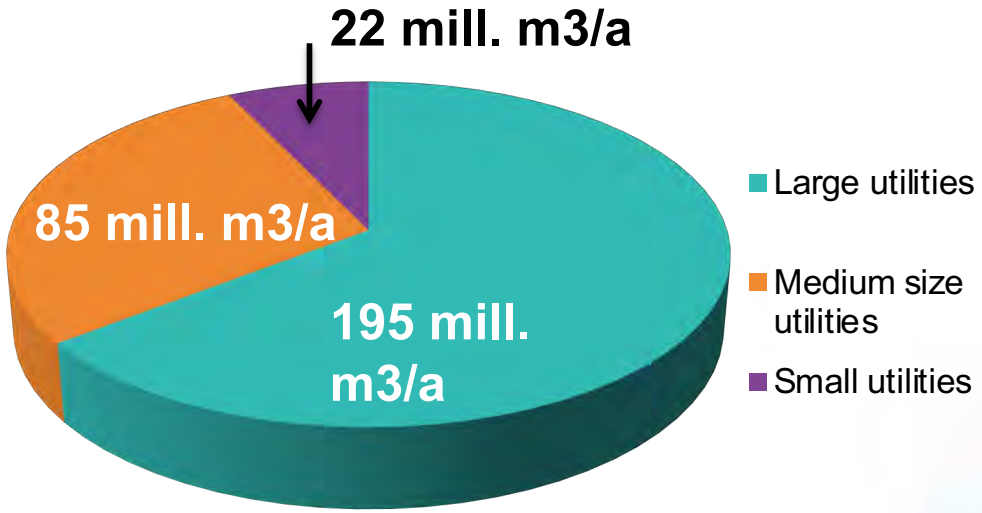
FIWA

Diversity of WSS sector in Finland

Size distribution of FIWA's member WSS utilities



Number of WSS utilities



Amount of water sold (m3/year)

Large utilities: over 2 million m3 / year

Medium size utilities: 350 000 – 2 million m3 / year

Small utilities: less than 350 000 m3 / year

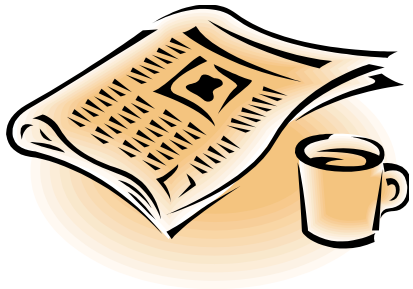
FIWA

Management of water services

- **Municipalities are responsible that water services are available if needed**
- Amount of water utilities about 1500
- Most of them very small – over 1000 serving less than 1500 inhabitants
- Only 7 serving over 100 000 inhabitants
- Inter municipal water companies owned by municipalities are increasing (*slowly*)
  - *Municipal energy company and water utility joined in some 20 cases*
- Water and waste water usually in the same organization
  - *In many countries e.g. in Central Europe this is not the case*

HSY

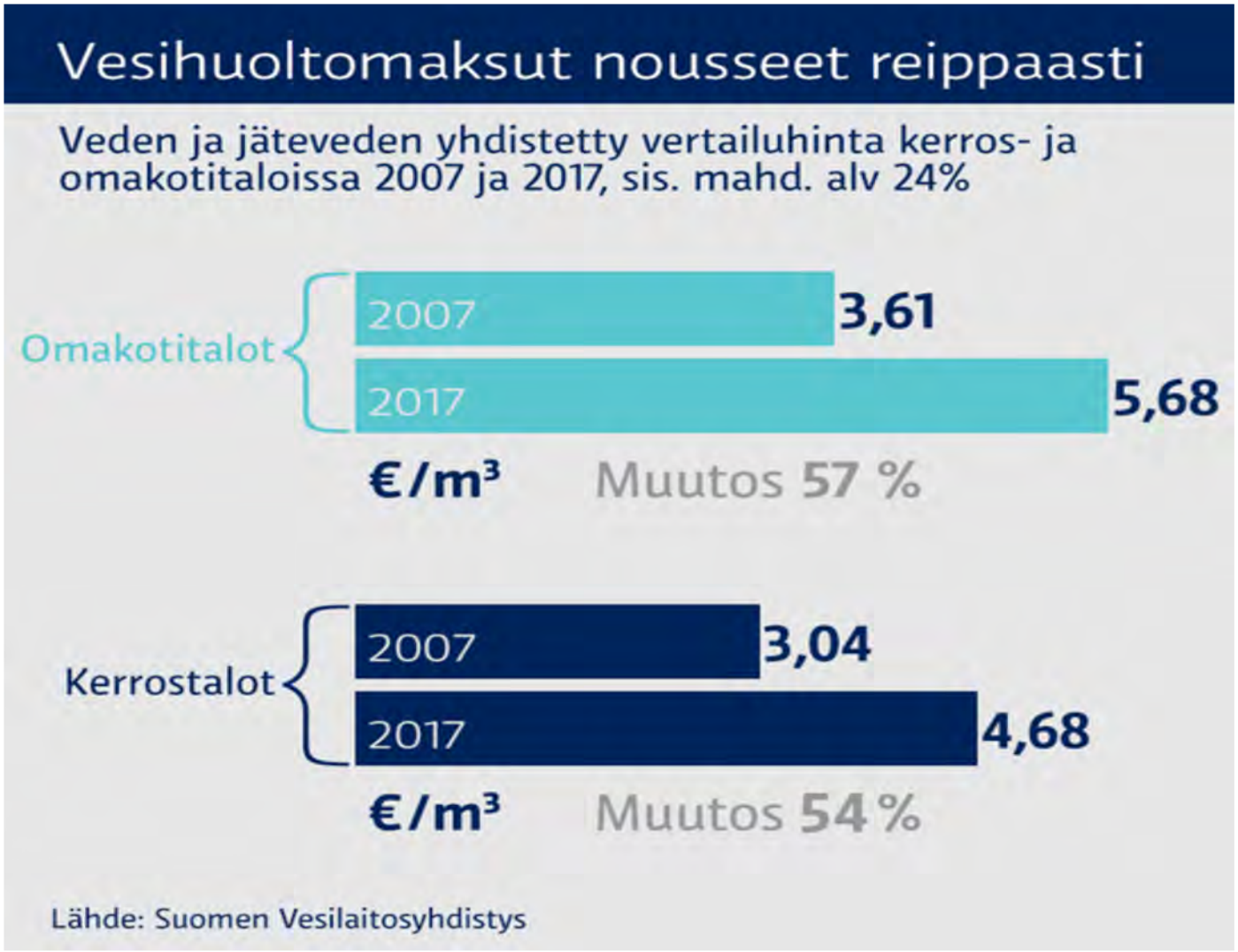
Regulation by authorities



- No special regulator for the services (utility / customer) – in some cases the consumer authorities and in some cases the competition authorities
  - *Meaning that e.g. prices are decided locally*
  - *Discussion, if we need a regulator… (Denmark, UK,…)*
- Transparency and media with local democracy are very efficient control system
- Voluntary (*and today also obligatory*) benchmarking to add openness
  - *FIWA and Min. of Agriculture and Forestry*
  - *…and to improve management and enhance development… (EBC)*

HSY

Water tariffs in Finland (consumption fee + fixed fee + connection fee) single family house (above) and apartment house (below)



HSY

Tap water

- Over 90 % of inhabitants are connected to water network
  - In countryside and sparsely populated areas with own wells
- Only big towns use surface water – lack of ground water resources
- The quality of tap water is very good – use of bottled water is the lowest in the world in Finland

HSY

Waste water

- Over 80 % of inhabitants are connected to waste water networks
- All of the waste waters are treated biologically with phosphorous reduction – nitrogen reduction when needed
- The average reductions
  - BOD 97 %
  - Phosphorous 95 %
  - Nitrogen 54 %

HSY

Future targets

- Increase the co-operation between utilities and create bigger units by merging utilities
- Primary target high service level – to reduce costs is secondary target
  - *Willingness to pay is rather high at least in the HSY area / JKA*
- **Keep the value of assets by renovating**
- Develop customer relations and image

- *Min. of Agriculture and Forestry: structural changes of water services in Finland…?*
  - *Report out fall 2018*
  - *Next steps?*

HSY

Overall institutional framework of water services in Finland

ME=Ministry of the Environment, MAF=Ministry of Agriculture and Forestry, MSH=Ministry of Social Affairs and Health, MEE=Ministry of Employment and the Economy, MFA=Ministry of Foreign Affairs

Fig. 12.3 Overall institutional framework of water services in Finland in 2014.[5]

(Katko, T.S., 2016: Finnish Water Services)

FIWA

Major legislation related to water services in Finland

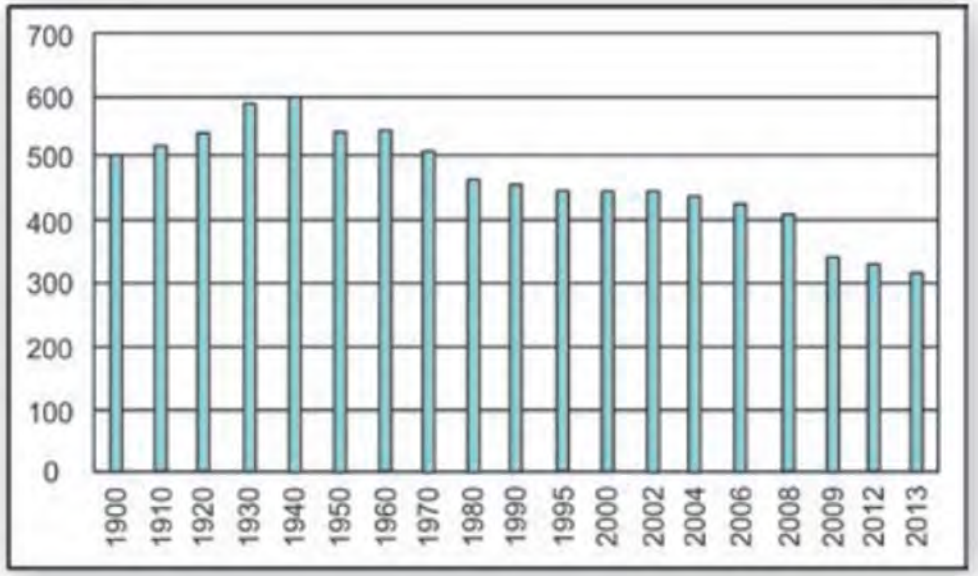
Fig. 12 5 Major legislation related to Water Services in Finland.[30] *(Katko, T.S., 2016: Finnish Water Services)*

FIWA

Number of municipalities in Finland

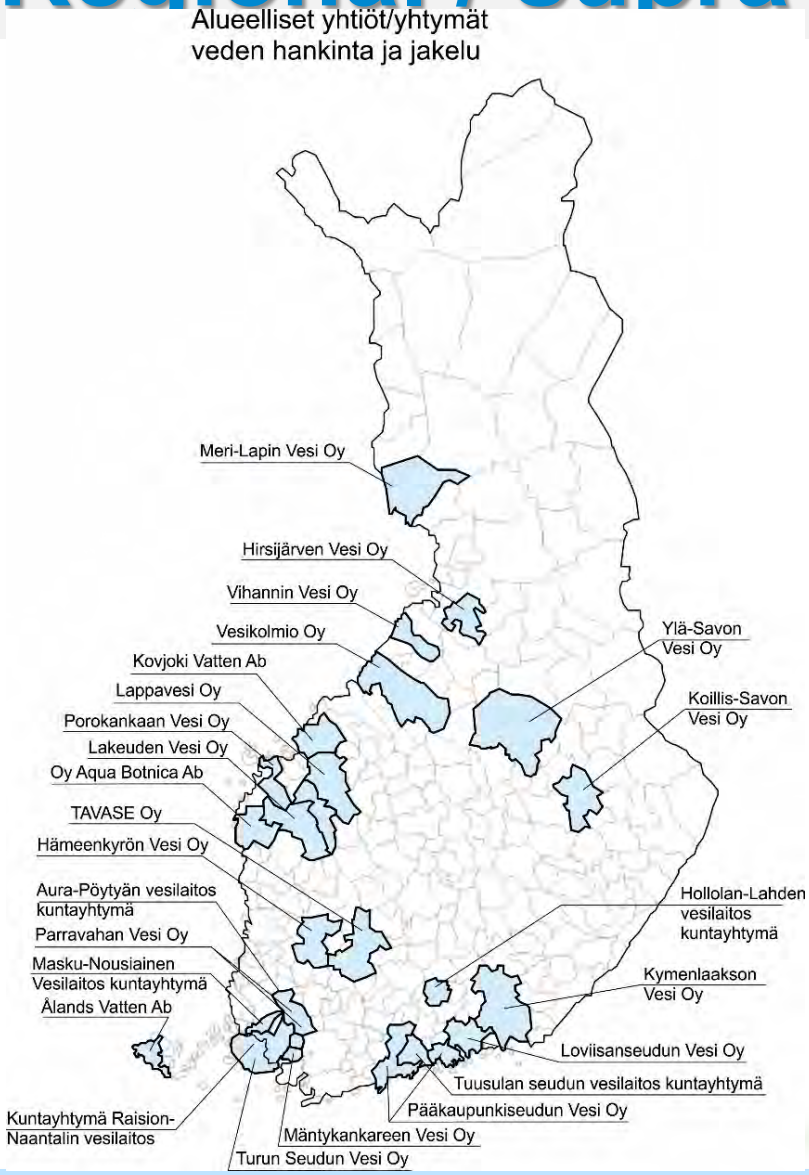
- The number of municipalities has reduced during the last decades
  - In 2016 there are 313 municipalities
- Municipal reforms were planned, but …
  - In connection with the reorganization of social and health services, 18 autonomous counties / regions will be established from 2019 – *let's see…*
  - Number of municipalities may still slightly reduce

