Climate Impact Assessment in Urban Planning: the Ecocity Evaluator Method

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Eero Paloheimo Ecocity Ltd

- Founded in 2009 on the basis of Professor Eero Paloheimo's substantial work on the ecological city
- Design projects in China and in Finland
- The Mentougou Eco-Valley nominated for the international Katerva Award on sustainable development
- Both urban development projects and GHG assessment in Finland
- Development of the Ecocity Evaluator –application: the most advanced program currently available for assessing both the climate impact and emission reduction cost of urban planning

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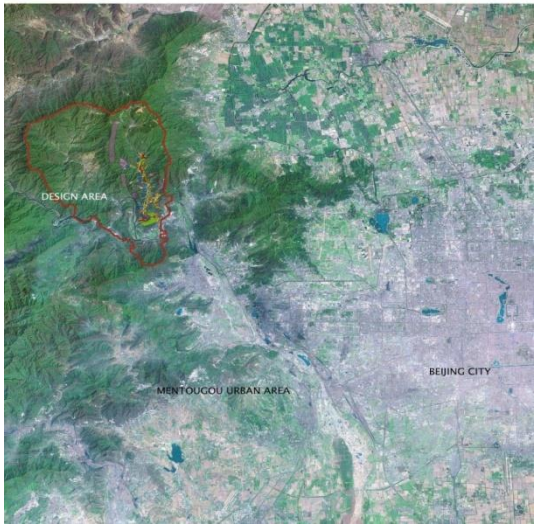
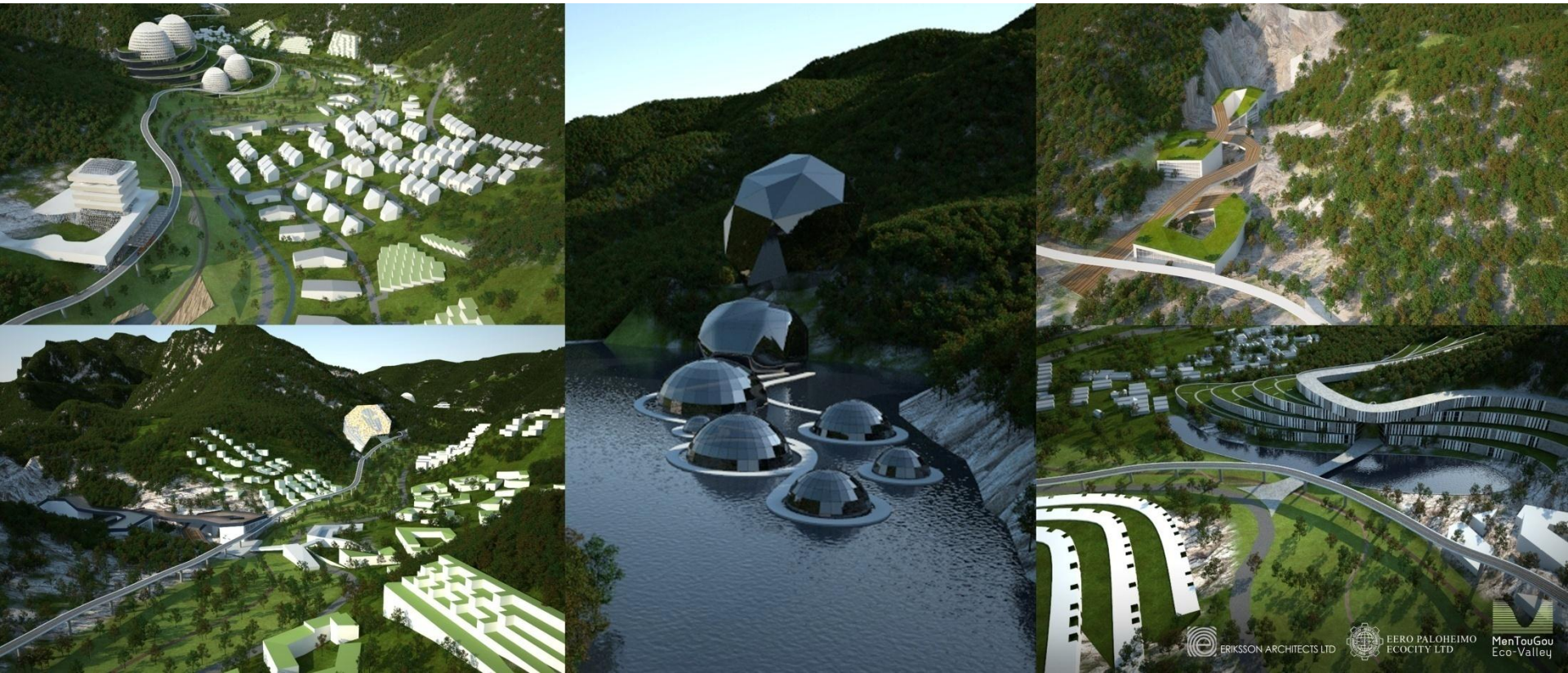
Mentougou Ecovalley

- 10 institutes focusing on eco city development
- Self sufficient in terms of water and energy
- Self sufficient in terms of food and nutrients
- Closed loop waste management
- Zero emission management





Ecocity Evaluator in a Nutshell

- Allows urban planners and decision makers to assess how well their planning actions support the climate targets of a region
- Input: from city level data down to a single construction site
- Output: energy demand, GHG emissions, carbon reduction costs
- Both consumption and production based emissions are accounted for
- Integrates construction, traffic, energy, industry, agriculture and carbon sinks in a single evaluation tool
- Detailed modules for energy, construction and traffic

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Starting point and objectives

- Objectives of energy and climate policies, CASE Turku
  - Point of reference: **10,5 t CO2-eq / capita** in 1990
  - Policy objective: **30% reduction** by 2020
  - Longer perspective: e.g. **4 t CO2-eq / capita** in 2030
- How to reach these objectives?
  - Land use
  - Construction
  - Energy
  - Traffic
  - Waste management
  - Agriculture & forestry

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How?

