

FIG Working Week 2012
Rome, Italy, 6-10 May



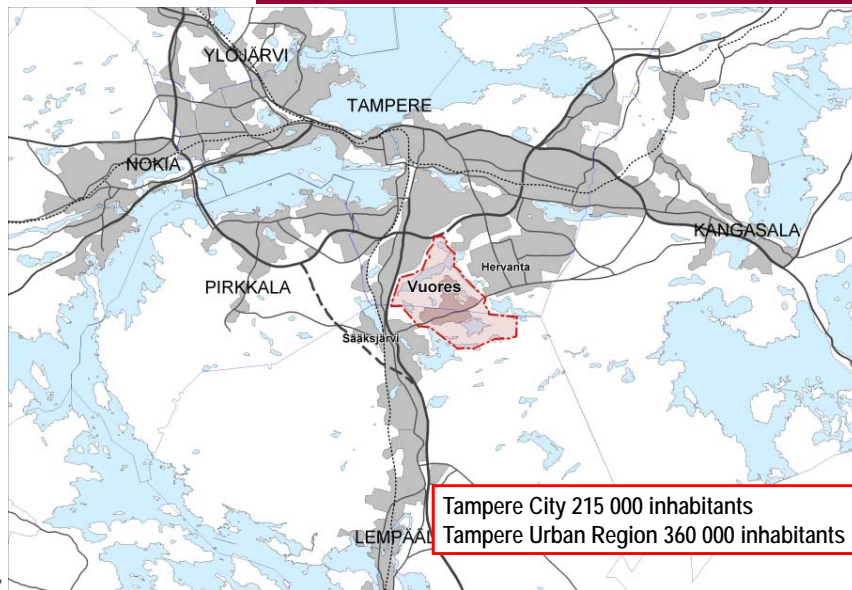
Urban sustainability in Vuores, a new housing development in Tampere

8.5.2012

Pertti Tamminen, Project Director



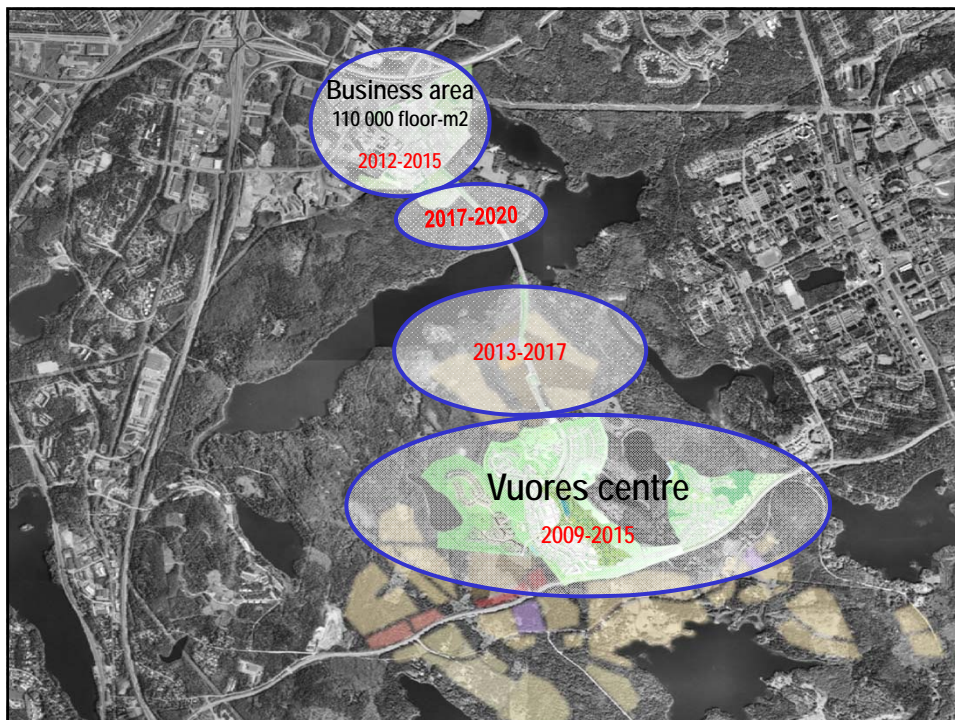
Location of the Vuores area



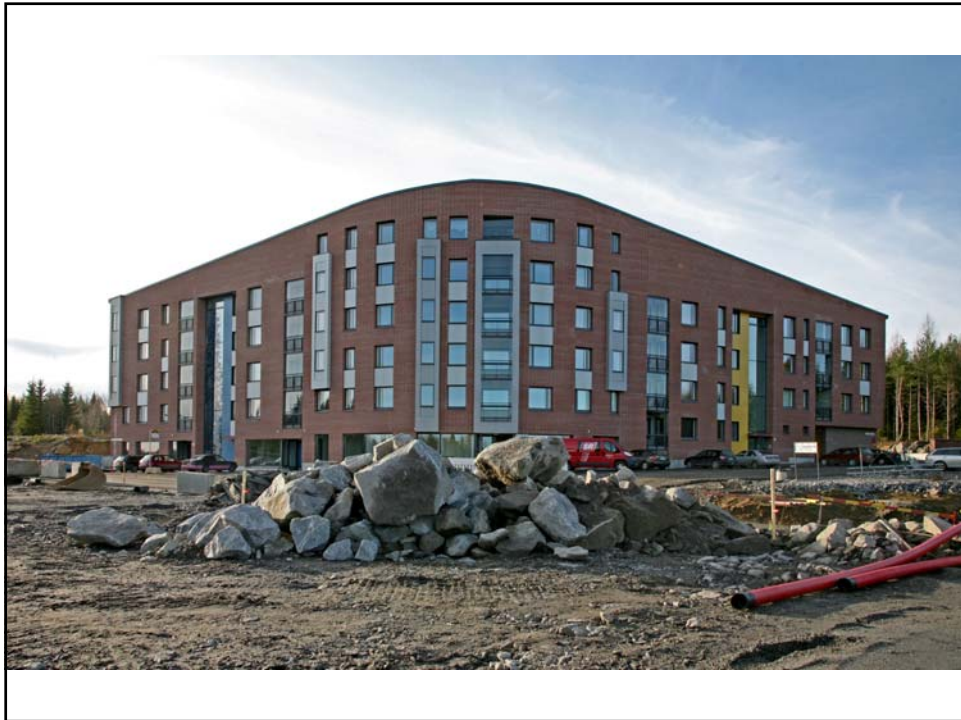
Vuores: Main goals

- 13,000 inhabitants, 3000-5000 jobs
- small town image
- eco-efficiency
- natural environment and ecology are an essential part of the area identity
- diversity in the housing stock and social structure

Tampere
Vuores









6.3.2012



26.4.2012



Background



Enormous potential in built environment

- Share of energy end-use 42 %
- Produce 38 % of carbon emissions in Finland

Commitments and Strategies

- Kyoto Protocol (before 2012)
- International climate change negotiations (after 2012)
- Climate and Energy Strategy (2020)
- Finland's Foresight Report on long-term Climate and Energy Policy (2050)