(Katko, T.S., 2013: Hanaa! Book in Finnish)



FIWA

Regional / supra-municipal utilities (1)

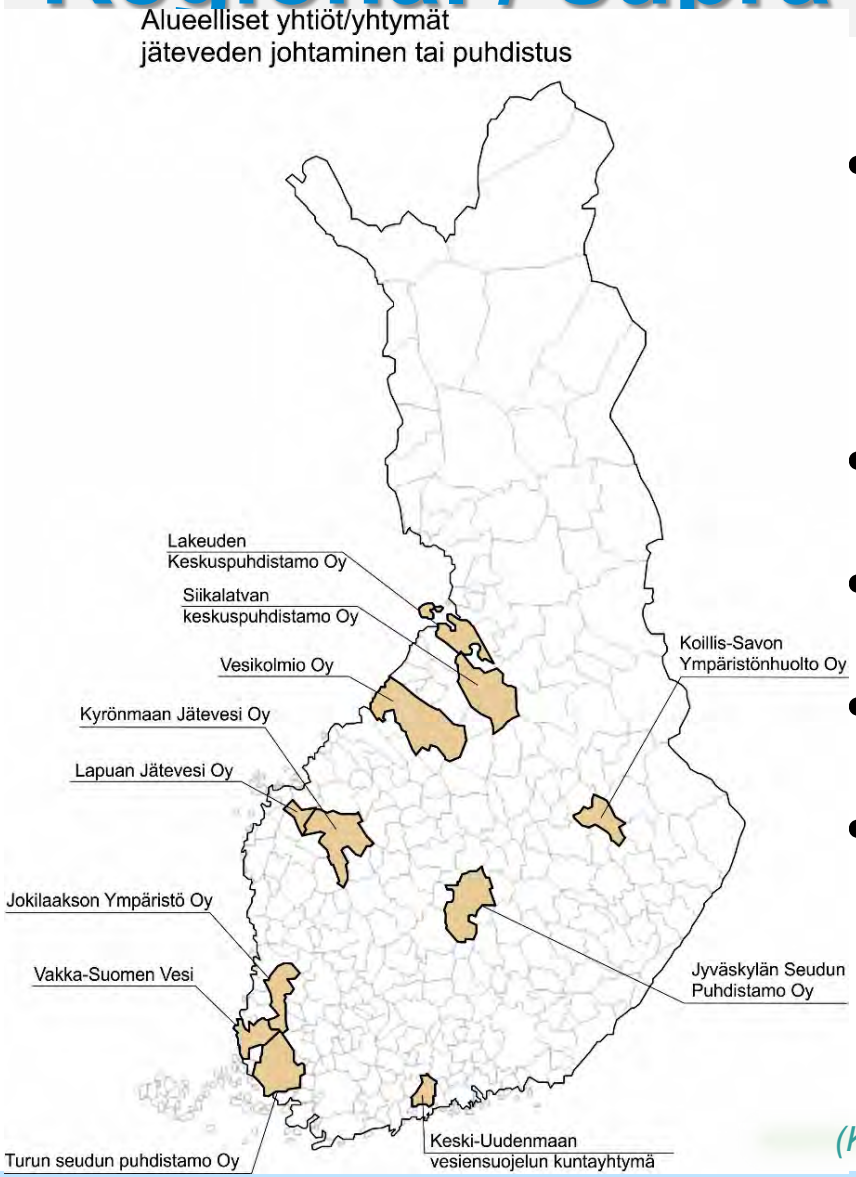


- Regional / supra-municipal **”water-only utilities” – bulk supply**
- Total number about 25 pcs
- About 5 federations of municipalities
- About 20 joint-stock companies (owned by municipalities)

(Katko, T.S., 2013: Hanaa! Book in Finnish)

FIWA

Regional / supra-municipal utilities (2)

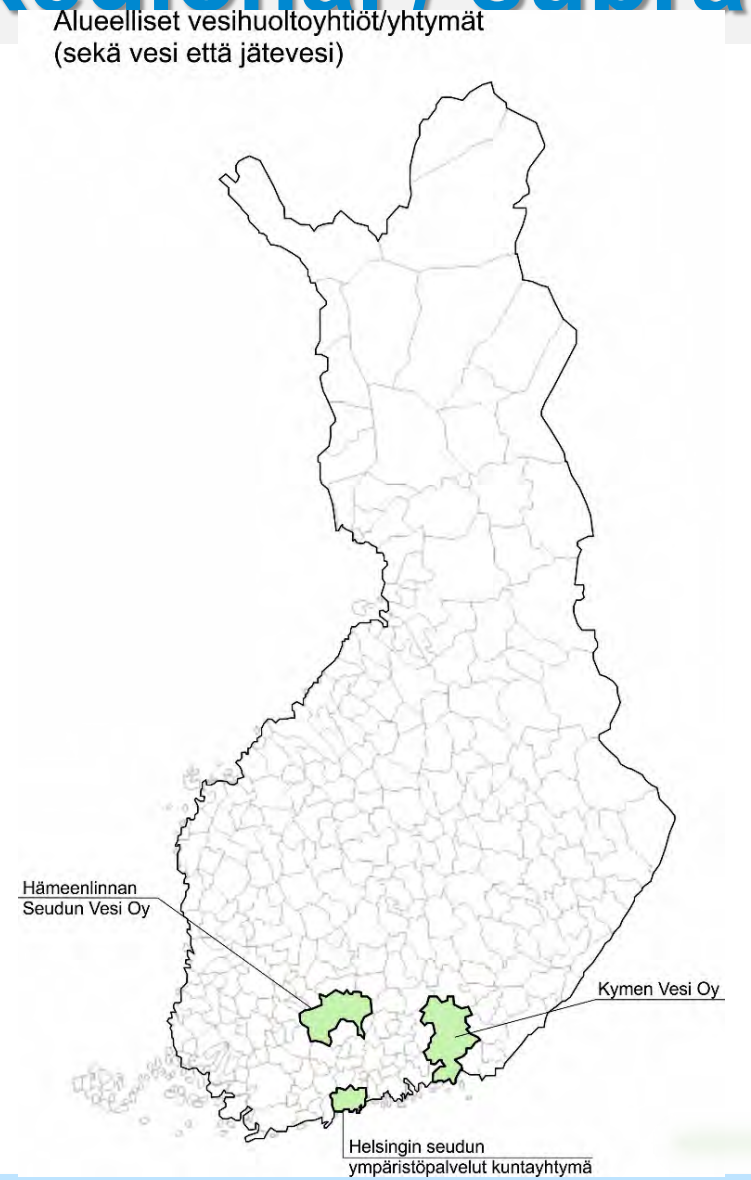


- Regional / supra-municipal **”wastewater-only utilities” – bulk operators**
- Total number about 11 pcs
- One federation of municipalities
- One municipal enterprise
- About 9 joint-stock companies (owned by municipalities)

(Katko, T.S., 2013: Hanaa! Book in Finnish)

FIWA

Regional / supra-municipal utilities (3)

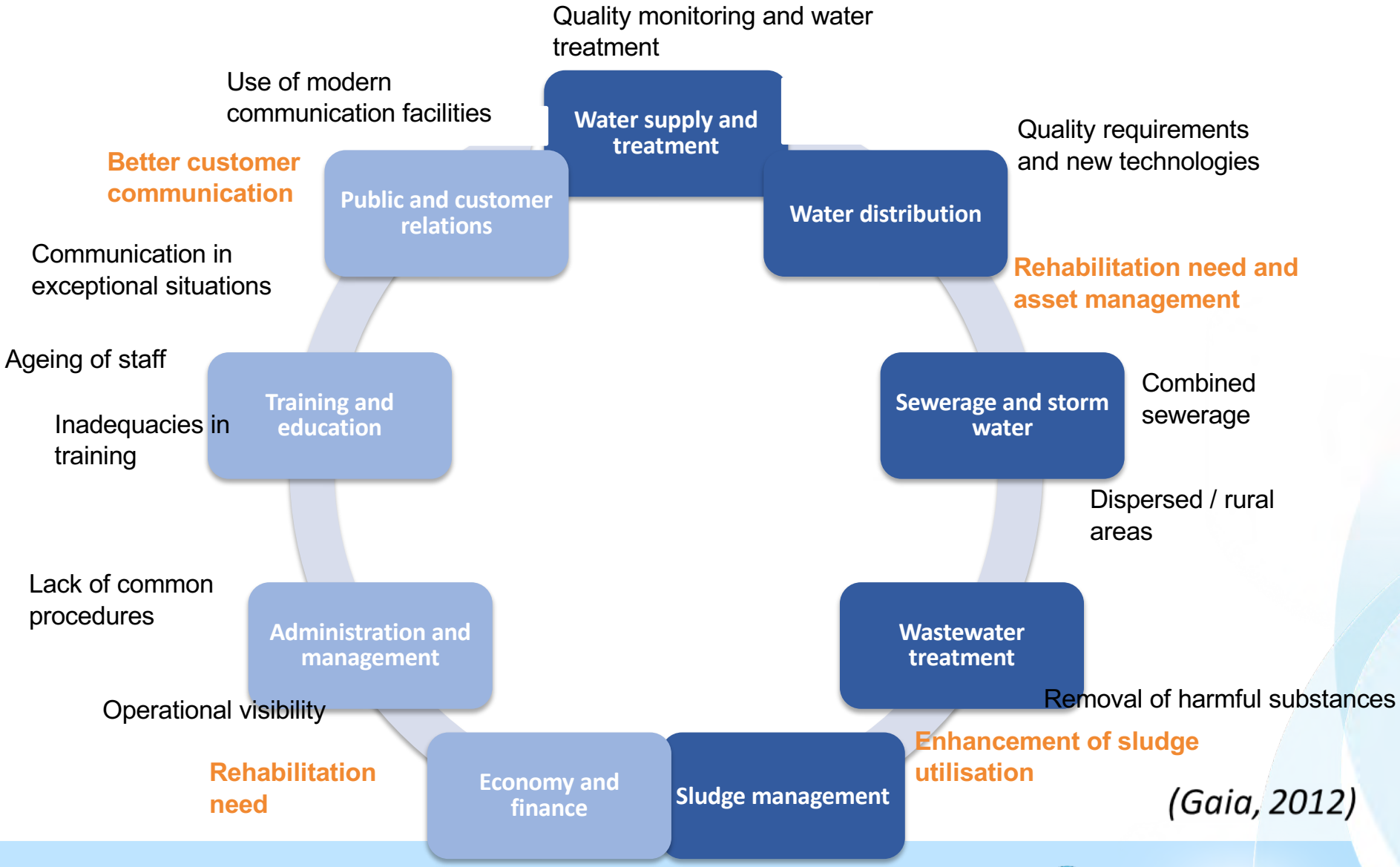


- Regional / supra-municipal **”water & wastewater utilities” – full service**
- Total number 3 pcs
- One federation of municipalities
- 2 joint-stock companies (owned by municipalities)

(Katko, T.S., 2013: Hanaa! Book in Finnish)

FIWA

Development needs of WSS utilities



(Gaia, 2012)

FIWA

Review of Water Services Act

- **Original Act 2001, renewed 2014 (enacted 1.9.2014)**
- Main legislation regulating e.g. the business environment of utilities and interactions between the utilities and their customers
- Other key sector legislation include: drinking water quality legislation and environmental protection legislation
- Water Services Act 2001 separated the utilities' roles of service provider, authority and service producer

FIWA

Review of Water Services Act

Some key features of renewed Water Services Act

- Improved regulations on risk management in water services
- Improved financial transparency of water utilities
- Changes in the responsibility of properties to connect to water utility's network outside urban areas
- Changes in storm water management responsibilities

Water services in Finland, something to watch in the future…

- Reorganization of social and health services, 18 autonomous counties / regions will be established from 2019
  - *Radical change on municipal sector: 50% of municipal budget will go to the new regions*
  - *What will this mean to water services?*
- Water + Energy? Water + Waste? Regional water utilities? Big utilities operate smaller utilities?