- **Land use planning**
- Construction / buildings
- Traffic
- Energy
- Agriculture and forestry
- Industry

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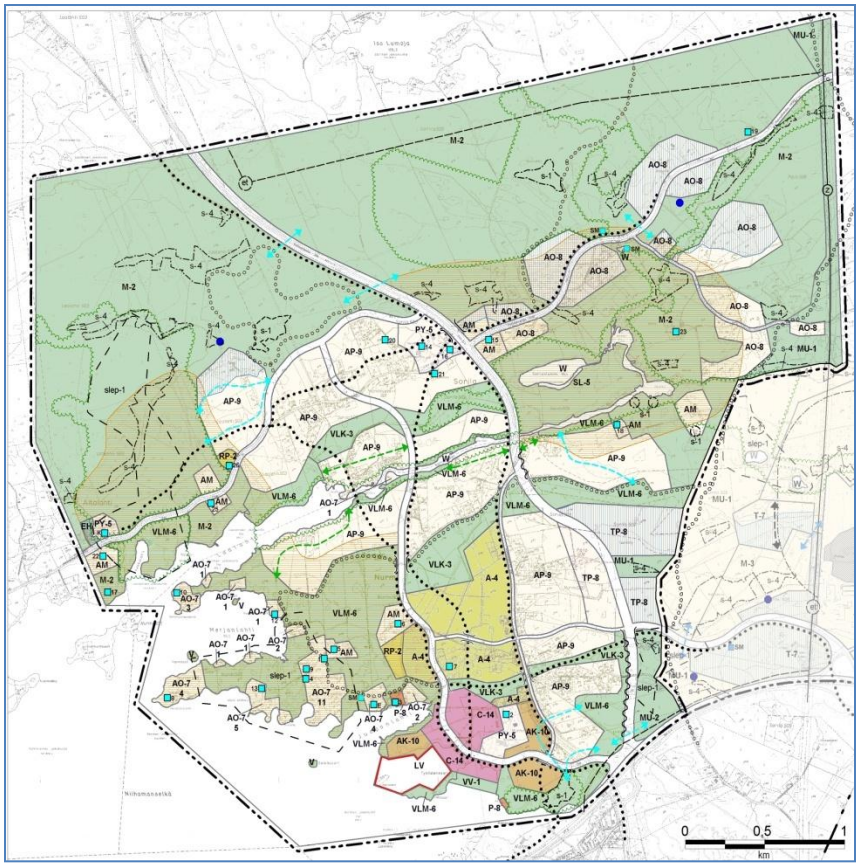
Start with assessing your plan...



- Define the area types: AP, AK, TP, T, P, MU...
- Effective area (FSI) and population for each type
- Scale / distances between types
- Testing e.g. different density scenarios