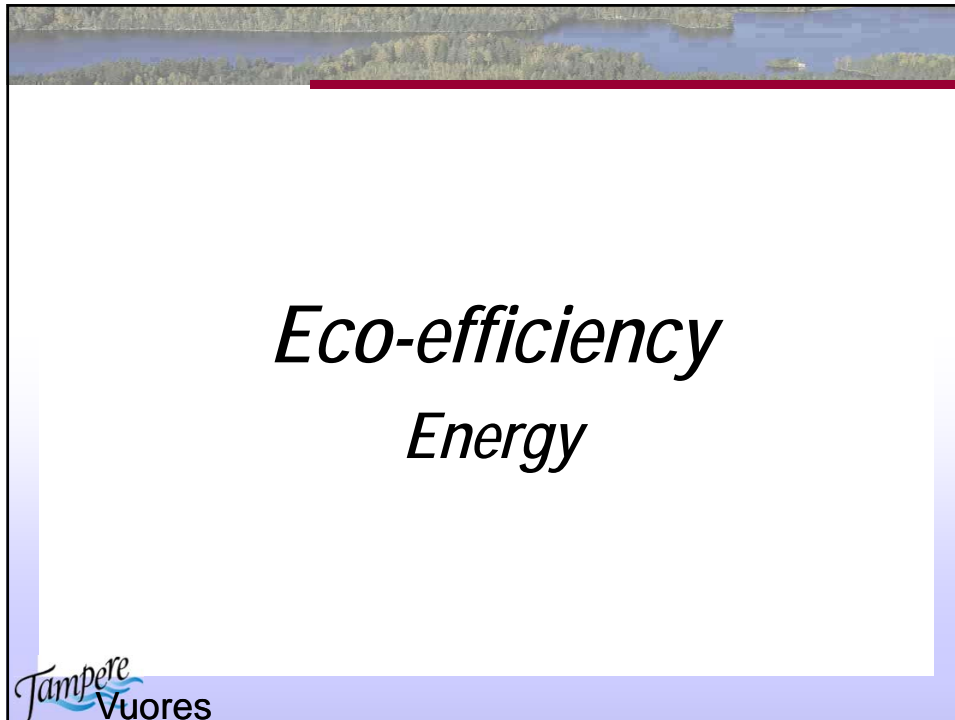
ERR17


Eco-efficiency Transport

Vuores avenue and Särkijärvi bridge








VTT TECHNICAL RESEARCH CENTRE OF FINLAND 1603/2011 3 

Background

NZEB

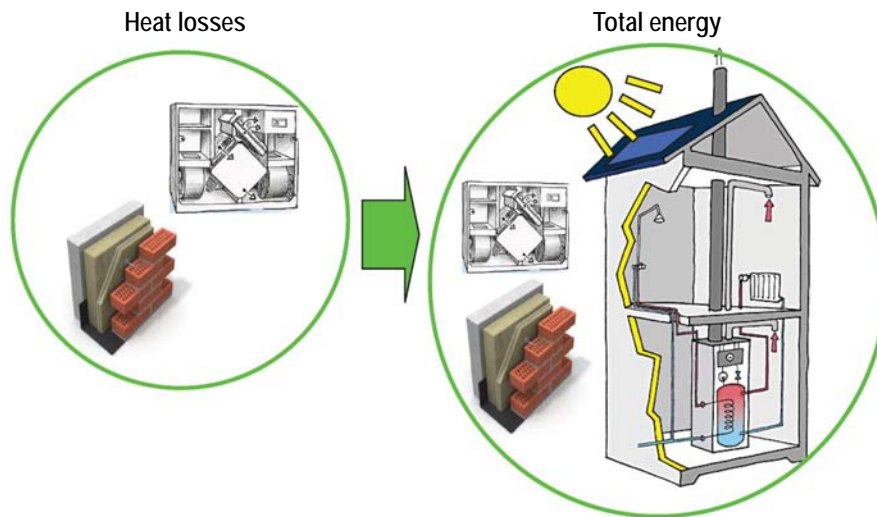
- By the end of 2020 all new buildings should be "nearly zero - energy buildings" according to the Energy Performance of the Buildings Directive recast 2010
- The national definition of zero energy buildings should be stated
- Member States are expected to draw up plans for increasing the number of nearly zero-energy buildings
- An exact, numerical definition of nearly zero is not given, allowing space for **national interpretations**
- **Cost optimum** depends strongly on the national conditions (eg. climate, building culture, available design concepts)

EPBD



Definition of the nearly zero energy building (NZEB):
"NZEB's are buildings with very high energy performance and their energy requirements are covered by renewable energy sources to a significant extent"

Finland: from heat losses to total energy evaluation



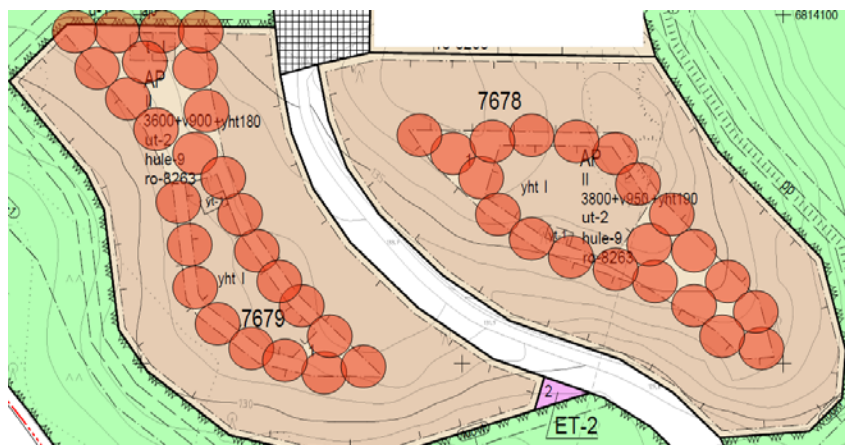
Koukkuranta residential area (530 housing units)