HSY

Topics

1. Water Services in Europe
2. Water Services in Finland
3. **Helsinki Region Environmental Services Authority (HSY)**
4. HSY Water Services
5. From strategy into actions: Energy Efficiency
6. Development plans
7. Something to discuss…

HSY

HSY

Helsinki Region Environmental Services Authority

HSY

What we do

We produce and organise water services, waste management services and regional information

Turnover ca.
€ 354 million

Our customers

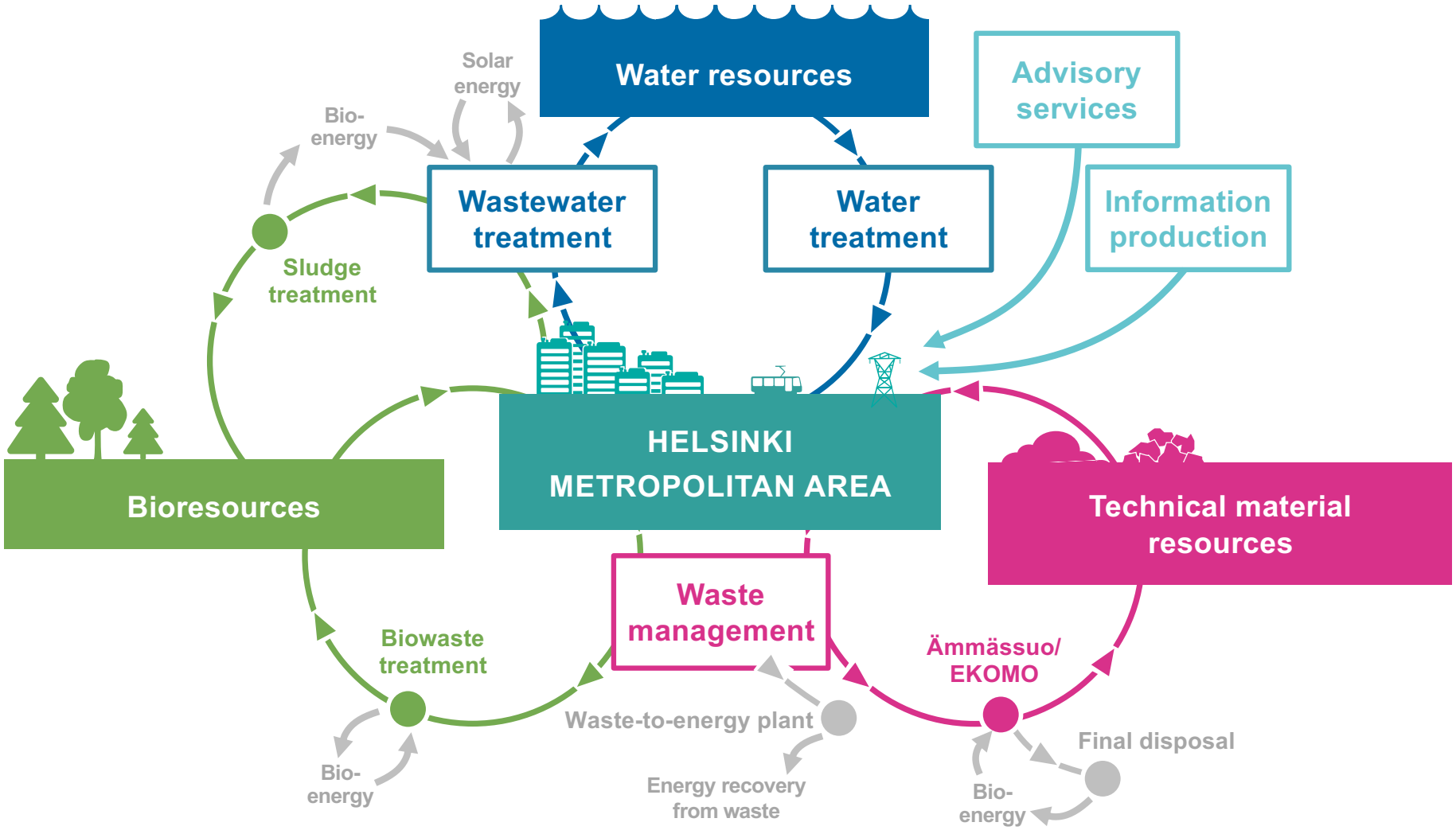
Residents and companies in the Helsinki Metropolitan Area:
1.1 million people

Employees
ca 800

Our member municipalities

Helsinki
Espoo
Vantaa
Kauniainen

Premises
12


Water resources
Solar energy
Bio-energy
Advisory services
Information production
Wastewater treatment
Water treatment
Sludge treatment
HELSINKI METROPOLITAN AREA
Bioresources
Technical material resources
Waste management
Biowaste treatment
Ämmässuo/ EKOMO
Waste-to-energy plant
Final disposal
Bio-energy
Energy recovery from waste
Bio-energy

HSY

Helsinki region

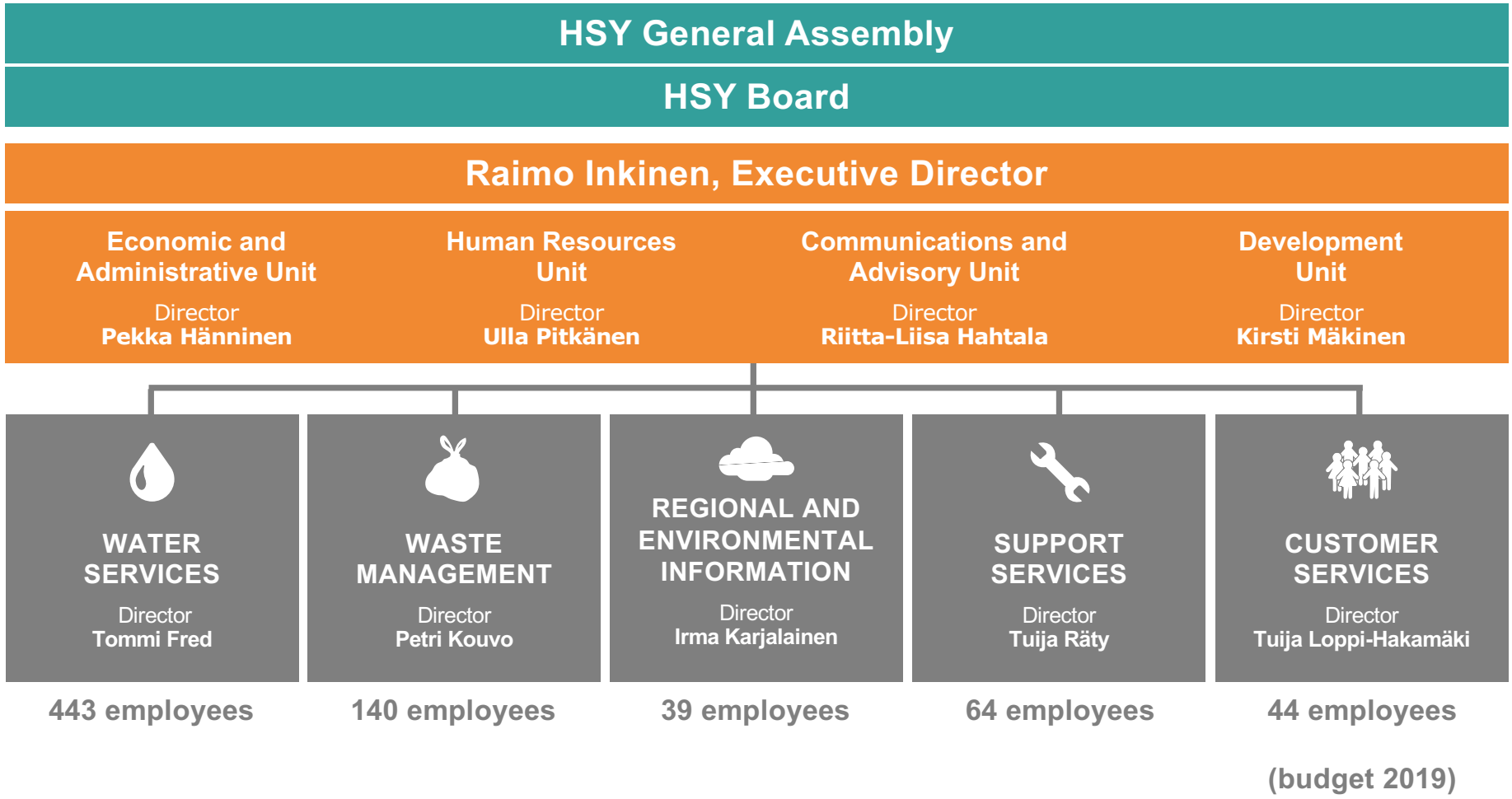
Helsinki

Metropolitan Area

Europe

HSY

Organisation



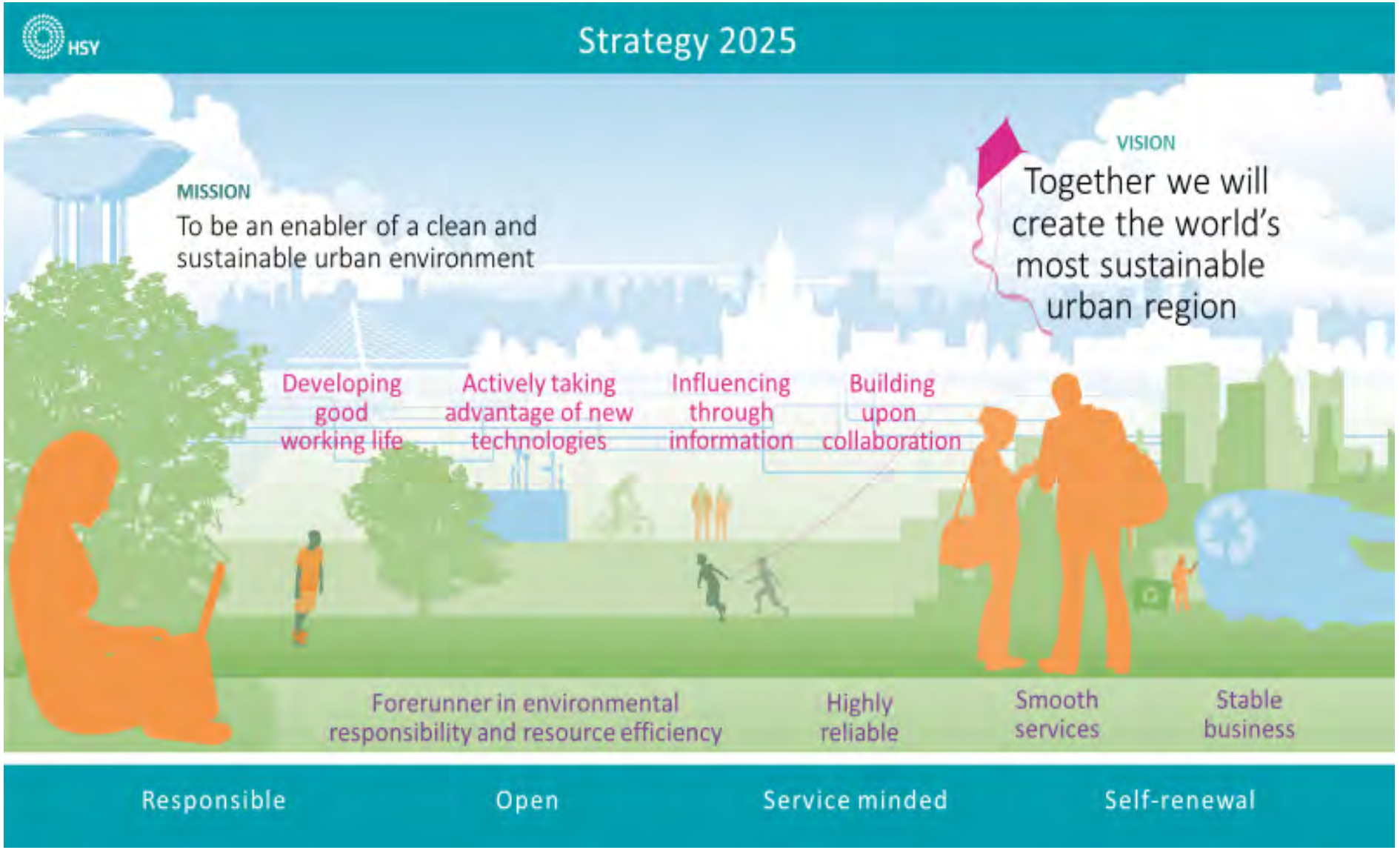
HSY

HSY and money 2017: budgeting is governance…

- Operating income 368 M€
  - Water sector 257 M€ (70%)
- Operating expenses 173 M€
- Operating margin 197 M€
- Annual margin 130 M€ (Financial expenses 67 M€ included)
- Depreciation 101 M€
- Surplus 28 M€
- Loans 1 511 M€
  - Loans from member municipalities 1 188 M€
- Investments 150 M€ annually → we are very close to a situation where we can finance our annual investments by tariffs
- Total assets 2 263 M€

HSY

New strategy in short (Note: unofficial translation)



HSY

Governance of HSY

Note: no economical regulation of water services in Finland!