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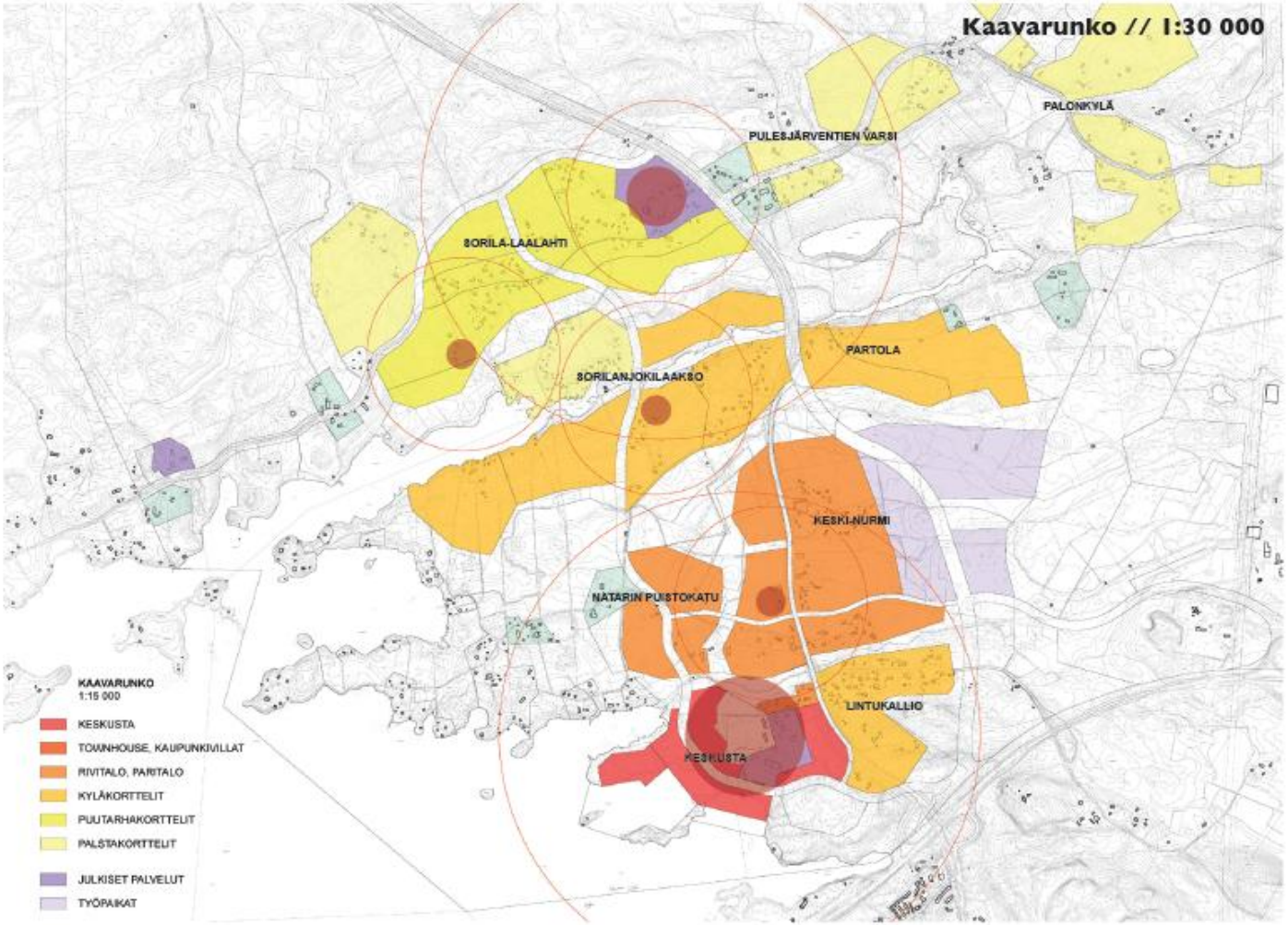