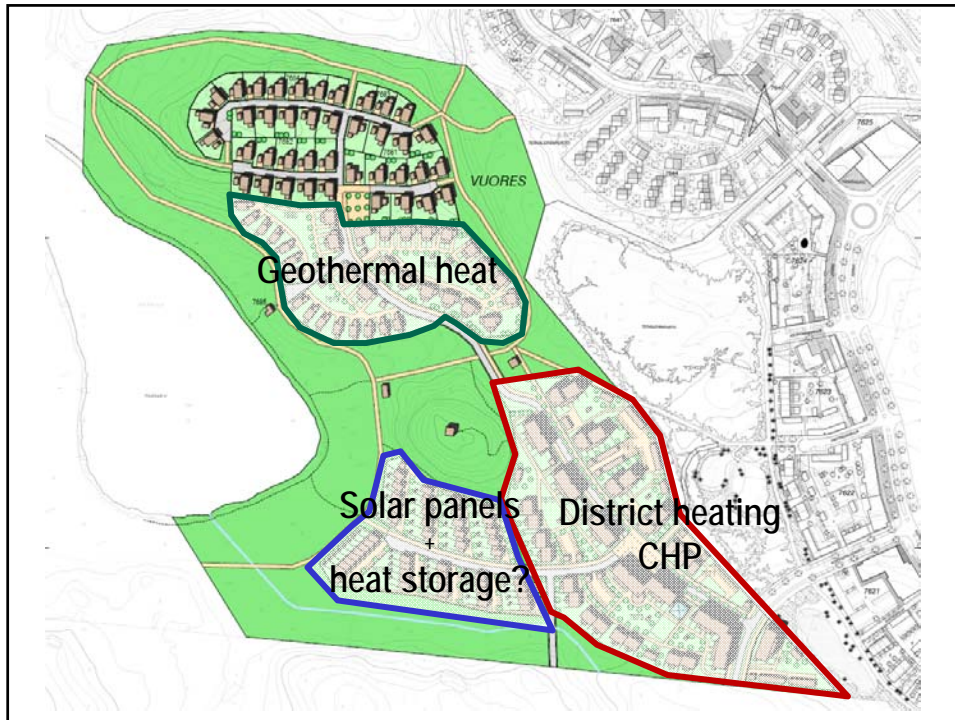


Annual solar energy potential



Ground source heat pumps

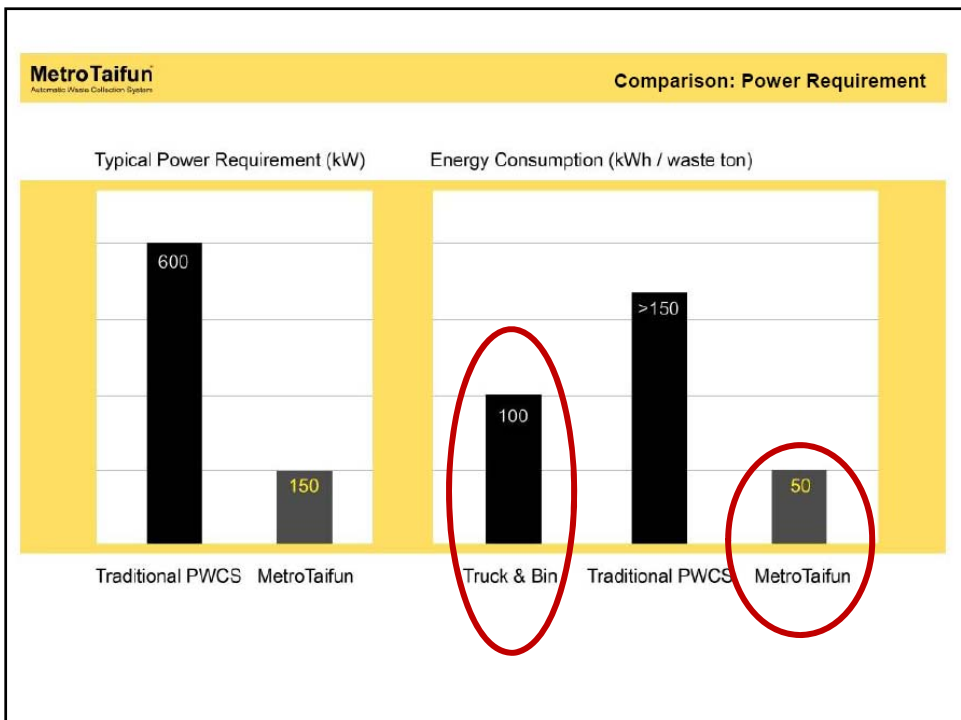
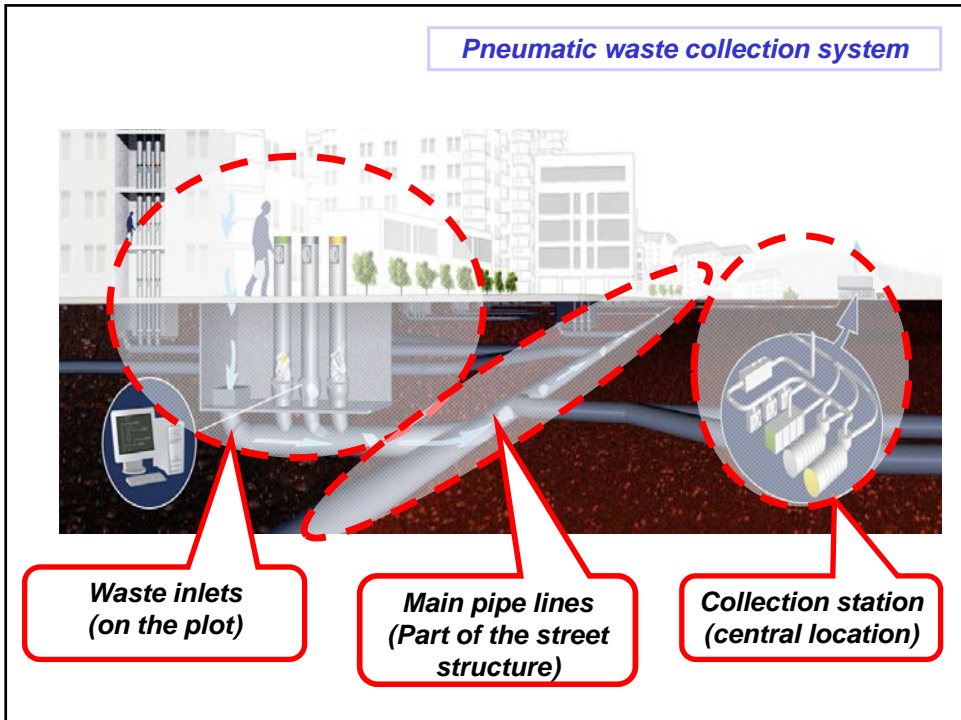





Eco-efficiency

Pneumatic waste collection system

Tampere
Vuores





Eco-efficiency

Materials – timber construction

Tampere Vuores

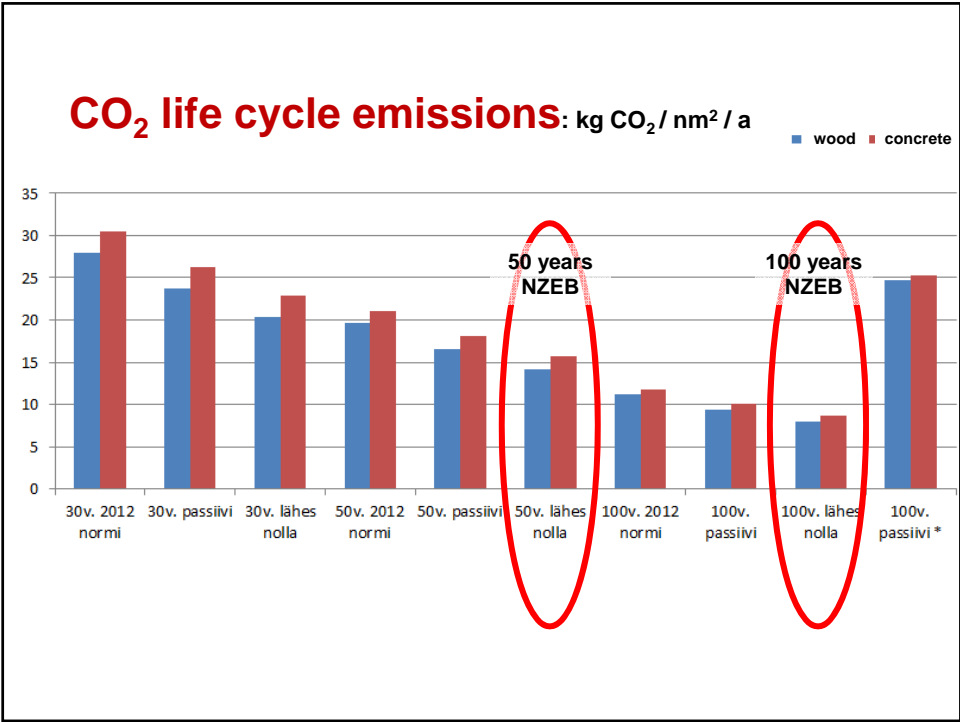
Table 4-1. Life Expectancies of World Reserves, Selected Mineral Commodities

Luonnonvarojen riittävyys erilaisilla perustuotannon kasvuvauhteilla*

Production growth	0 %*	2 %*	5 %*
Coal	216	84	49
Crude oil	44	31	23
Natural gas	64	41	29
Aluminium	202	81	48
Copper	28	22	18
Iron	132	65	41
Wood

Sources: Tilton (2002); US Bureau of mines (1977); US Geological Survey (2000a); US Geological Survey (2000b); American Petroleum Institute (2000); BP Amoco (2000); International Energy Agency (2000).

puu on ekoin!



Heinola, Finland



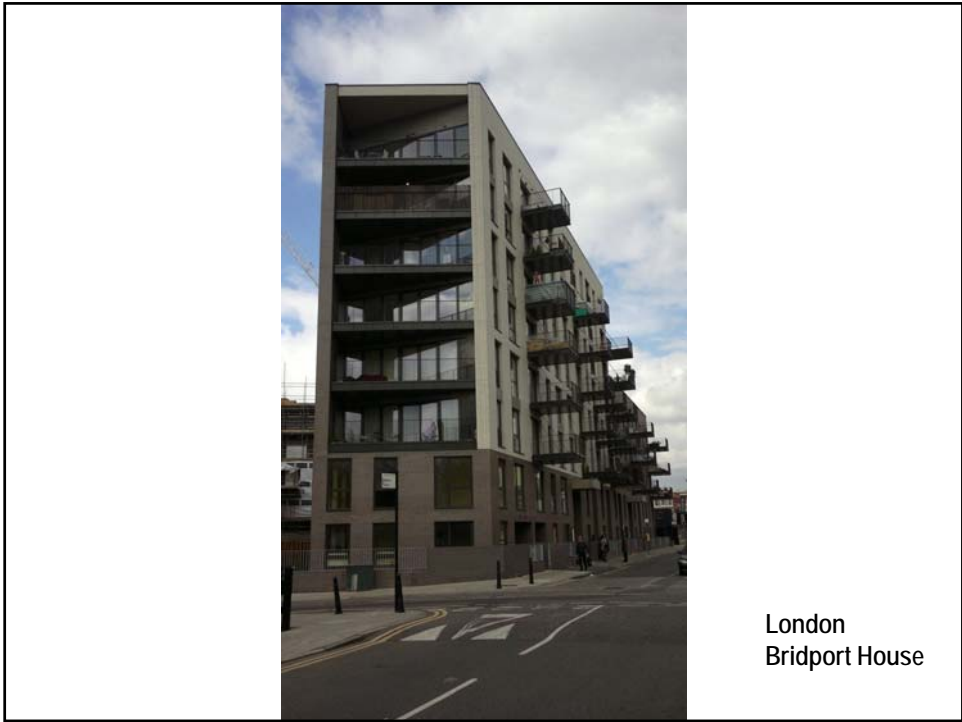
Helsinki, Omenamäki, 2006; 3 taloa, 131 asuntoa