- Decision making (see HSY's web site)
  - The general assembly (one representative per member municipality)
  - The board of directors (14 members: Helsinki 7, Espoo 3, Kauniainen 1, Vantaa 3 – the Act of Equality, political balance,…)
  - The audit committee (7 members)
- Processes
  - Budget, strategy,…
  - Development plans, investment plans,…
- Agreements
  - The Basic Agreement
  - KT agreement (infrastructure, technical, defines ways of co operation between HSY and technical sectors of member municipalities) + several more detailed agreements of this field
- Laws etc

HSY

Topics

1. Water Services in Europe
2. Water Services in Finland
3. Helsinki Region Environmental Services Authority (HSY)
4. **HSY Water Services**
5. From strategy into actions: Energy Efficiency
6. Development plans
7. Something to discuss…

HSY

Helsinki Region Environmental Services Authority

Water services

Purely better, every day

HSY

Core tasks of HSY Water services

Clean water

Comfortable environment

Developing community

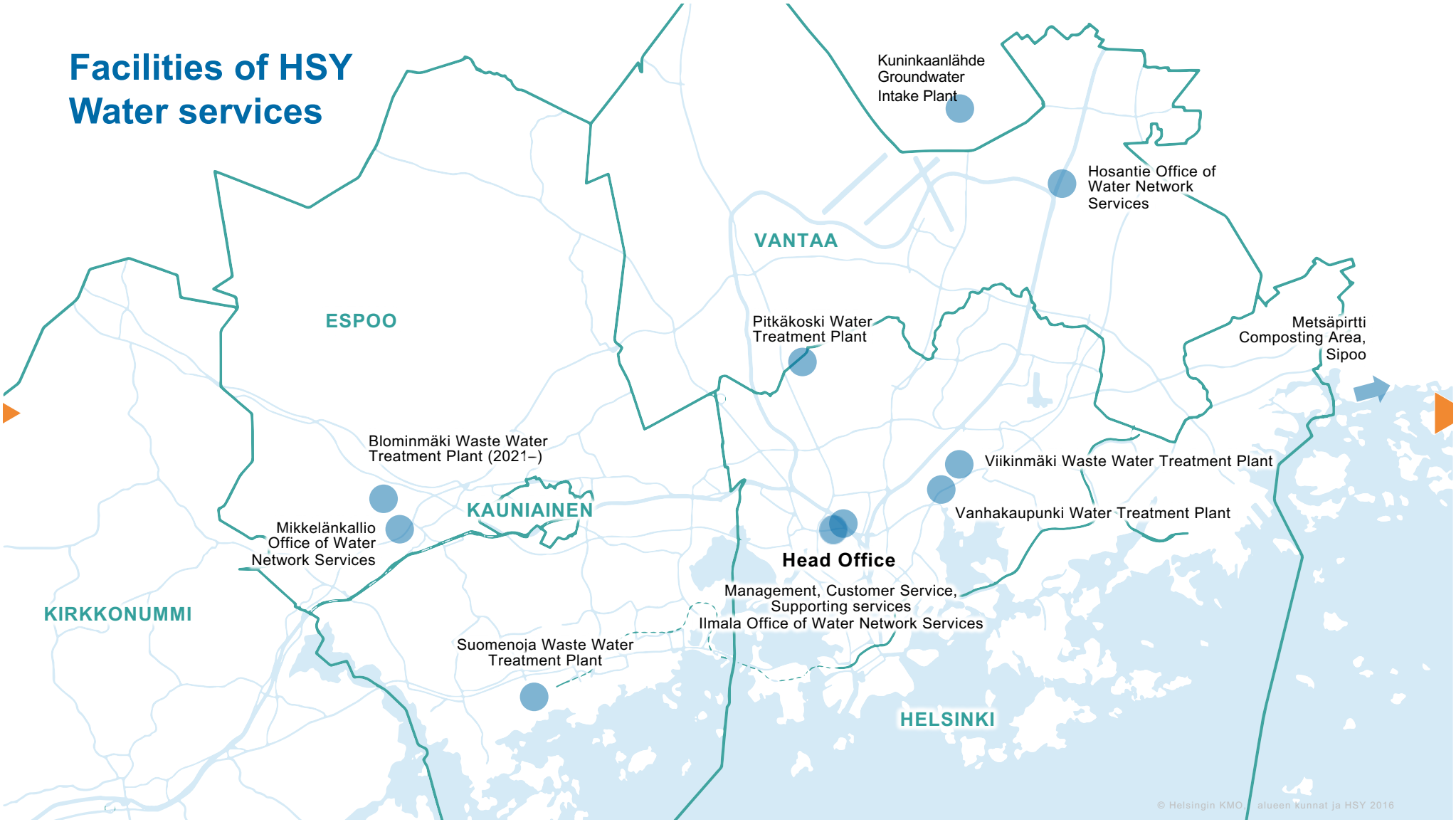
Acquisition, cleaning and supply of high-quality domestic water

Sewage collection, treatment and discharge into the sea

Production of water management services that correspond with the growth of communities

HSY

Facilities of HSY Water services



HSY

HSY Water Services

Director Tommi Fred

Executive secretary Merja Heikkinen

FINANCES AND ADMINISTRATION
Jyrki Kaija

INVESTMENTS
Tuomo Heinonen

REGIONAL NETWORKS
Jukka Saarijärvi

NETWORK PROJECTS
Ilpo Korhonen

PLANT PROJECTS
Arto Kallio

NETWORK
Kia Aksela

EXCAVATION UNIT
Eeva Huhtanen

CONTRACT WORK UNIT
Tapio Kemppainen

MAINTENANCE UNIT
Jari Kallio

NETWORK SERVICES
Pentti Janhunen

NETWORK MANAGEMENT AND SUPPORT
Sami Sillstén, Ilmala
Hannu Vornanen, Mikkelä
Timo Kattilamäki, Hosa

WATER TREATMENT
Veli-Pekka Vuorilehto

PLANT MAINTENANCE
Harri Kolehmainen

PRODUCTION
Matti Ropponen

QUALITY CONTROL
Kirsi Hiillos

PROCESS LABORATORY
Tuula Laakso

WASTEWATER TREATMENT
Mari Heinonen

MAINTENANCE
Kari Reinikainen

PRODUCTION
Marina Graan

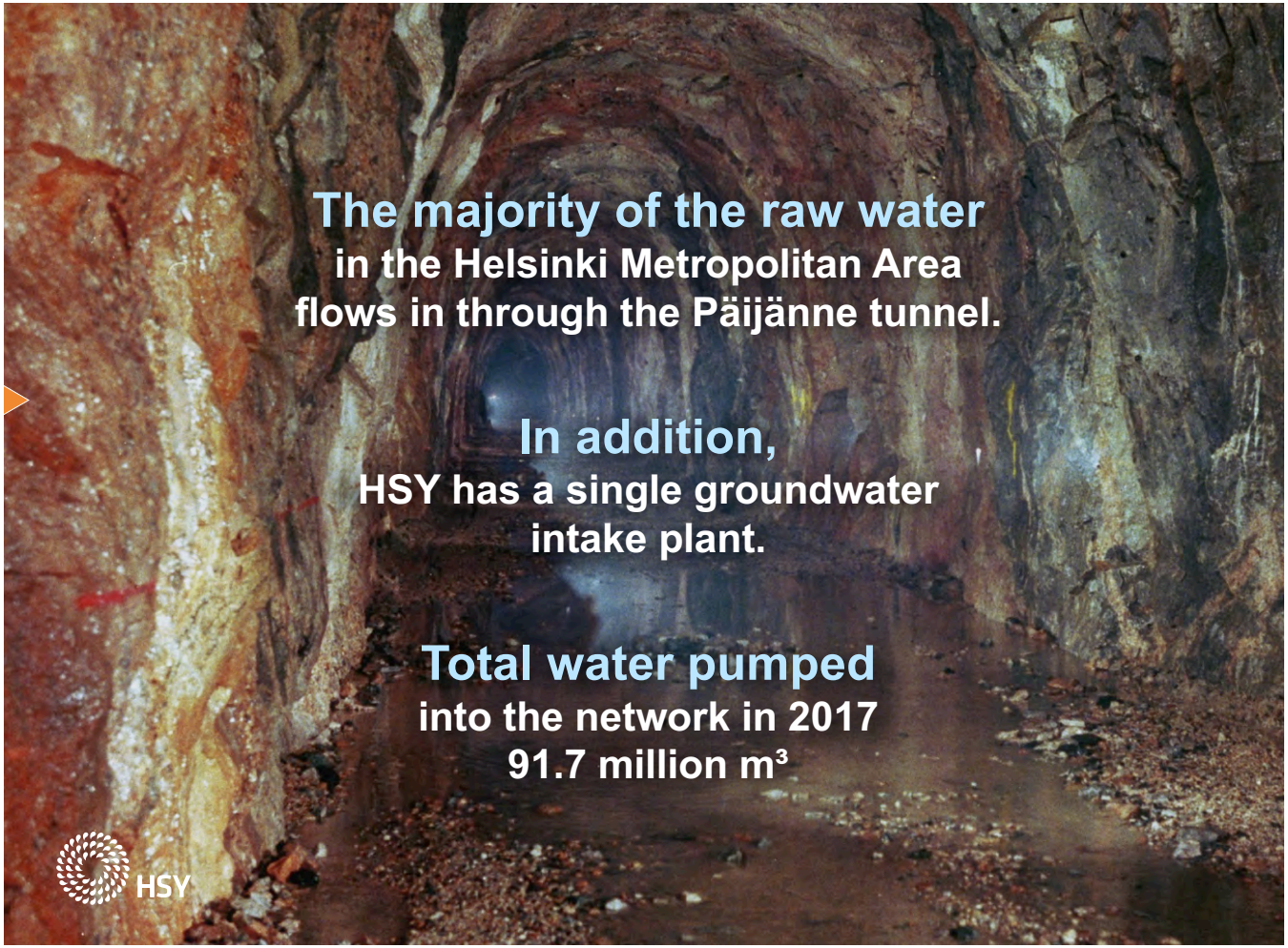
REMOTE OPERATION AND AUTOMATION
Petteri Jokinen