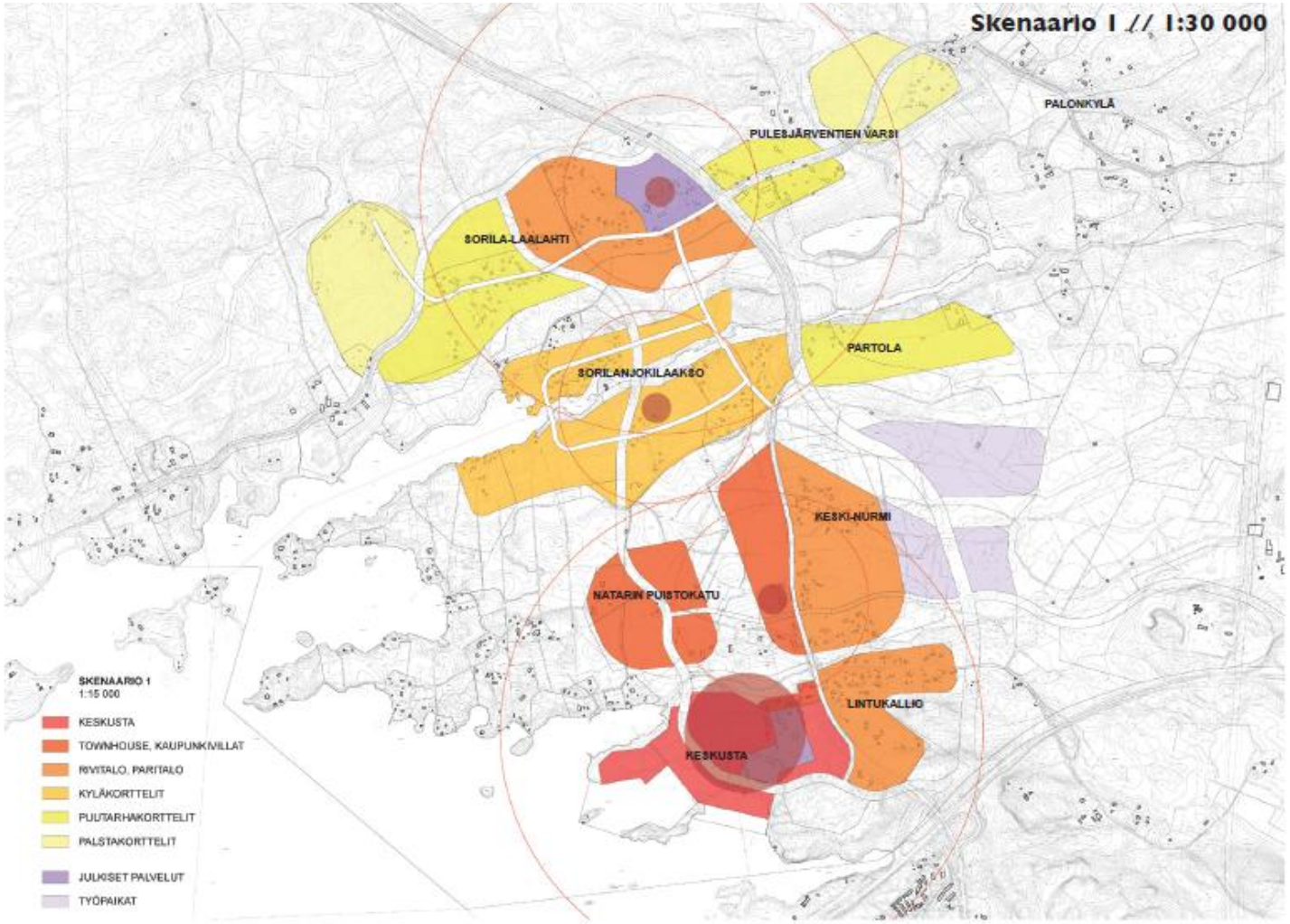
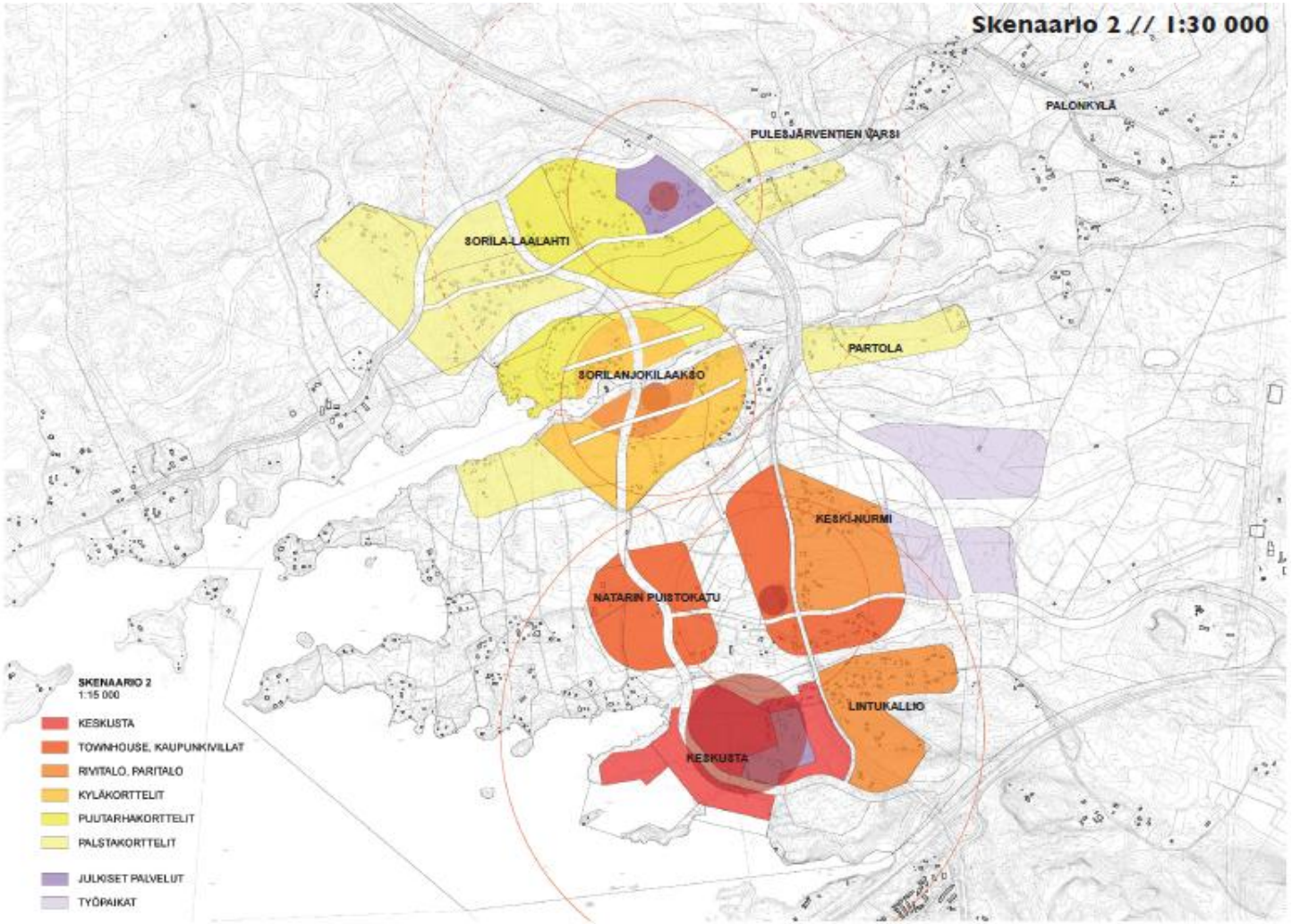
Land use, general plan