Case

Viikki, Helsinki



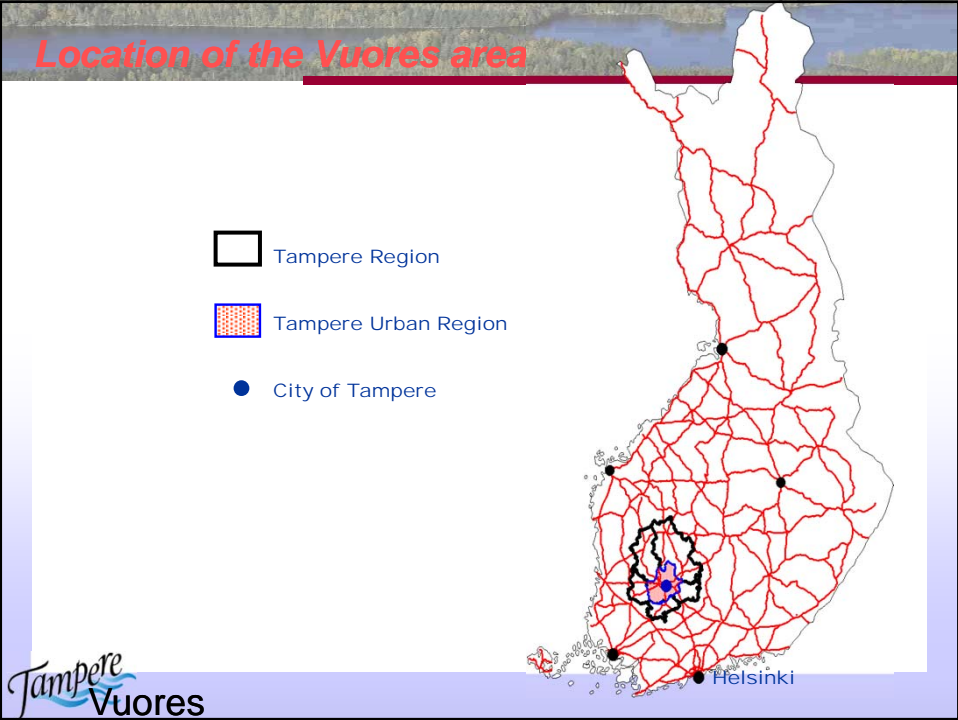
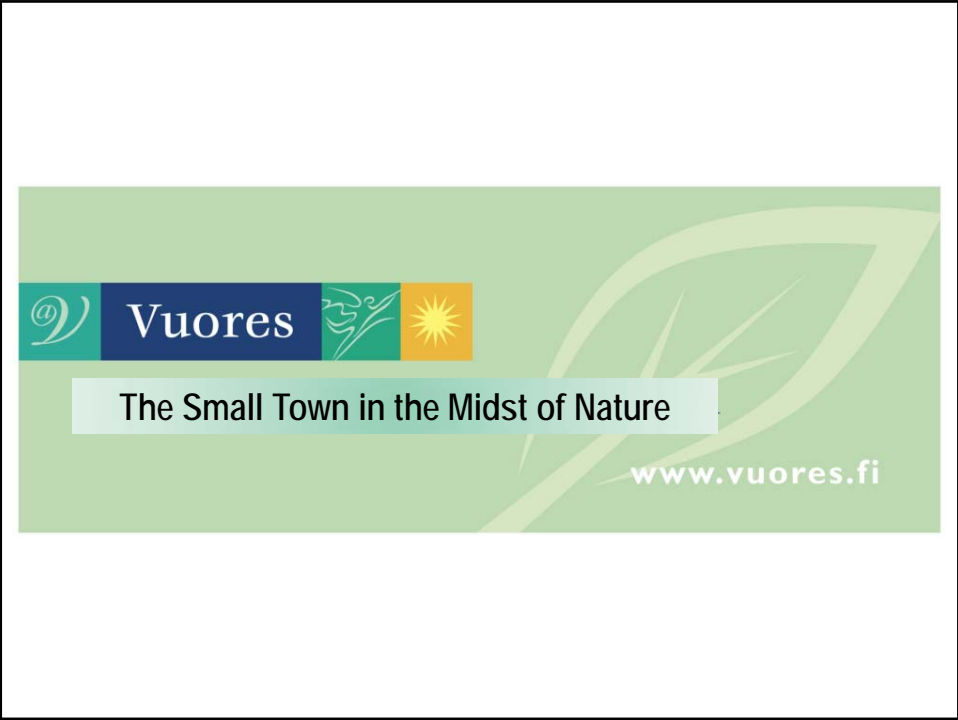




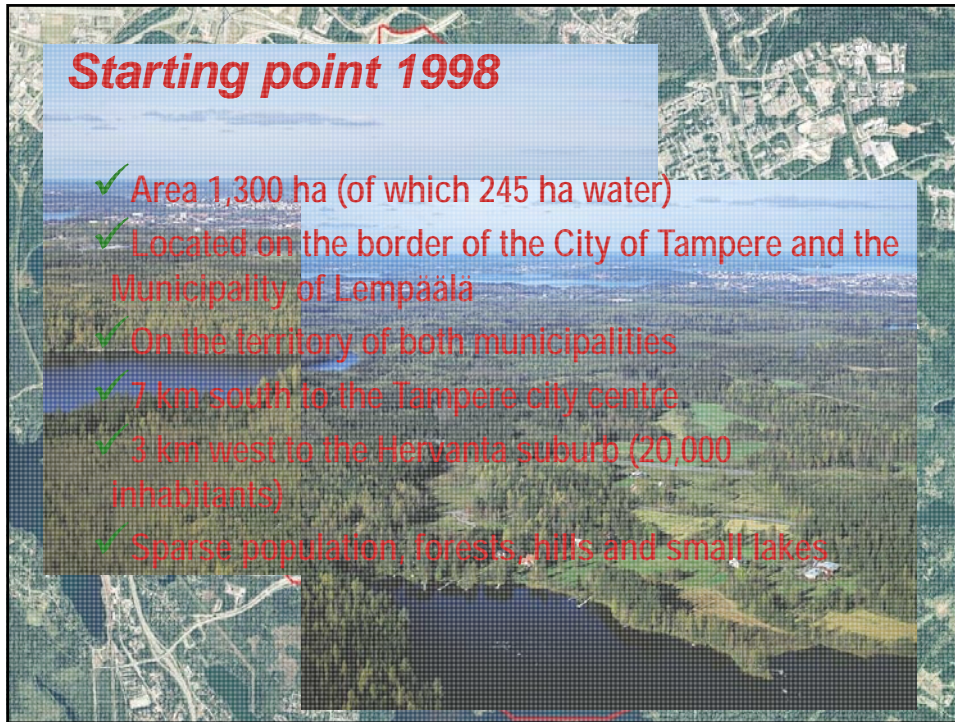


Summary

- Eco-efficiency = to construct and run urban environment using fewer natural resources
- Traffic system:
 - 1st public transport, walking and cycling - 2nd private cars
- Energy systems:
 - Most dense areas – district heating based on CHP
 - Distributed energy production: geothermal heat, solar energy, wind power – must be integrated into land use planning
- Timber construction: most eco-efficient
- **Don't forget the main goal:** good, pleasant living environment – good architecture, services, parks, squares...