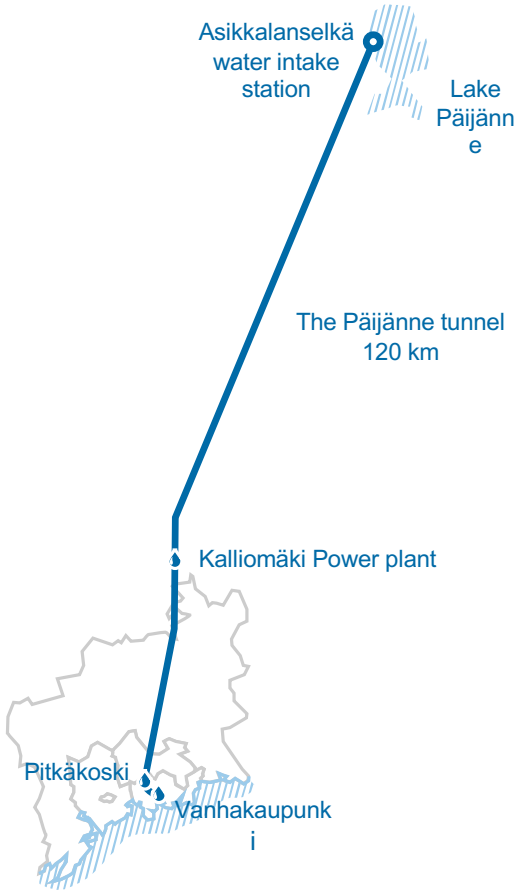
MONITORING SERVICES
Eija Lehtinen

PRODUCTION SERVICES
Janne Nipuli

HSY

Water acquisition in the Helsinki Metropolitan Area





HSY

Water treatment technology and know-how

Water quality monitoring in process laboratories

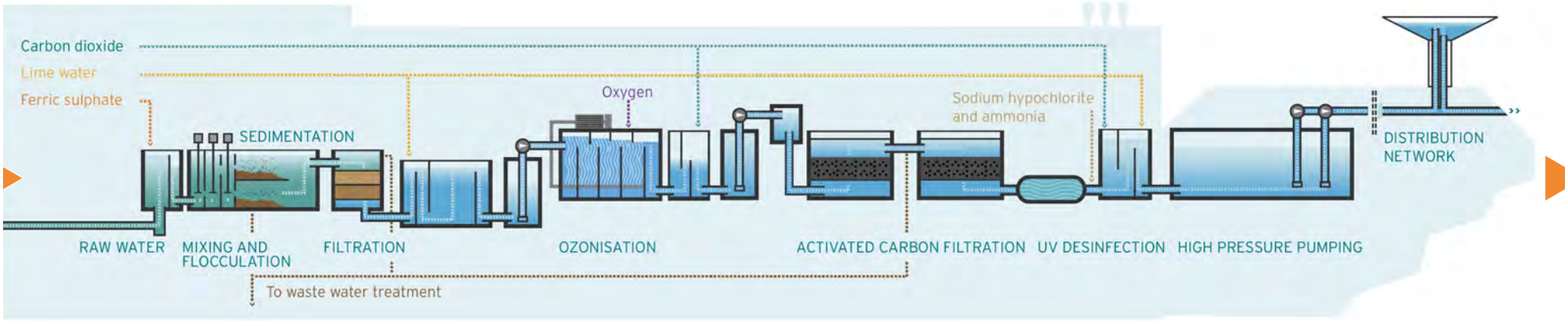
The domestic water easily fulfils the quality requirements

Vanhakaupunki water treatment plant

Pitkäkoski water treatment plant

HSY

Water treatment process at the Pitkäkoski and Vanhakaupunki plants



HSY

Water distribution system in the Helsinki Metropolitan Area

Rock tunnels and water mains are used for water distribution

12 water towers

Remote monitoring of networks

Systematic renovation activities

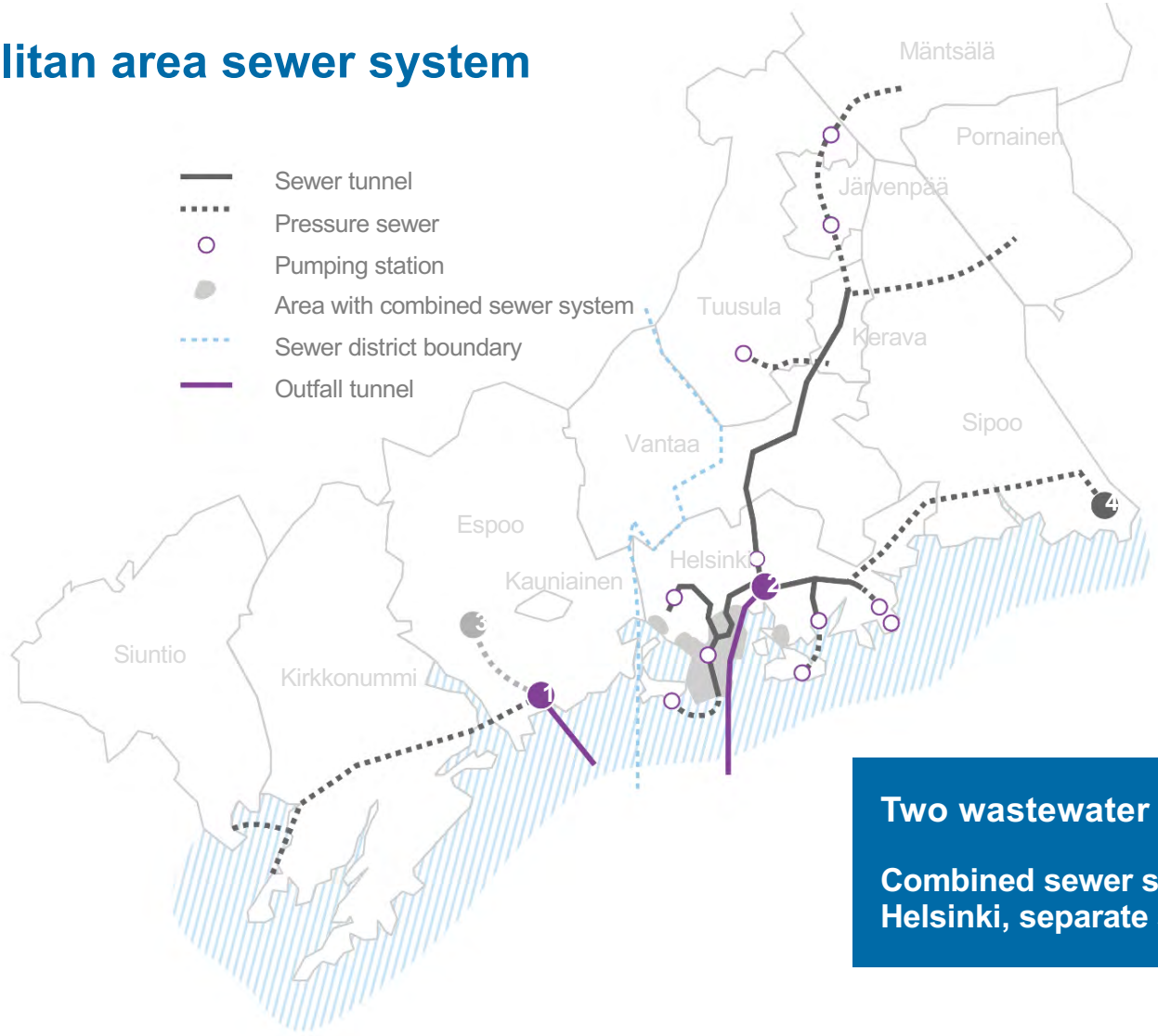
HSY

Key figures for the water supply network 2017

WATER SUPPLY NETWORK	Total length of network	New built in 2017	Old renovated in 2017
Water pipes	3,059 km	25 km	11 km
Wastewater and combined sewers	2,797 km	18.4 km	10.3 km
Storm drains	2,260 km	28 km	2 km
Total	**8,116 km**	**71.4 km**	**23.3 km**

HSY

Metropolitan area sewer system



1. Suomenoja wastewater treatment plant
2. Viikinmäki wastewater treatment plant
3. Blominmäki wastewater treatment plant and tunnels (under construction)
4. Metsäpirtti composting field

Two wastewater treatment plants

Combined sewer system in the centre of Helsinki, separate sewers elsewhere

HSY

Centralised wastewater treatment

Wastewater treatment plants in Viikinmäki and Suomenoja

The treatment result meets the environmental permit requirements

Treated wastewater is led through a discharge tunnel to the open sea

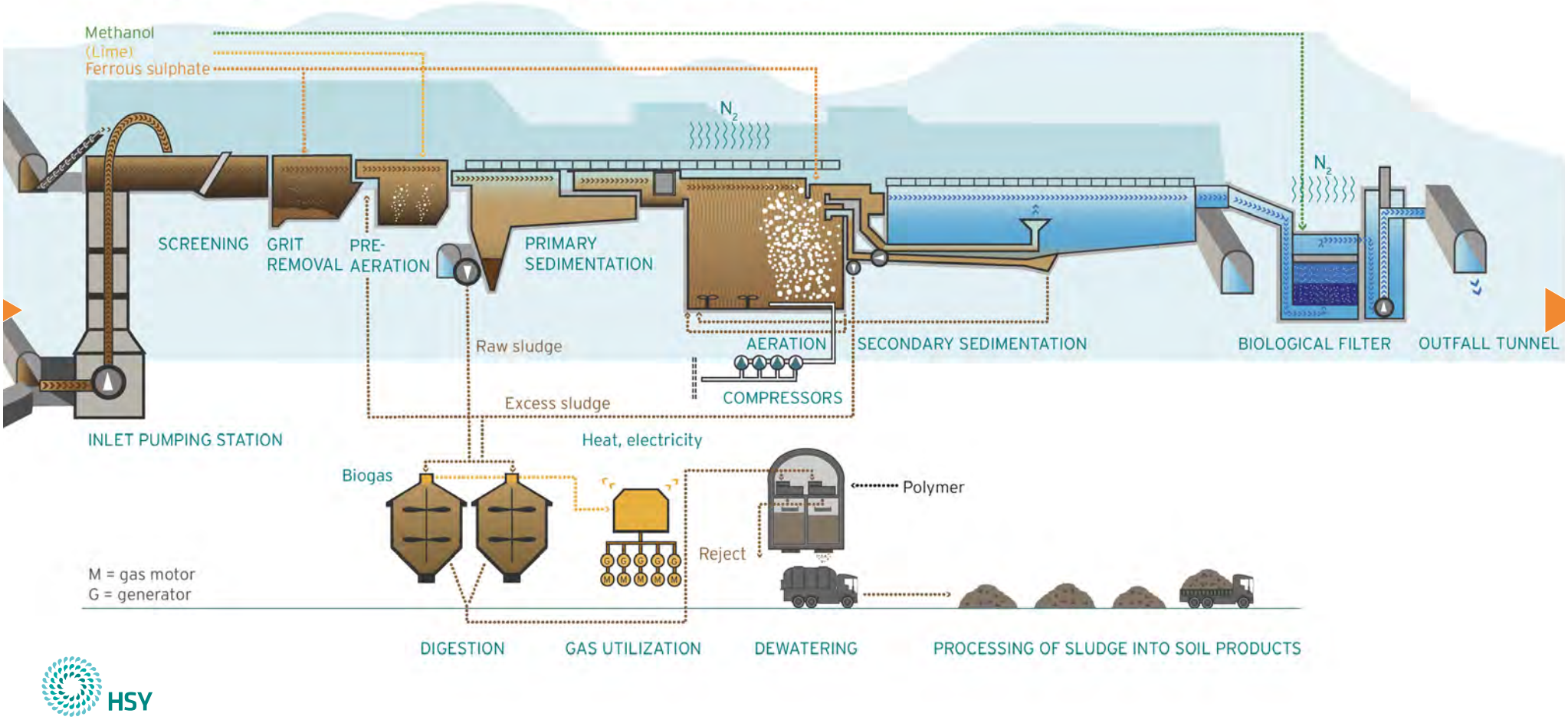
The amount of treated wastewater in 2017 was 145.7 million m^3