Land use scenario 1

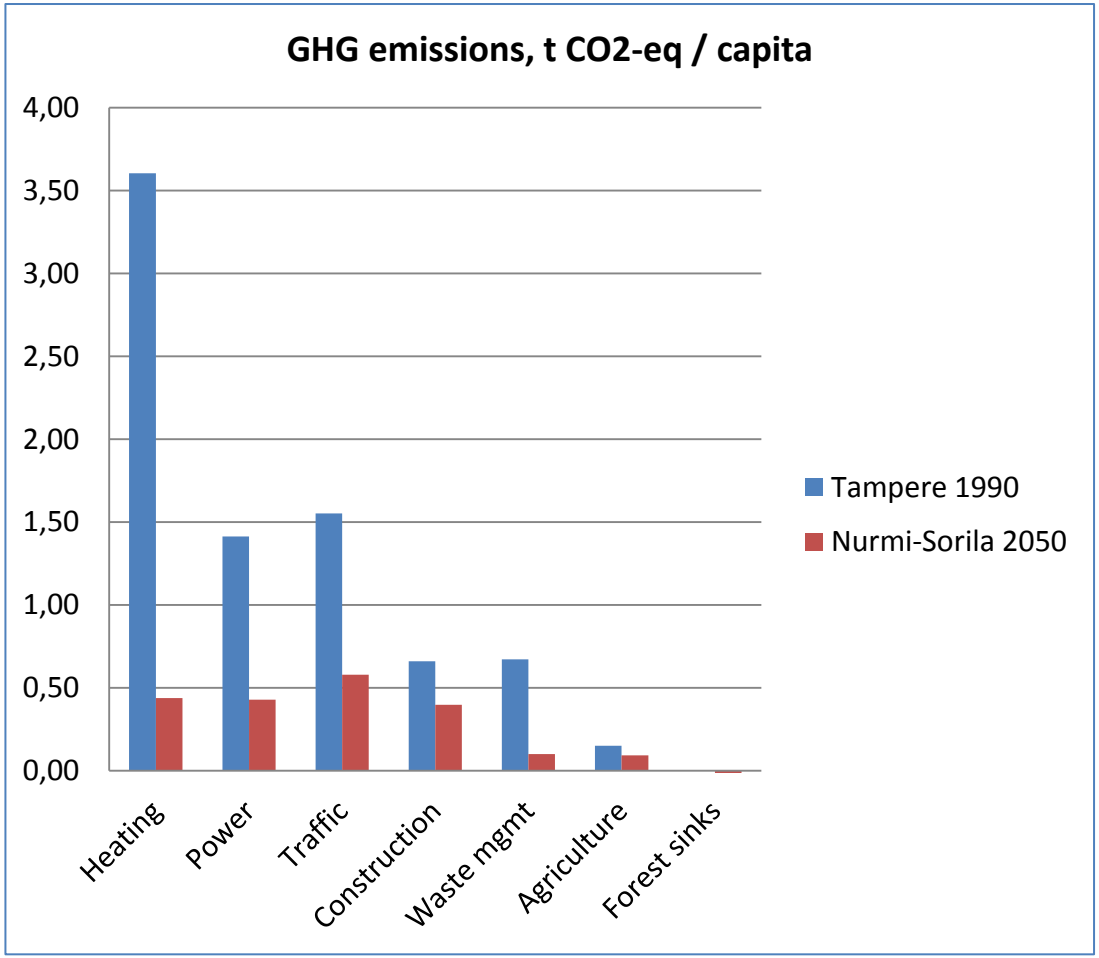


Land use scenario 2



Example: low carbon community

- Heat: 90% off
- Traffic: 60% off
- Power: 60% off
- Net reduction: 75%



How?

- Land use planning
- **Construction / buildings**
- Traffic
- Energy
- Agriculture and forestry
- Industry

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Define the buildings in your plan...

- 13 building templates
- User choice:
  - Construction materials
  - Energy efficiency
  - Method of heating

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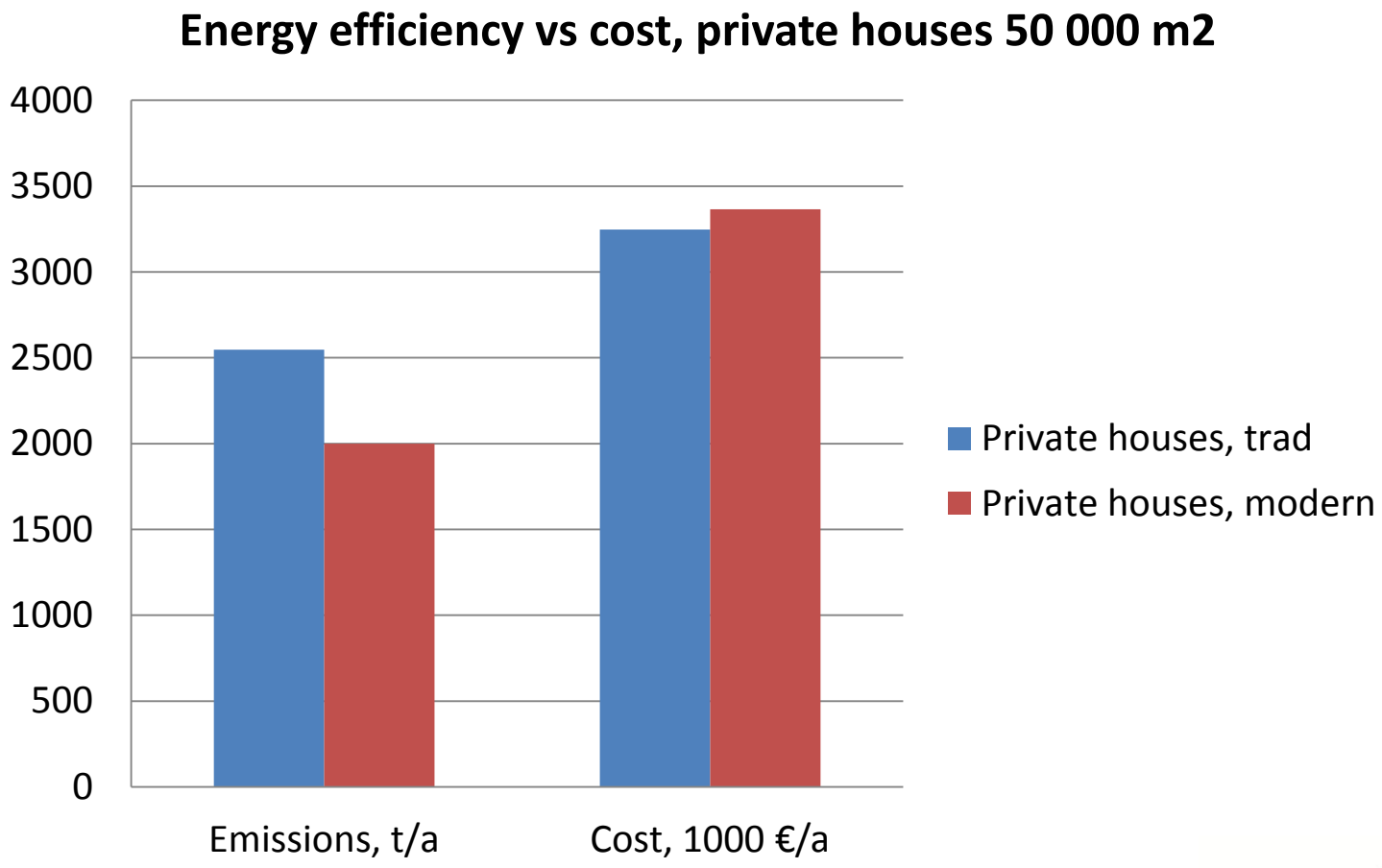
Example: energy efficiency vs cost



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How?