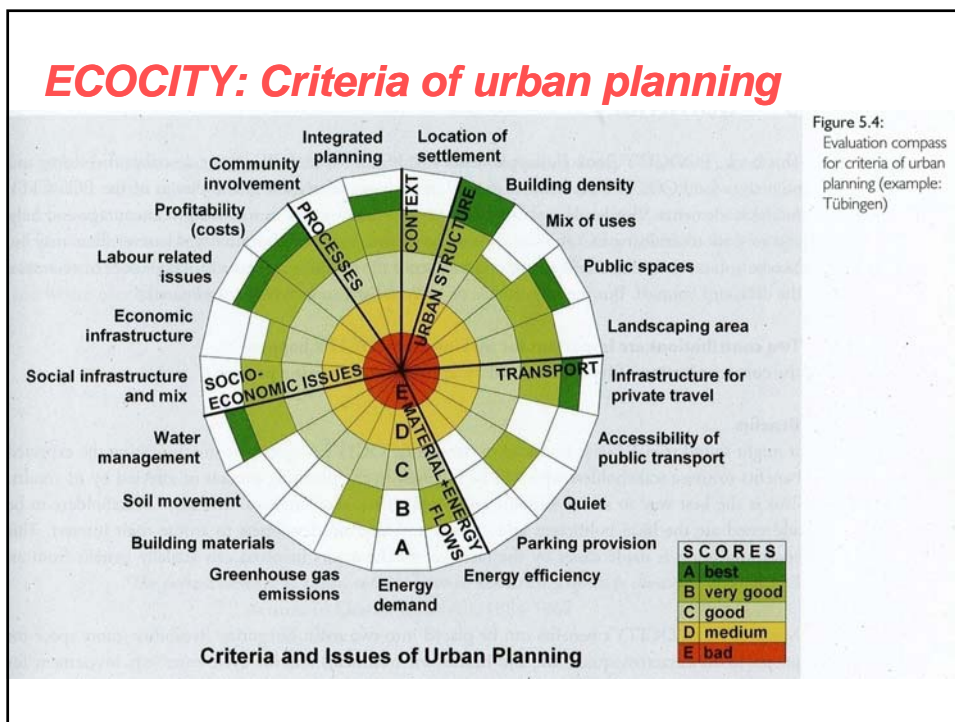
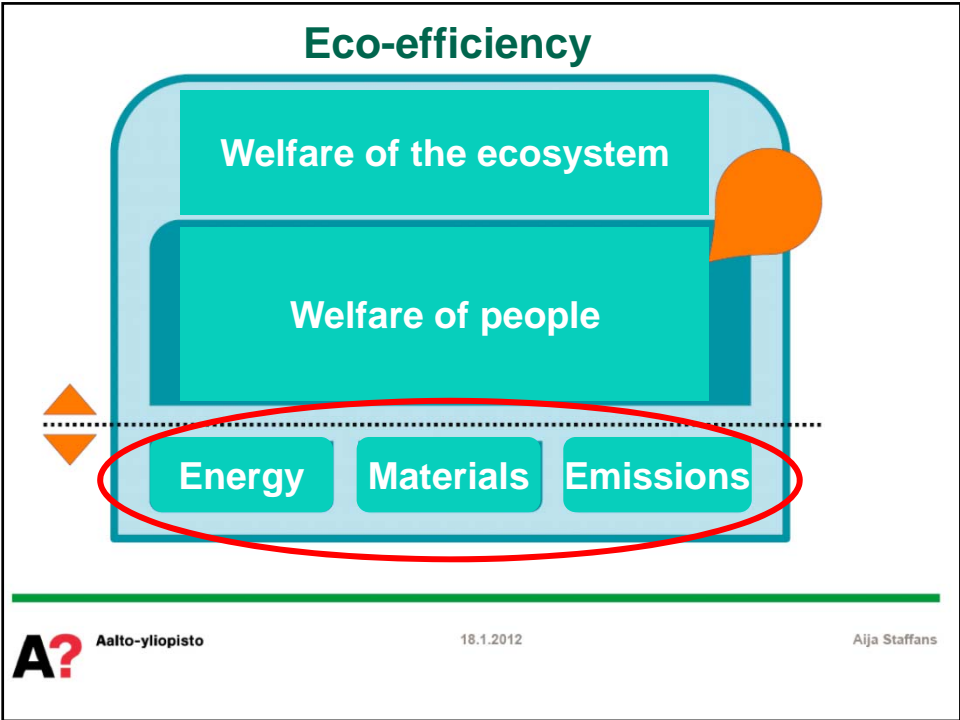
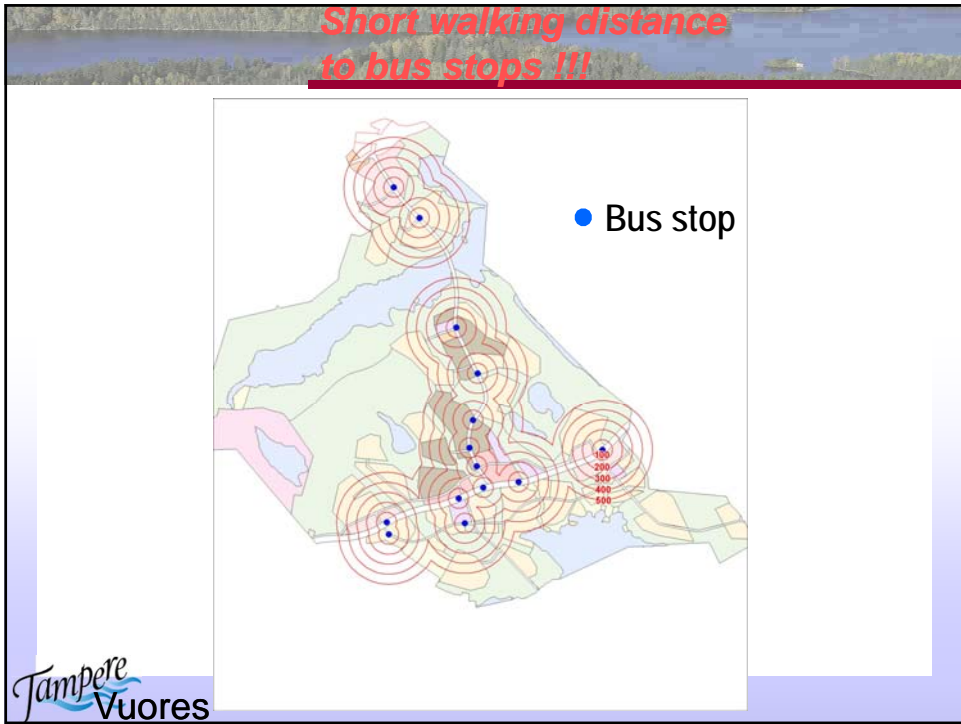


Figure 5.4: Evaluation compass for criteria of urban planning (example: Tübingen)





Distributed methods of energy production



Piirroksel: Leena Ahveninen

ERRA17

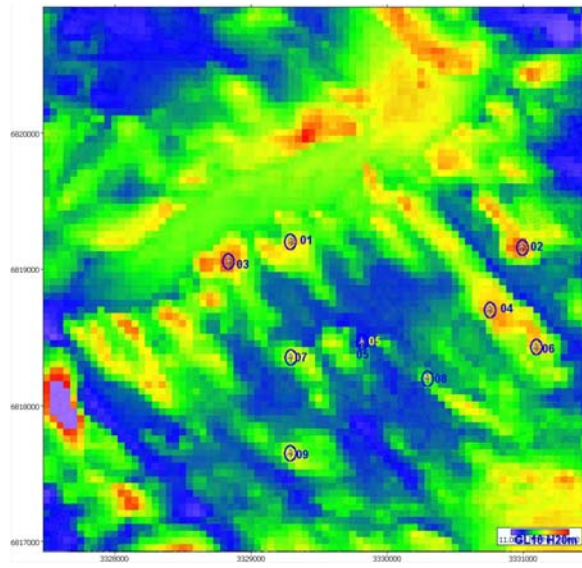
Wind power studies WASP analysis

- YKJ-koordinaatisto
50x50m hilaväli
20 m korkeudelle
- Lasketaan tuulen nopeus
 - Ginlong 10 kW voimalan vuosituotto [MWh]