Viikinmäki wastewater treatment plant

Suomenoja wastewater treatment plant

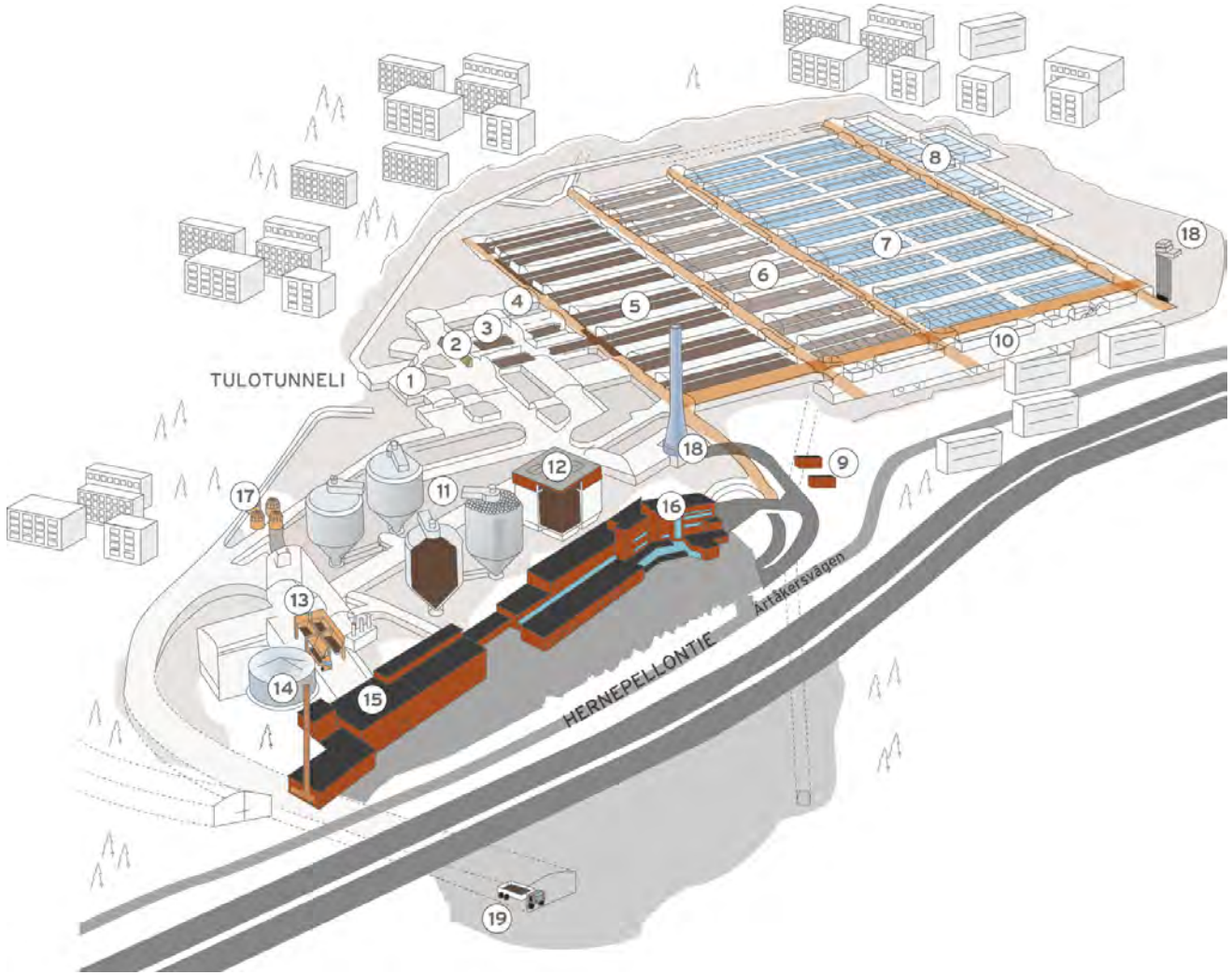
HSY

Viikinmäki wastewater treatment process



HSY

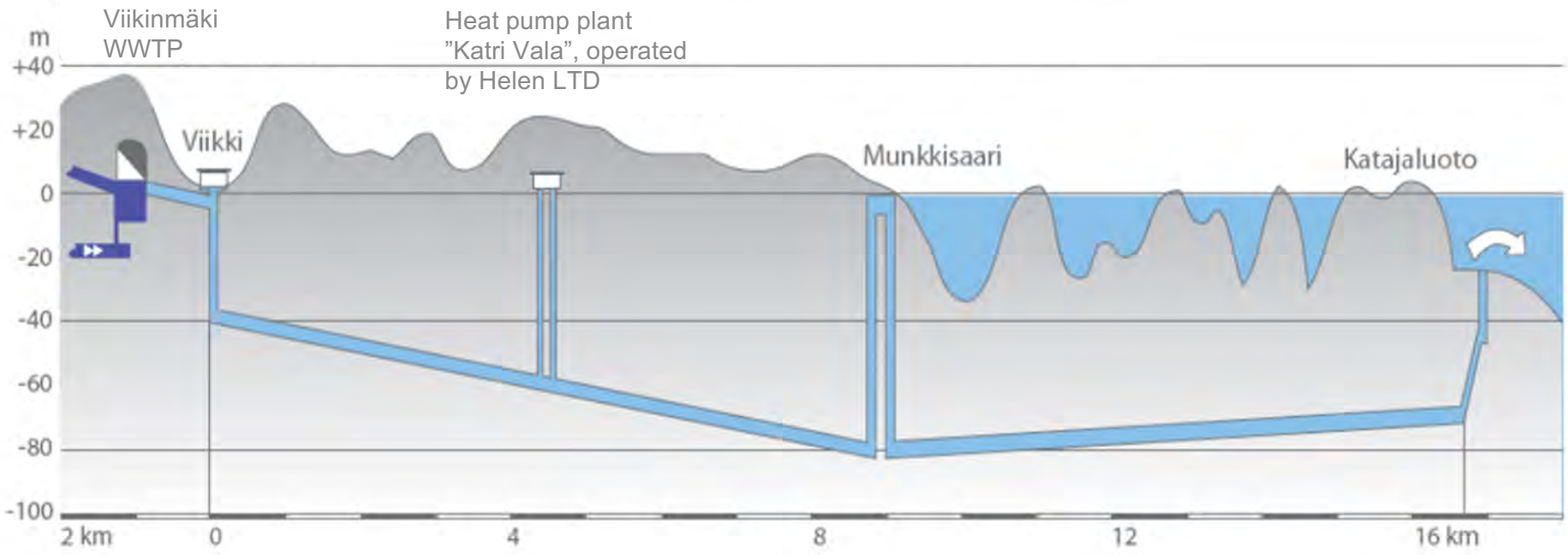
Viikinmäki wastewater treatment plant



1 Influent pumping station
2 Bar screens
3 Grit removal
4 Pre-aeration
5 Primary sedimentation
6 Aeration
7 Secondary sedimentation
8 Biological post-filtration
9 Methanol station
10 Facilities for machinery and equipment
11 Digesters
12 Sludge decantation tanks
13 Sludge dewatering
14 Gas holder
15 Power station
16 Main building
17 Air intake
18 Exhaust air
19 Heavy traffic

HSY

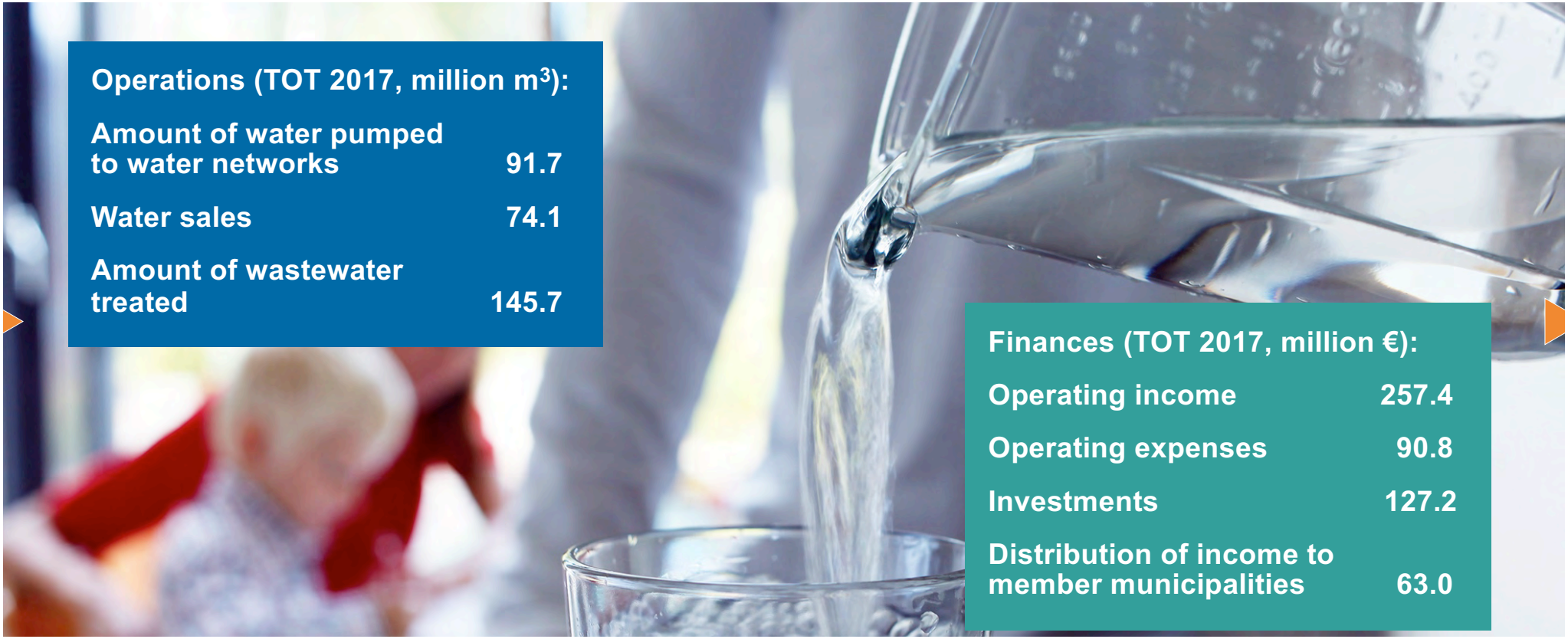
Viikinmäki treated wastewater discharge tunnel



Nutrients into a more fertile form in the Metsäpirtti composting field

HSY

Key figures for HSY Water services in 2017



Operations (TOT 2017, million m^3):	
Amount of water pumped to water networks	91.7
Water sales	74.1
Amount of wastewater treated	145.7

Finances (TOT 2017, million €):	
Operating income	257.4
Operating expenses	90.8
Investments	127.2
Distribution of income to member municipalities	63.0

HSY

Water services asset itemisation/balance 2017 (*€1,000)

ASSETS	
NON-CURRENT ASSETS	**1 995,935**
Intangible assets	**1,880**
Tangible assets	**1 812,658**
Buildings	112,413
Land and water structures, supply networks and devices	1 549,835
Machines and equipment	4,093
Incomplete procurements	146,317
Investments and receivables (shares and holdings)	181,398
CURRENT ASSETS	9,780
Inventories	1,762
Sales receivables	16,327
Cash at hand and in bank	-8,310
TOTAL ASSETS	**2 005,715**

HSY

Water services: cheap or expensive?

Usage rates 2018
(water and wastewater) 3.15 €/m^3

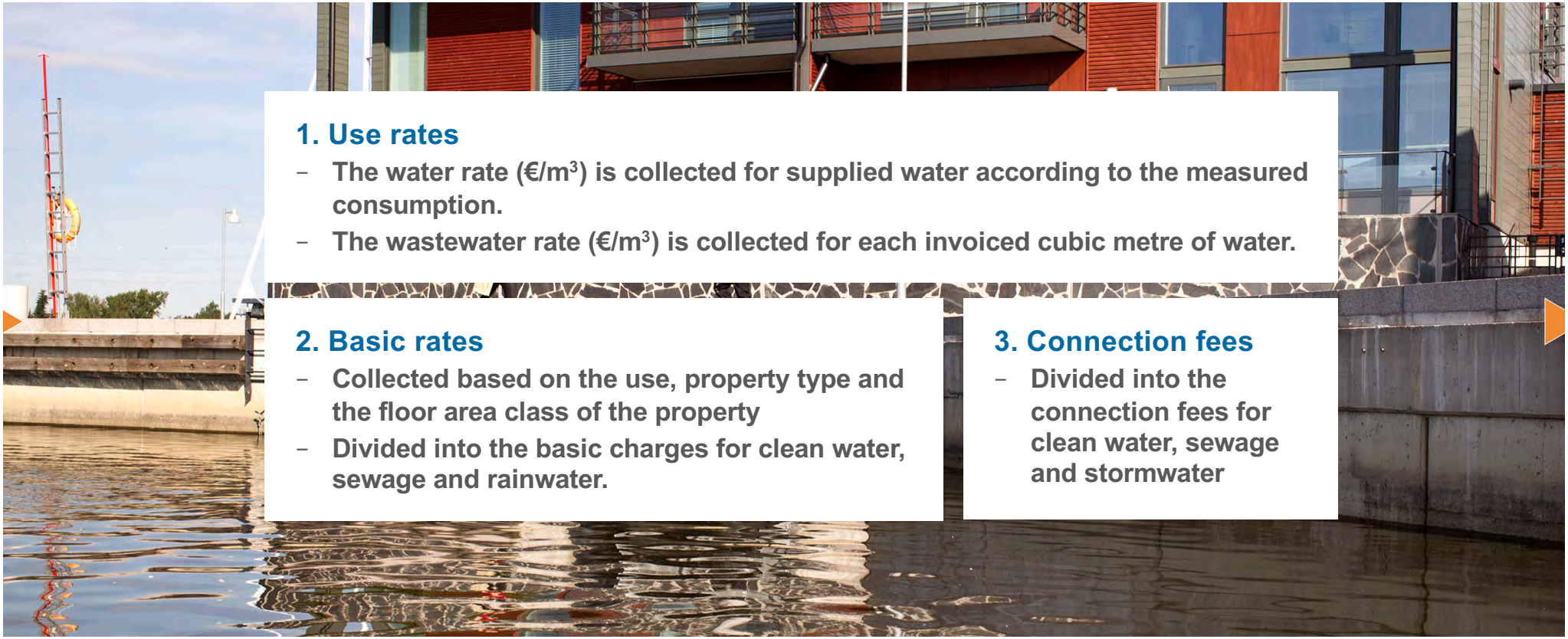
Basic rate
(detached house, 4 residents) 10.42 €/month

Water consumption 137 l/res./day

➡ **52 cents/res./day**

HSY

Water services rates



1. Use rates

- The water rate (€/m³) is collected for supplied water according to the measured consumption.
- The wastewater rate (€/m³) is collected for each invoiced cubic metre of water.