- Land use planning
- Construction / buildings
- **Traffic**
- Energy
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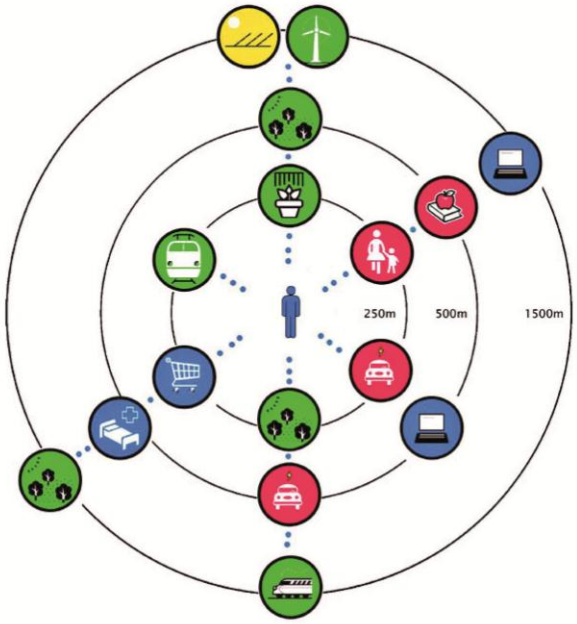
Define the traffic demand...



- Sources: National transit surveys (both people and cargo)
- Can be specific, e.g. for shopping centers
- Typically given for area type or zone
- Highly dependent on construction

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Tampere Isokuusi

How?

- Land use planning
- Construction / buildings
- Traffic
- **Energy**
- Agriculture and forestry
- Industry

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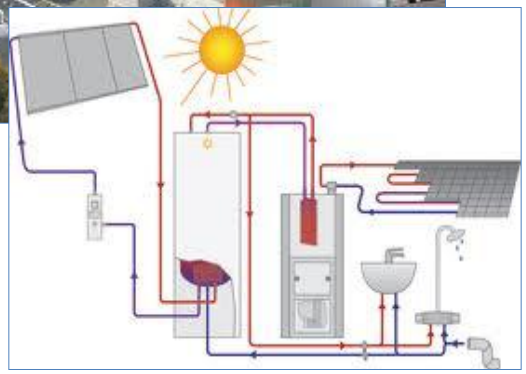
What is the energy structure?



- Consumption from buildings
- Current heat energy mix as starting point
- 9 templates for energy conversion
- Consider energy planning in the urban planning context

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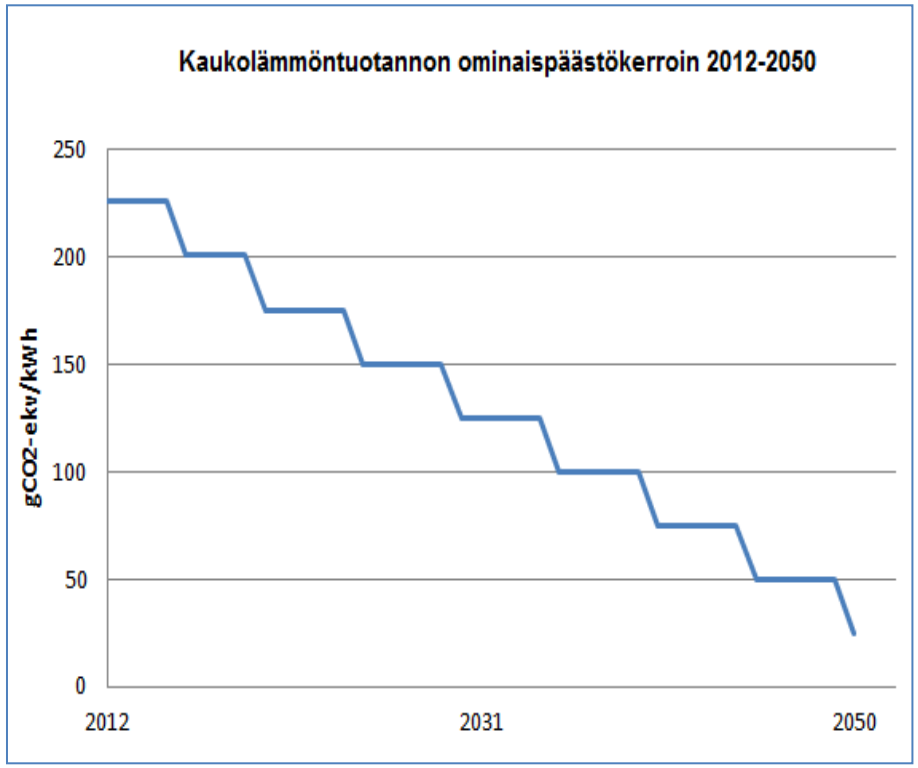
Energy conversion & emissions