Sijoitetaan voimalat
hyvätuottoisille paikoille
Lasketaan tuotot

Tuulitaito

Tampere
Vuores



Windmill power production potential

YKJ-koordinaatisto

50x50m hilaväli

20 m korkeudelle

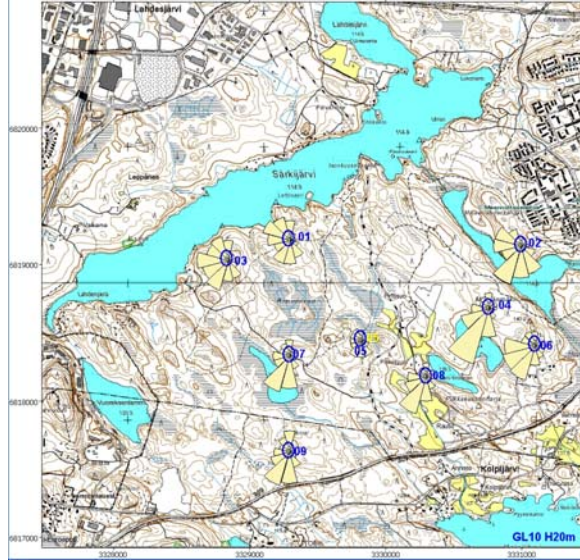
- Lasketaan tuulen nopeus
- Ginlong 10 kW voimalan vuosituotto [MWh]

Sijoitetaan voimalat ja tarkistetaan ovatko paikat mahdollisia

Lasketaan tuotot sektoreittain

Tuulitaito

Tampere
Vuores

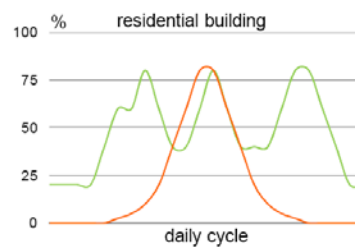
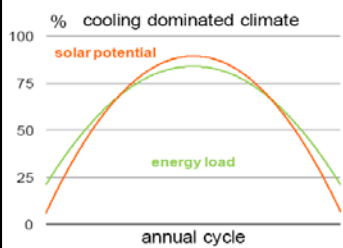
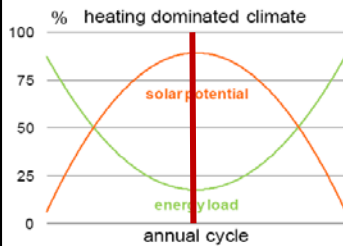


Rotor diameter 9 m
Height 20-30 m
20-30 MWh / a

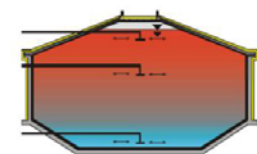
Kuva 19. Ilmari 10 kW takatuulivoimala. Konehuoneen muotoilussa on kiinnitetty huomiota ulkonäköönkin. Voimalassa ei ole erillistä peräsintä vaan konehuoneen takana oleva potkuri ohjaa voimalaa tuuleen. Maston vaikutus virtaukseen kuuluu äänisäyksenä potkurin ohittaessa maston, mikä on yksi takatuulipotkurin heikoista puolista.

Energy use and supply mismatch

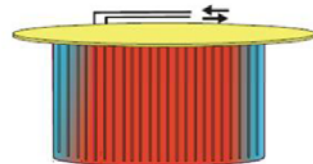
- Optimization of yearly demand and supply
- Energy efficiency reduces mismatch
- Other means
 - Energy storages
 - Orientation (PV): Supply responses demand more efficiently



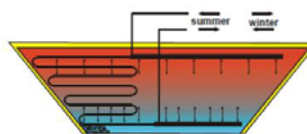
Heat storage



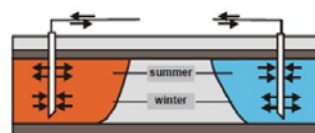
Water



Heat wells



Water - gravel



Ground water

<http://www.saisonalspeicher.de>

Examples 1

Friedrichshafen, 1996
 Storage for 390 apartments
 Collector area 4050 m²
 Thermal capacity 2835 kW_{th}
 Water storage 12 000 m³



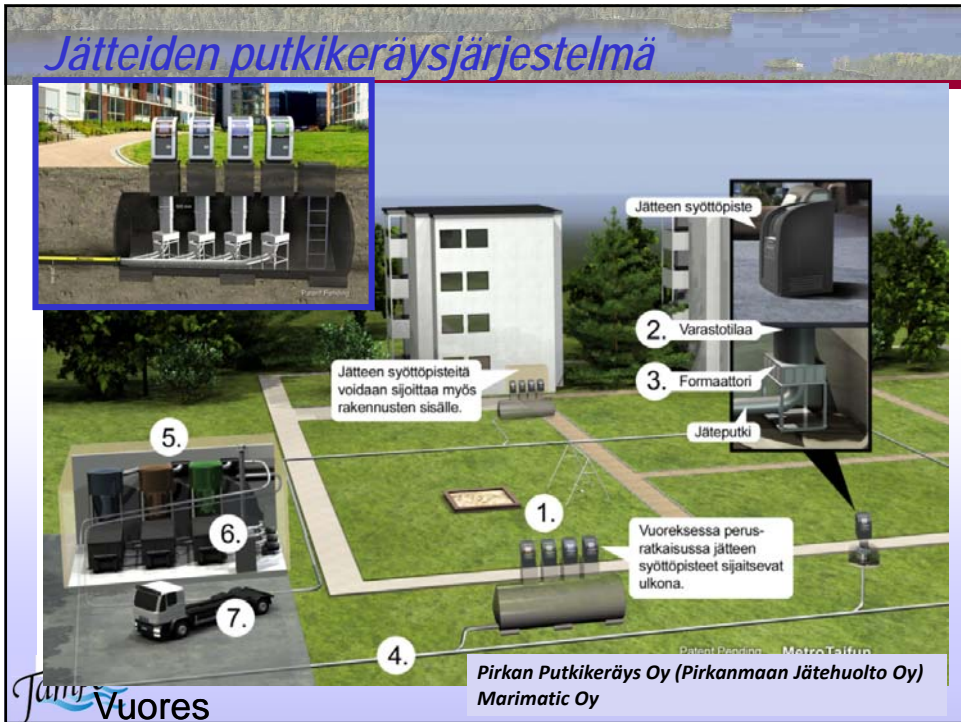
Neckarsulm, 1998
 Storage for 300 apartments
 Collector area 5469 m²
 Thermal capacity 38285 kW_{th}
 Heat wells 63 360 m³