2. Basic rates

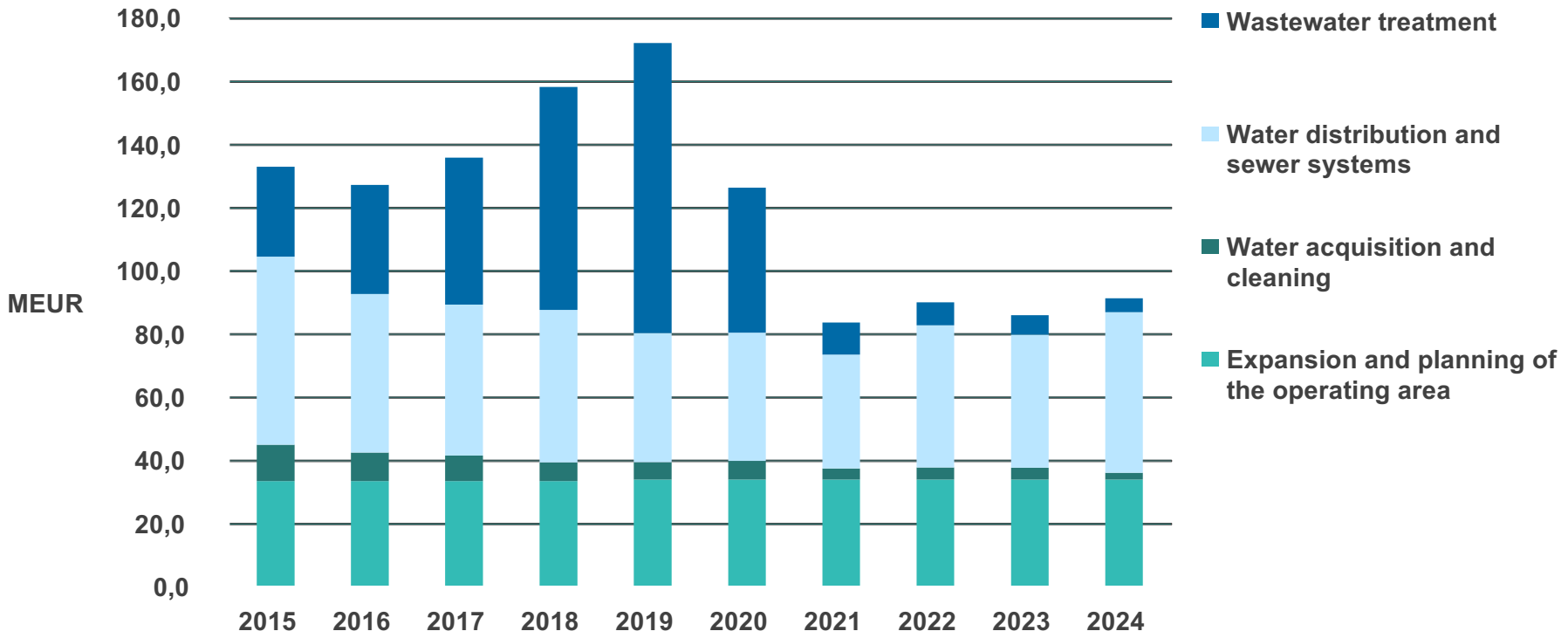
- Collected based on the use, property type and the floor area class of the property
- Divided into the basic charges for clean water, sewage and rainwater.

3. Connection fees

- Divided into the connection fees for clean water, sewage and stormwater

HSY

Investment programme 2015–2024



Investment programme 2015–2024 MEUR 1204.3

2015…MEUR 133	2017…MEUR 135.9	2019…MEUR 172.2	2021…MEUR 83.7	2023…MEUR 86
2016…MEUR 127.3	2018…MEUR 158.3	2020…MEUR 126.4	2022…MEUR 90.1	2024…MEUR 91.4

HSY

Summary of the strategic projects of Water services

PERSPECTIVE:
social effect

STRATEGIC GOAL:
To operate as an environmentally responsible pioneer in cooperation with municipalities in the region

HSY

Summary of the strategic projects of Water services

Strategic project	Purpose	Description
Increasing the capacity of water treatment in Pitkäkoski plant (€36 million). Completion date in 2023.	Increasing the reliability of water production and distribution	The production capacity of the Pitkäkoski plant will be increased to 9000 m^3/h by renovating existing process parts, removing production bottlenecks and replacing devices and methods that are obsolete, expensive or in poor condition with modern environmental and energy-efficient solutions.
New water tower in Hiekkaharju. Completion date in 2019.	Increasing the reliability of water production and distribution	A new water tower is being built, and it will replace the old water tower in Hiekkaharju, in the Eastern part of Vantaa, where number of residents is increasing.
Blominmäki wastewater treatment plant (€371 million). Completion date in 2021.	Securing wastewater treatment capacity	Constructing a new biochemical wastewater treatment plant in Blominmäki, (550,000 res. PE, 150,000 m^3/d) along with approx. 16 km of inlet and discharge tunnels.

HSY

Blominmäki wastewater treatment plant

HSY

Good citizen and a service provider

- Co-operation with member municipalities / good citizenship
  - Contingency plans
  - Baltic Sea Challenge
  - Climate change
  - Enabling growth and development of the area
  - Storm water management plans
  - Investment planning
  - Maintenance planning
  - …close connections in many ways and on many levels…
- Co-operation with other municipalities
  - Based on agreements
  - HSY more like a service provider

HSY

Our work with society stakeholders and international partners (case WWTPs)

- More than 4000 visitors annually
  - Schoolchildren and students
  - Group of experts and VIPs from all over the world
- 15-20 trainees annually
- 1 to 2 thesis every year
- Research and development
  - Participation in several studies
  - Own R&D work
- Education
  - Teaching material
  - Teaching in Aalto University
  - Several articles and publications annually
- Cooperation
  - Developing wastewater treatment with SWTP / Ecovod in St. Petersburg
    - Twinning 1995-2006
    - Maintenance Management 2009-2011
    - Micro Plastics 2014 (HELCOM)
  - Consulting
    - BSAG
    - John Nurminen Foundation
- International cooperation
  - Nordic wastewater treatment plants
  - Nordic wastewater conference / NORDIWA
  - TAG by ISLE utilities, EBC,…
- Lobbying
  - Finnish Water Association (FIWA)
  - National biogas producers association
  - EUREAU

HSY

Topics

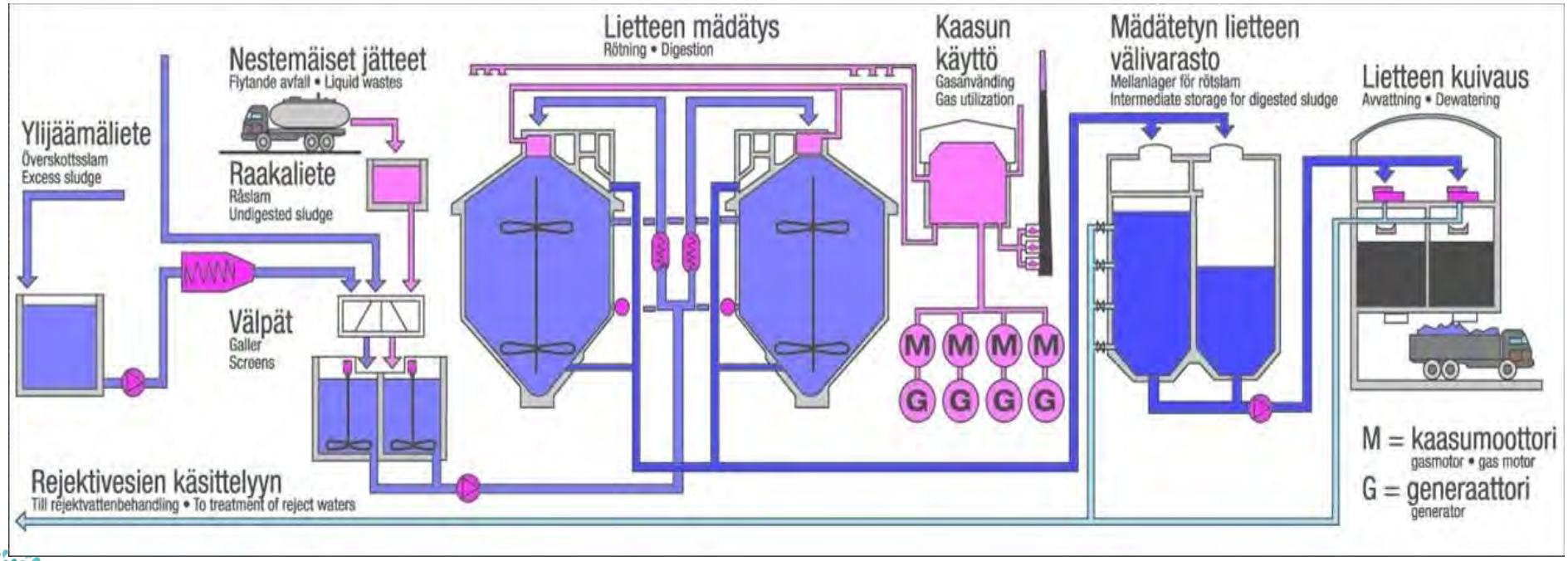
1. Water Services in Europe
2. Water Services in Finland
3. Helsinki Region Environmental Services Authority (HSY)
4. HSY Water Services
5. **From strategy into actions: Energy Efficiency**
6. Development plans
7. Something to discuss…

HSY

From strategy into actions: Energy Efficiency

Energy from biogas – case Viikinmäki WWTP

- Biogas utilized in heat and power production
- Production and use
  - Heat 100 % (value 1,2 M€/year) and electricity ca.90 % (value 3, 0 M€/year)



HSY

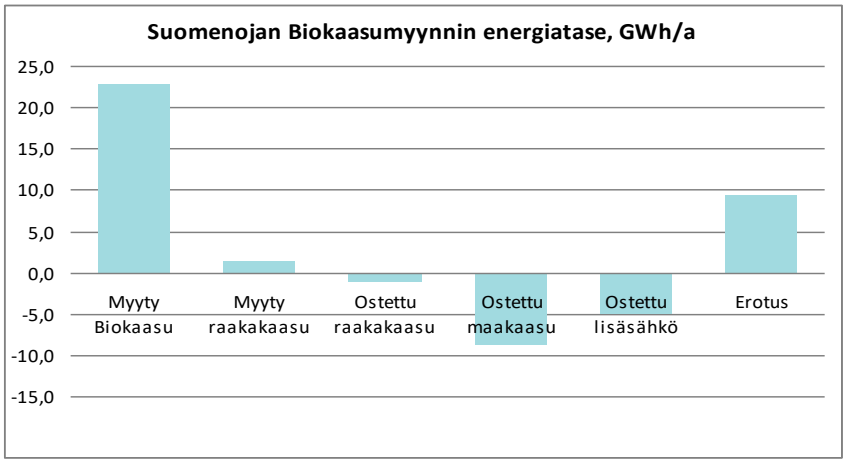
Viikinmäki biogas

- Biogas is utilized by own CHP gas engines as power and heat production
- Heat is utilized by
  - Treatment plant's own processes (digesters) and heating
  - Extra heat is used by Water treatment plant next to Viikinmäki
  - Excess heat of the exhaust gas is one potential source of energy
    - First ORC (organic rankine cycle) Process unit has been taken in operation January 2014
    - Power production 0,84 GWh/a and heat 4,2 GWh/a

HSY

Suomenoja WWTP biogas

- HSY has sold Suomenoja biogas to Gasum Ltd. since November 2012
  - All biogas can be used as a resource of energy
  - Energy content 22 GWh/a
- Gasum Ltd. refines the biogas suitable for the natural gas grid and the gas is utilized as a vehicle fuel
- Air emission decreased in metropolitan transportation
  - ca. 4700 t CO_2/a
  - 2,4 t particles /a
  - 20 t NOx /a