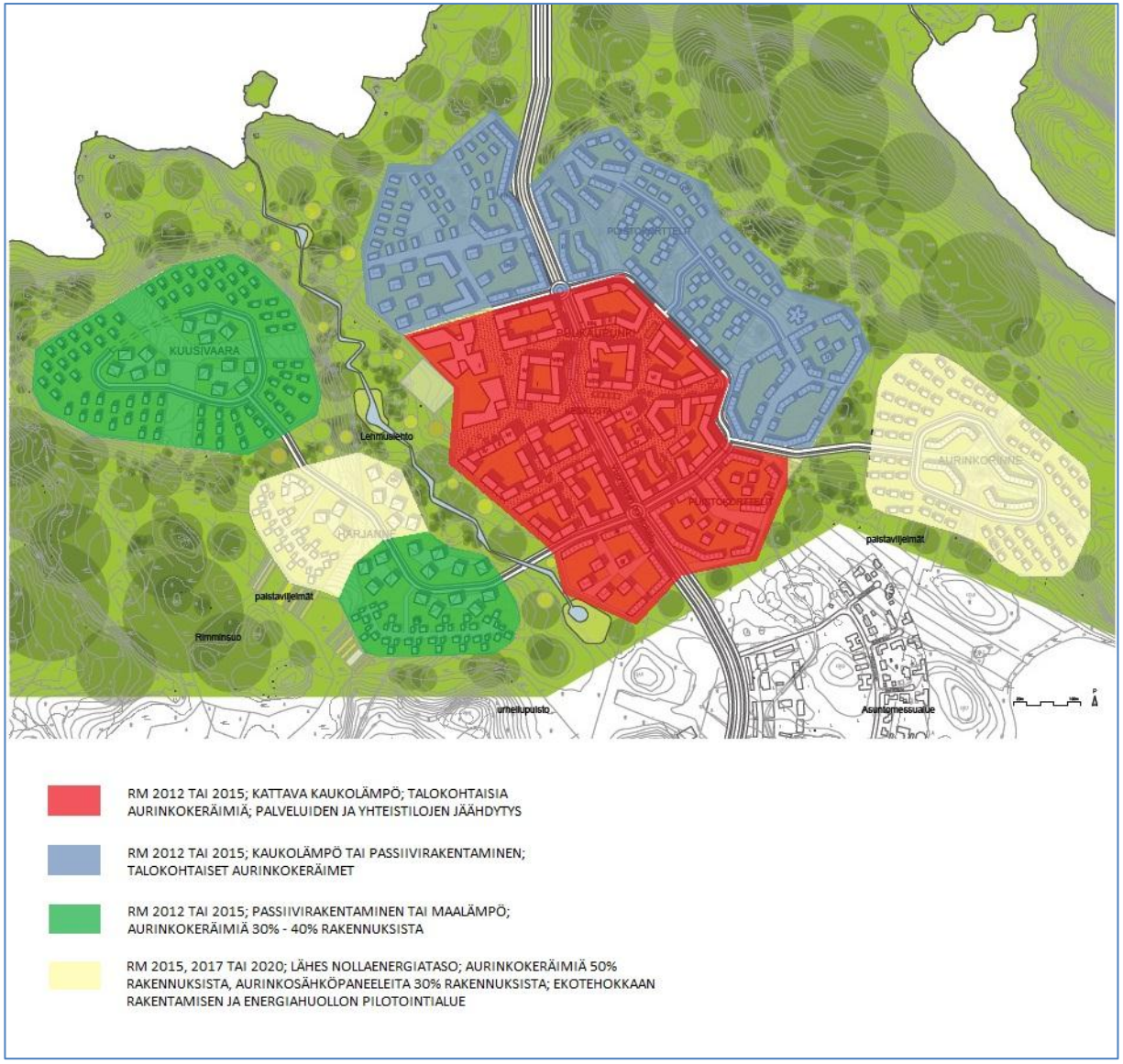
- Initial values: current emission coefficient for electricity in Finland: 273 gCO_2-eq/kWh_e
- Heat and power emission coefficient scenarios 2012 – 2050

Emission coefficient, market power
(Source: Finnish Energy Industries)



Emission coefficient, district heating
(Source: Finnish Energy Industries)

Isokuusi energy profiles



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Ecocity Evaluator included in all steps of the planning process

- City level
- District level
- Zoning
- Construction norms etc

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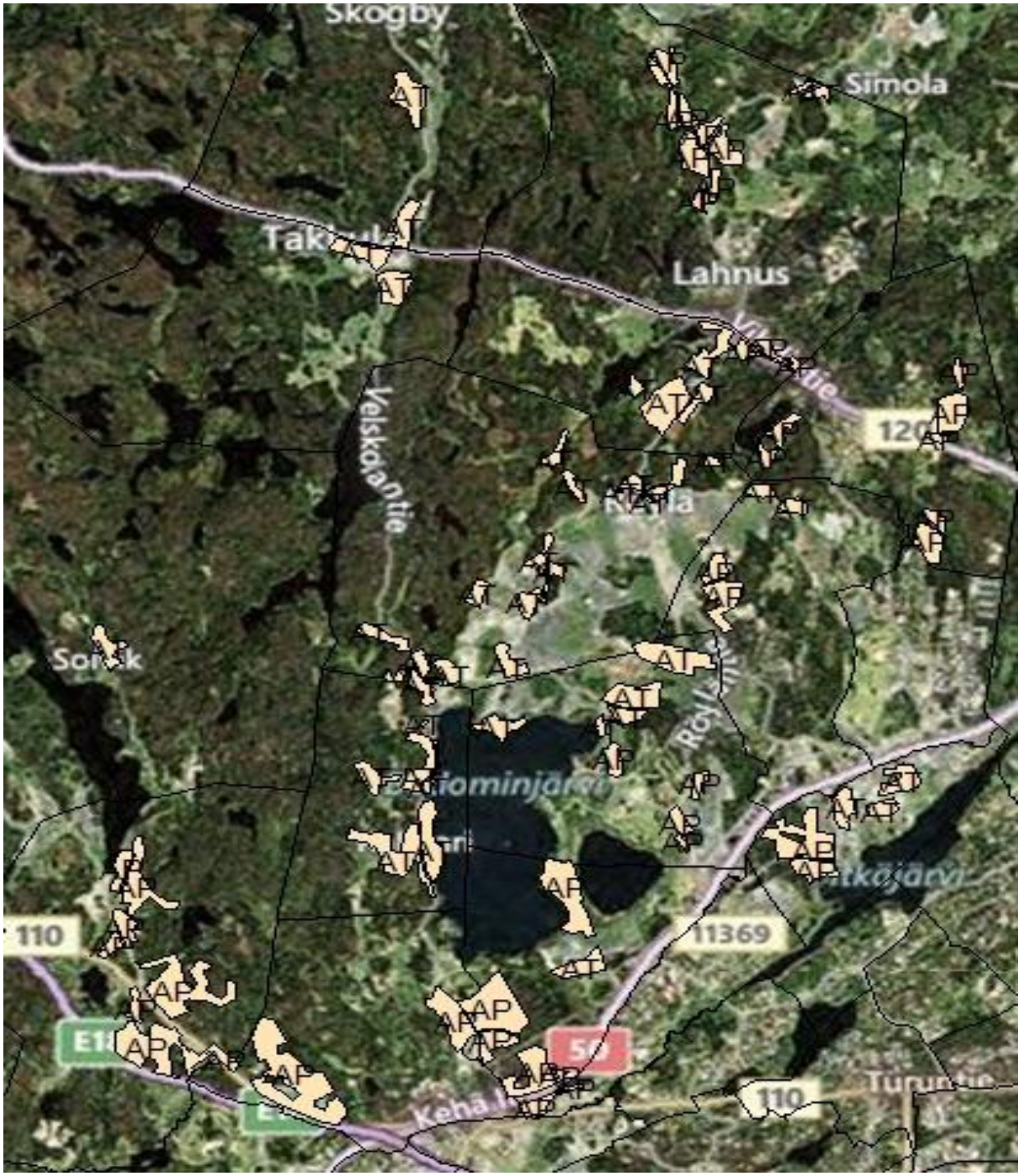
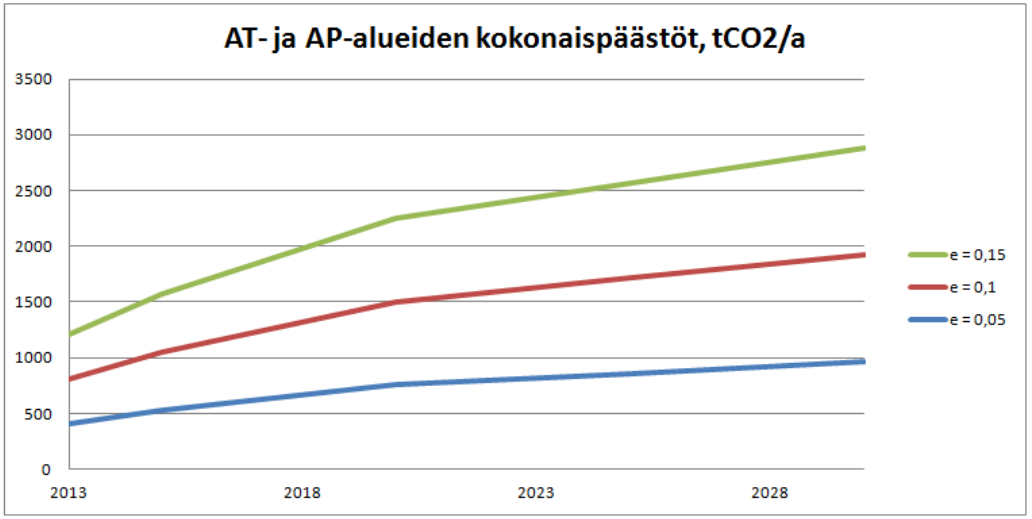
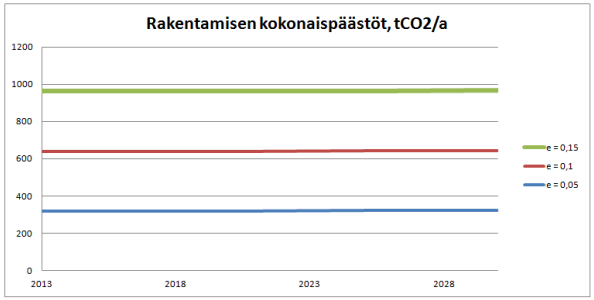
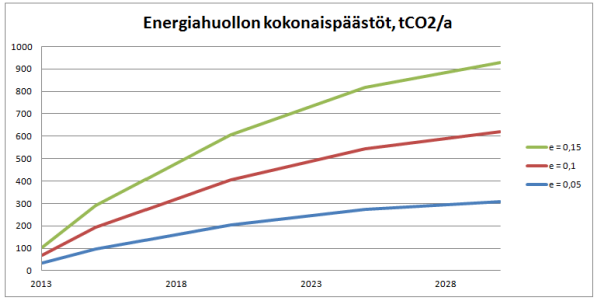