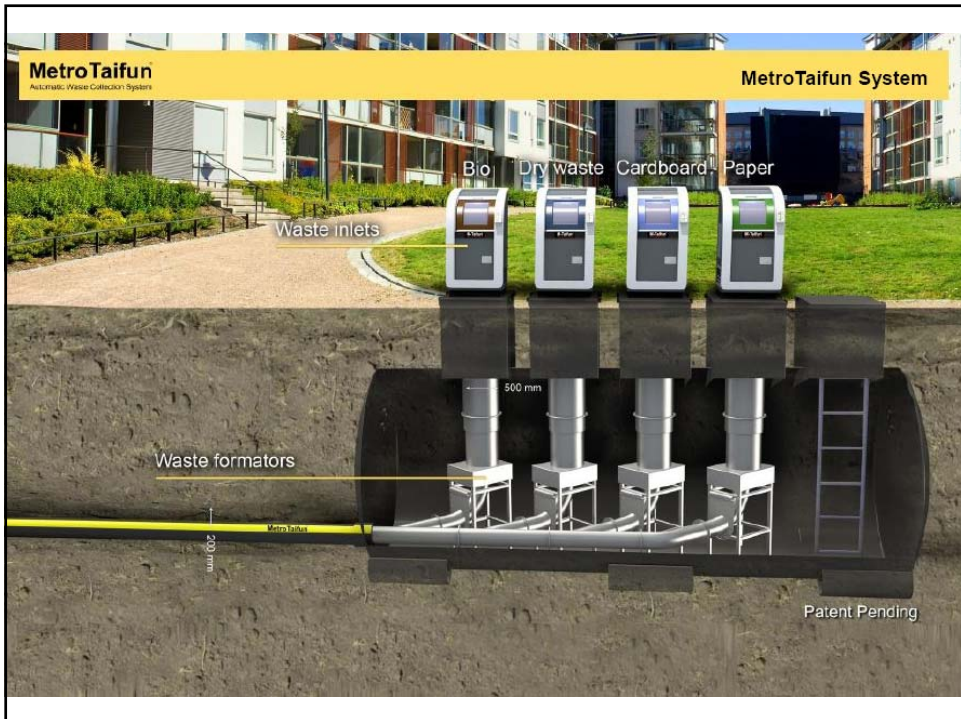
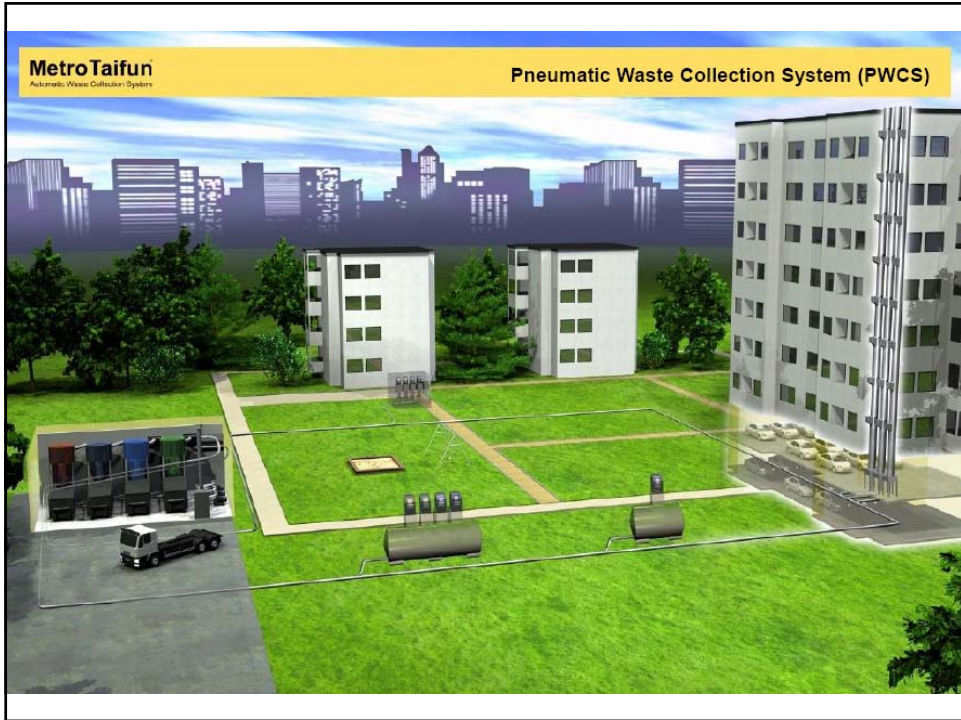


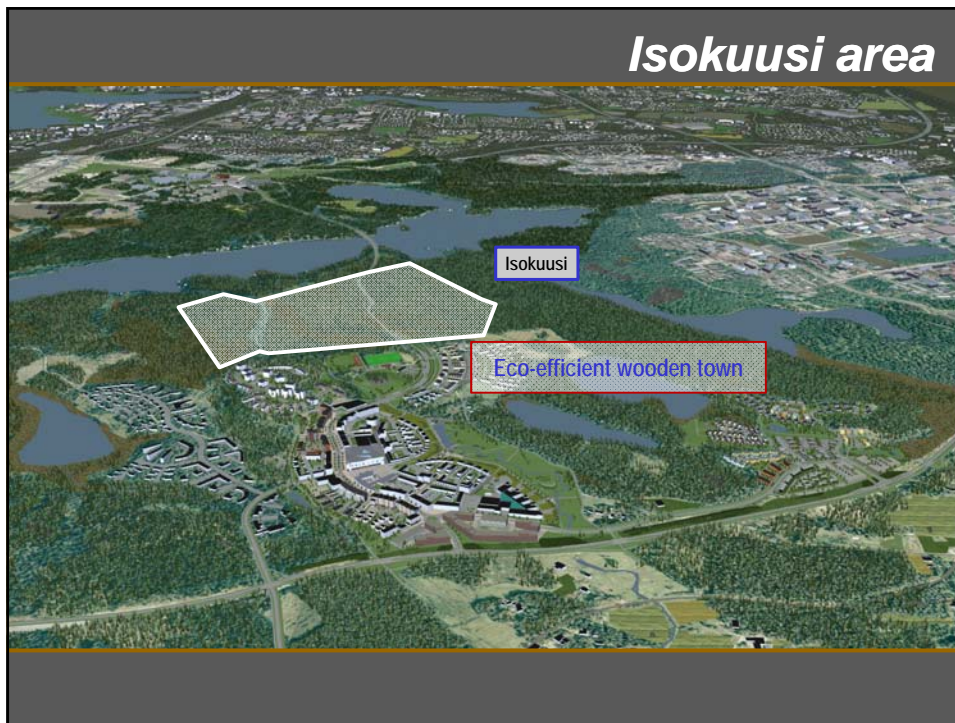
<http://www.saisonalspeicher.de>



Crailsheim



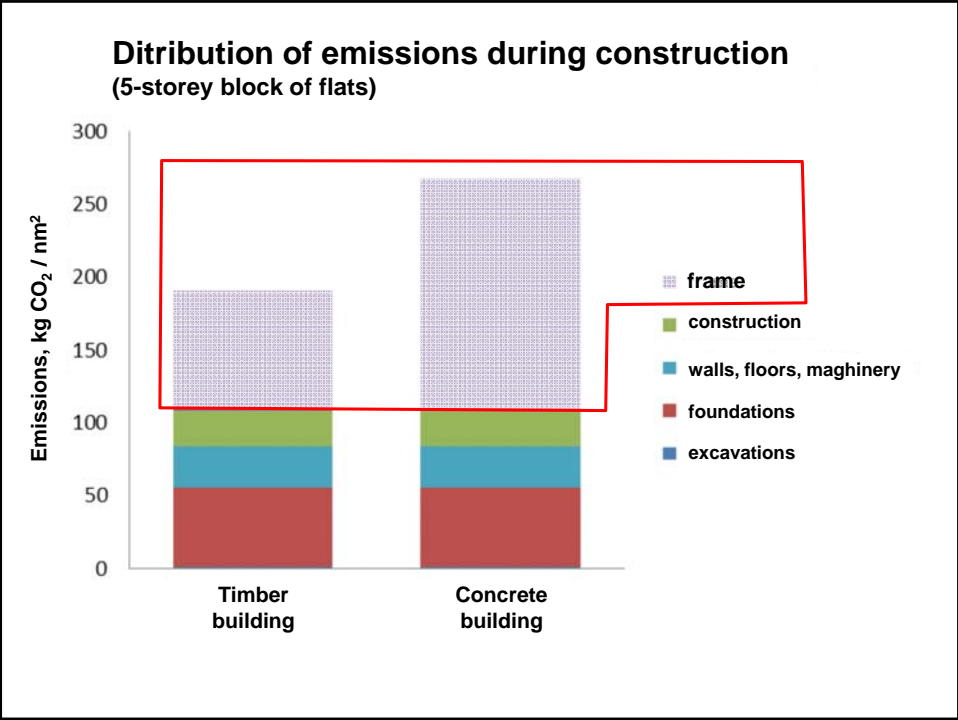




Isokuusi wooden town

- Total area: 2000 dwellings – 4000 inhabitants
- Wooden town: 700 dwellings – “Biggest in Finland”
- Planning process:
 - Masterplan
 - 3-4 site plans
- On each planning level
 - Eco-efficiency –evaluations / -plans
 - Solar energy, geothermal heat, wind power