Kuvat Gasum Oy

HSY

Wastewater Heat Recovery by local Energy companies

- Helsinki Energy - Katri Vala Heat Pump Station
  - In operation since 2006
  - Production potential ca. 800 GWh /a

- FORTUM – Suomenoja Heat Pump Station
  - Production 300 GWh/a
    - Eq. heating potential for 15 000 single family house in arctic condition

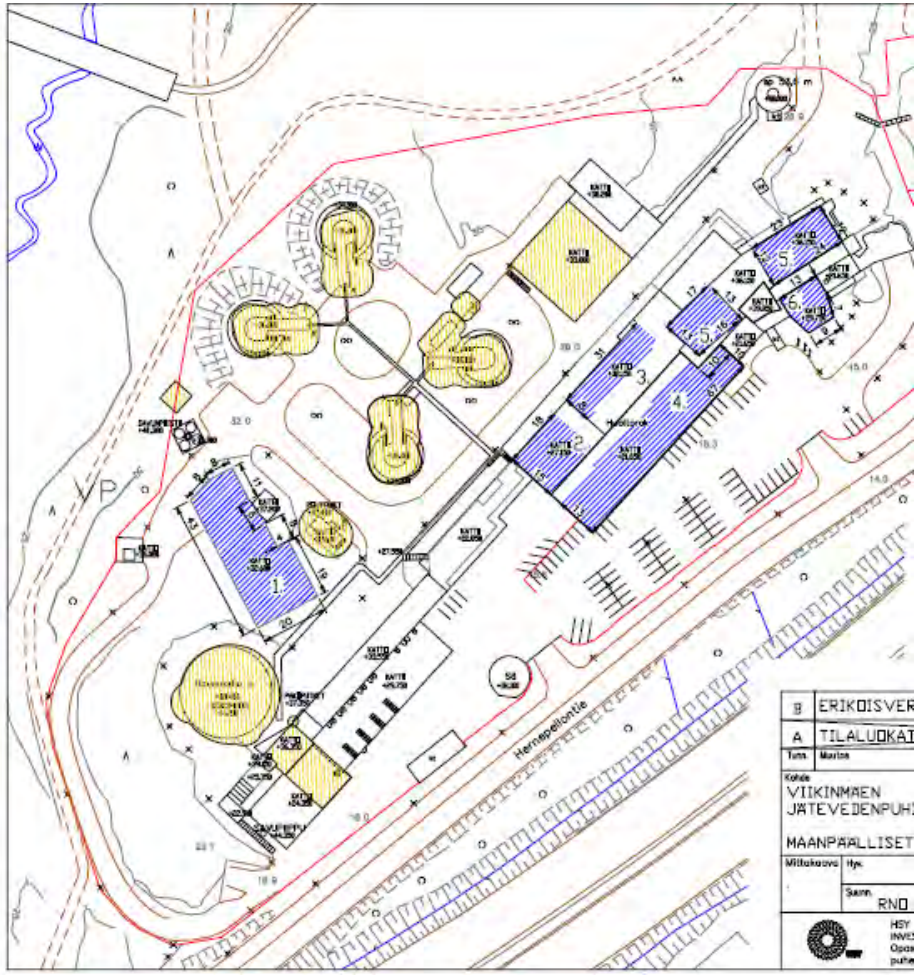
Kuvat Helsingin Energia ja HSY

HSY

Solar power

Case Viikinmäki

- Roofs of HSY buildings and water towers covered with solar panels
- Annual production ca. 260 MWh/a (0,7 % of annual demand of WWTP)
- Started in 2016



HSY

Topics

1. Water Services in Europe
2. Water Services in Finland
3. Helsinki Region Environmental Services Authority (HSY)
4. HSY Water Services
5. From strategy into actions: Energy Efficiency
6. **Development plans**
7. Something to discuss…

HSY

Development planning of water services

Henna Luukkonen

29.1.2019

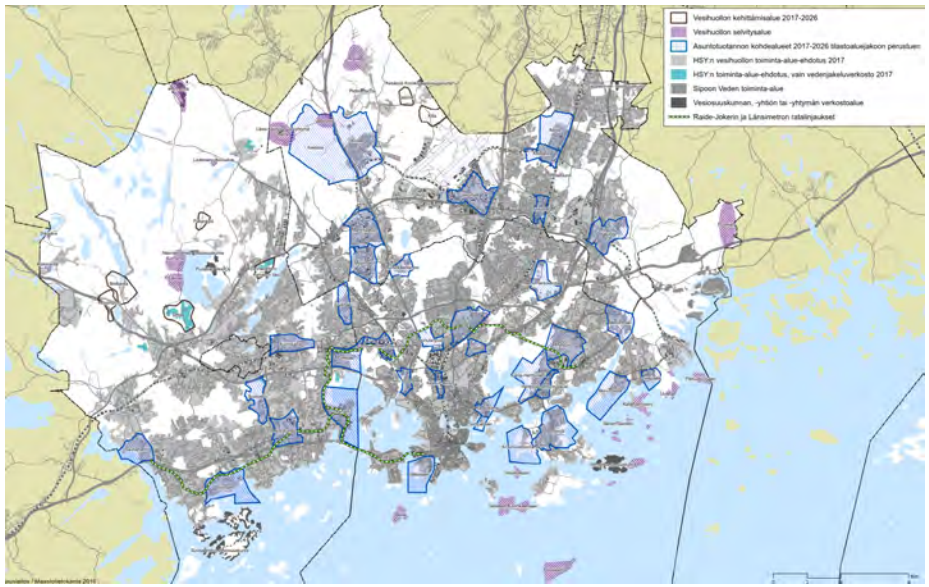
Development plans

- HSY organises the planning project but the cities are responsible for development planning → **cooperation**!
- HSY and its member municipalities have agreed that development plans are updated once in four years
- Each municipality has their own development plan and development plan concerning the whole HSY area is generated from these plans
- Development plans are made for next 10 years
- Decision making: member municipalities approve their own development plan. HSY approves the development plan for the whole HSY area after that.

Water Services Act

A municipality shall develop water services and sewerage in its territory in accordance with the development of communities so as to meet the objectives of this Act in cooperation with the water utilities in its territory.

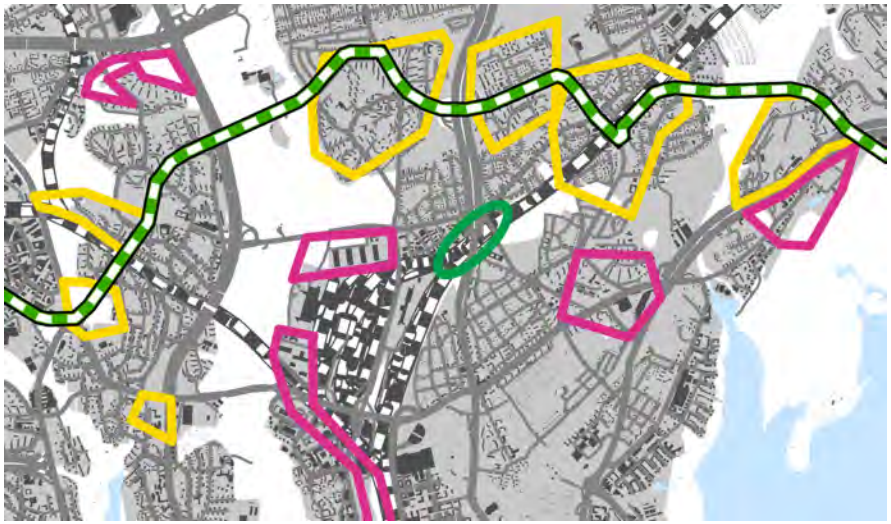
Main map of the development plan: blue areas are statistical areas that will have the most significant population growth in 10 years



HSY

The content of the development plans

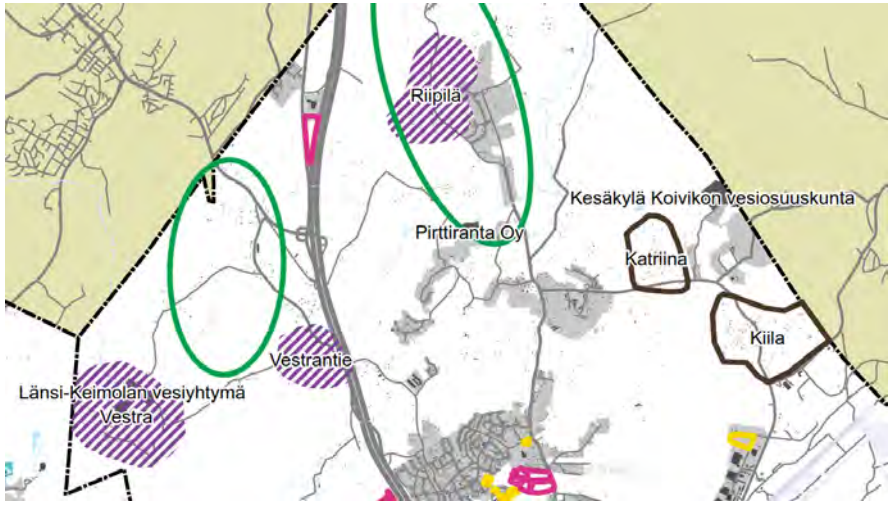
- The main goal of development plans is to identify areas where water services will be extended (build)
- The need for water services is mainly based on the needs set in city planning
  - New areas, for example: Jätkäsaari, Kalasatama, Pasila Kivistö, Suurpelto, Kruunuvuorenranta (pink areas in the map)
  - Changes in the land use, for example: Länsimetro route, Raide-Jokeri route (yellow areas in the map)
- During the planning process areas that will develop significantly in a longer time period than 10 years were identified and marked to the maps (green areas in the map)
  - Examples: Östersundom, Malmi Airport area

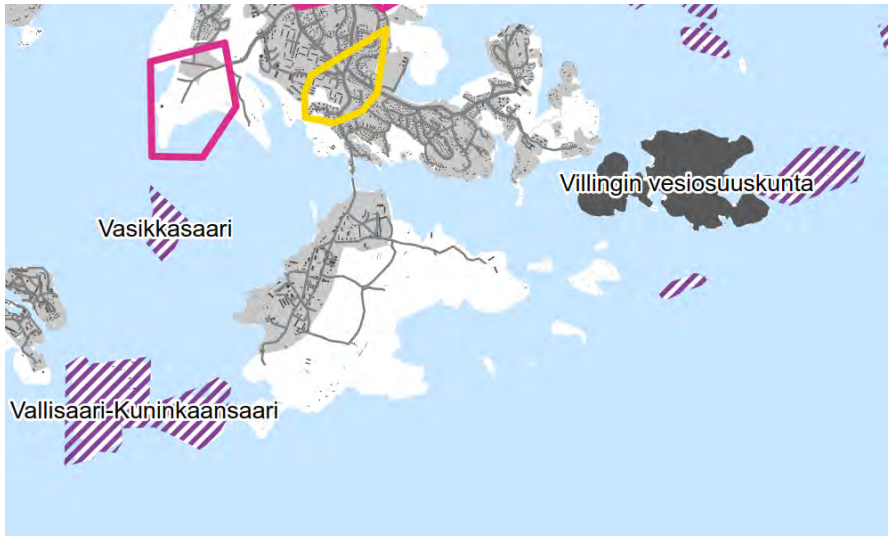


HSY

The content of the development plans

- The need of water services in sparsely populated areas (rural areas, islands etc.) is evaluated during the planning process and following areas were detected:
  - Development areas: HSY will build water and/or wastewater networks in the area in a timetable that is estimated in the development plans (brown areas in the map)
    - The need for water services is based on relatively large number of inhabitants or health or environmental protection reasons
    - Areas are identified by using GIS analysis
  - Inspection areas: The need for water services must be investigated more closely before decision can be made (purple areas in the map) → These areas do not meet the criteria set for development areas





HSY

Topics

1. Water Services in Europe, some examples
2. Water Services in Finland
3. Helsinki Region Environmental Services Authority (HSY)
4. HSY Water Services
5. From strategy into actions: Energy Efficiency
6. Development plans
7. **Something to discuss…**

HSY

Something to discuss…

- How do you see HSY as a member of our society?
  - How HSY should act to be a good citizen?
- How would you define ”good water services”?
  - How should we measure that?
- Governance vs. ability
  - Can governance affect the utility’s ability to improve the water services?
  - If so, how?

HSY

AALTO University

Thank You for Your kind attention!

HSY