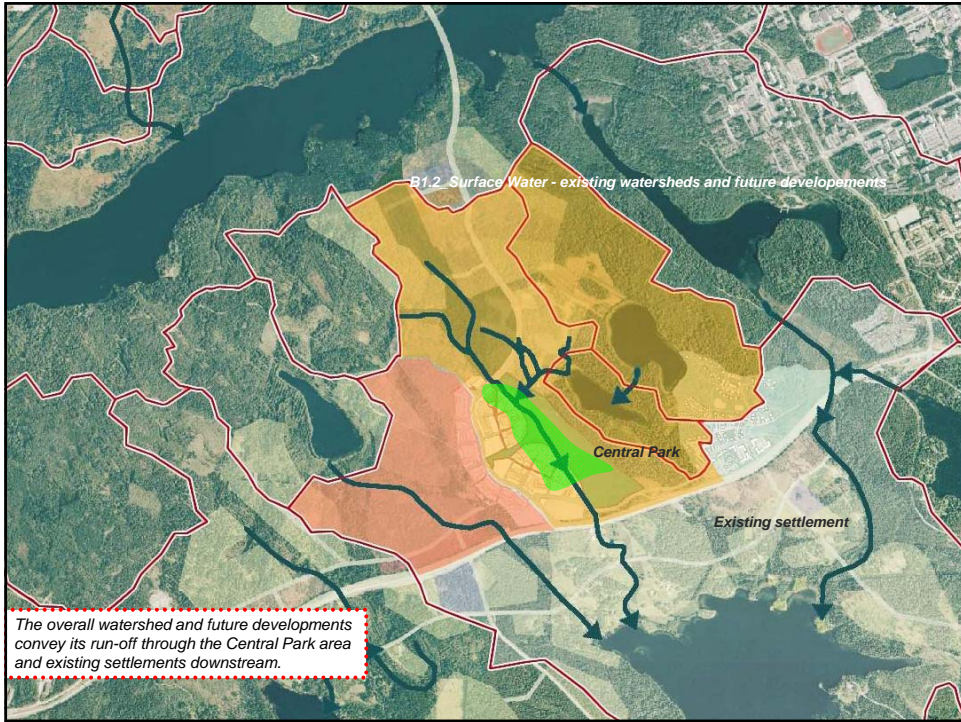
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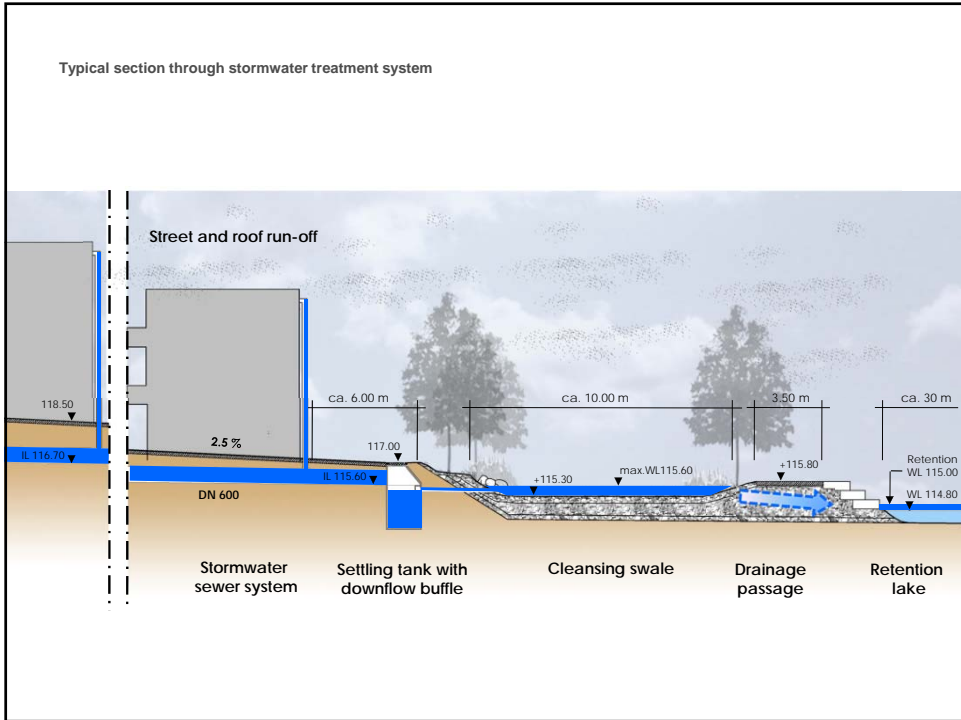


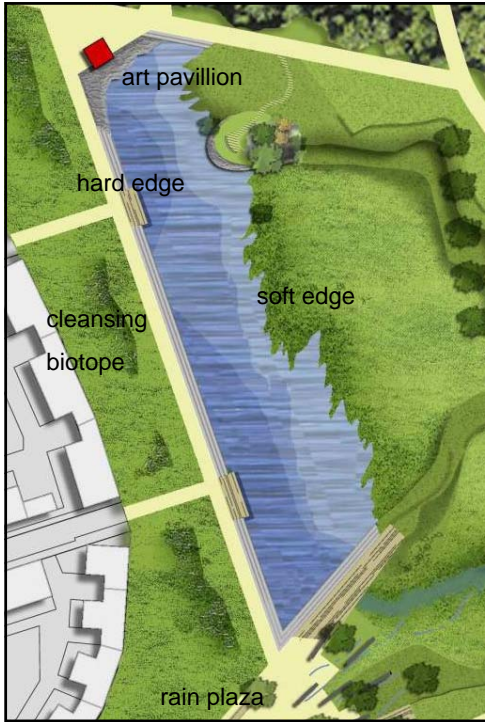
Eco-efficiency

Stormwater

Tampere Vuores







Lake and Park Intersections – Model

Puukerrostalorakentamisen ratkaisuja kehitetään voimakkaasti Euroopassa

Germany



7 storeys

UK, London



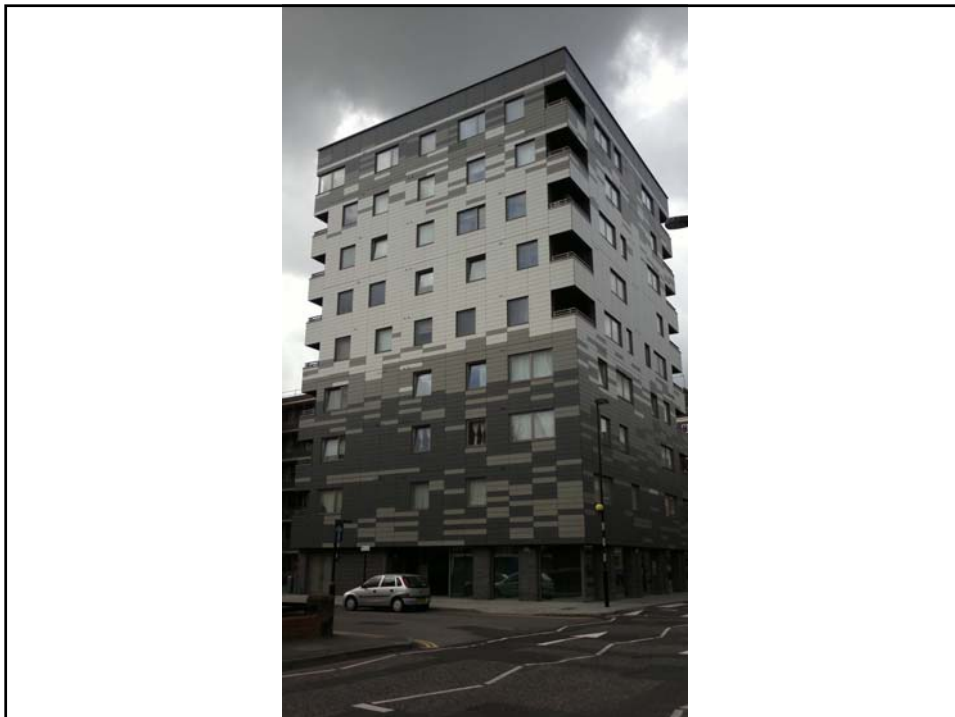
9 storeys



FWR Oy mukana
kehityshankkeessa jossa kehitetään
16-17 kerroksista puukerrostaloa



Finnish Wood
Research





Lahti, Puu-Paavola, 1998 – 2003; 4 taloa, 73 asuntoa