Skogby
Simola
Lahnus
Velskoantie
120
110
11369
E1
50
110

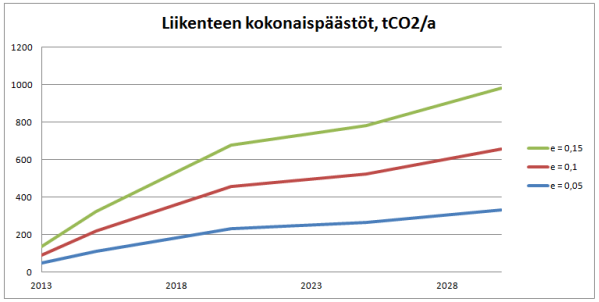
AT- ja AP-areas

e = 0,05 ~ 20 500 k-m^2, 460 as.
e = 0,1 ~ 41 00 k-m^2, 920 as.
e = 0,15 ~ 62 000 k-m^2, 1380 as.

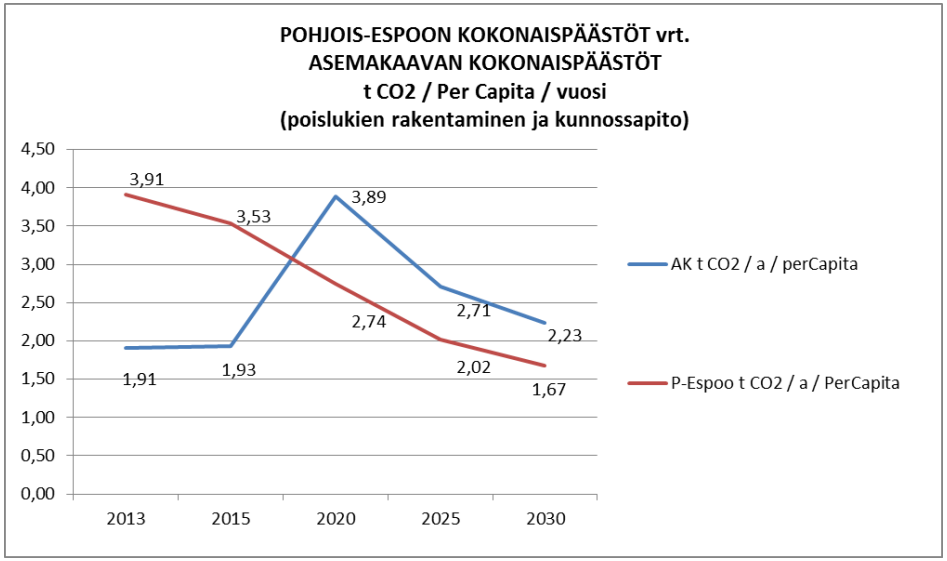


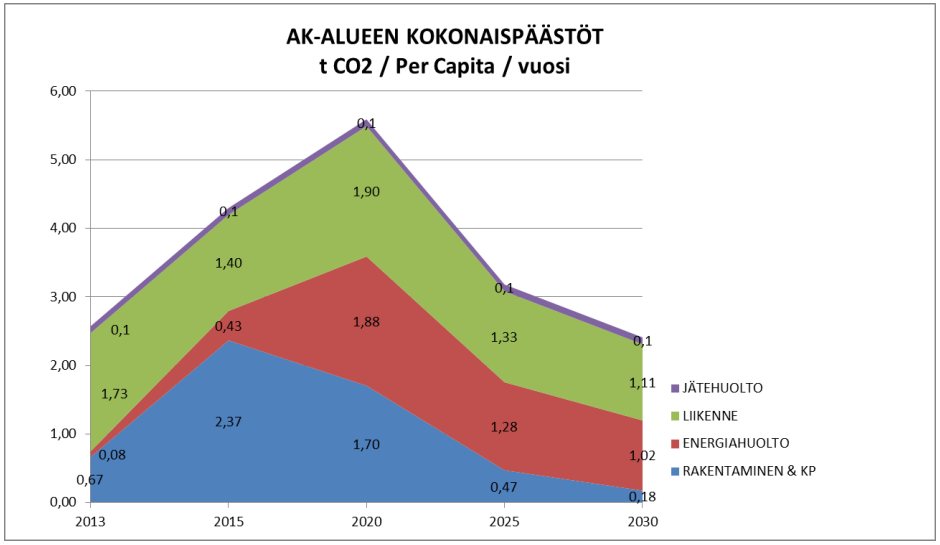






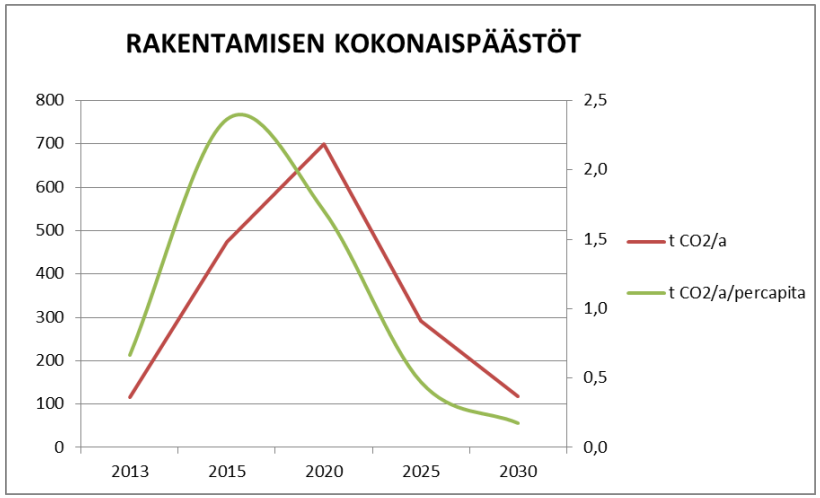
Nepperinportti

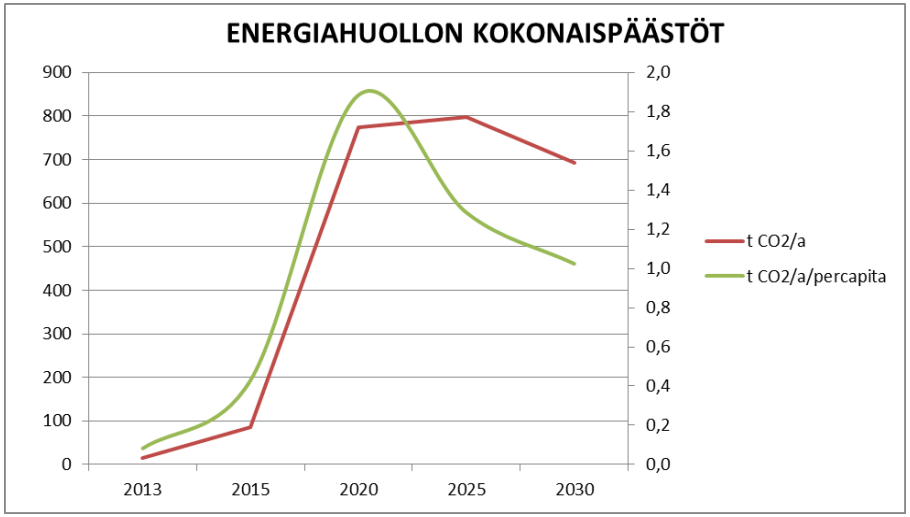


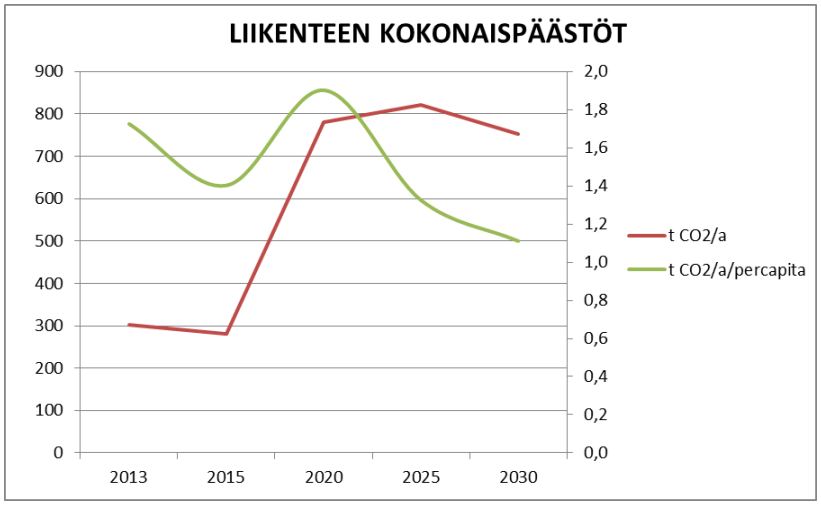


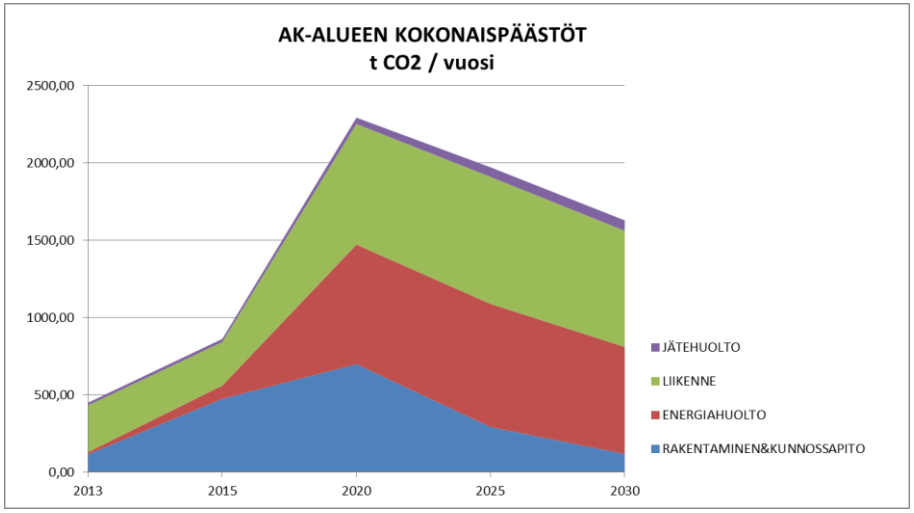
- Alueelle rakennetaan pari-, rivi- ja erillispientaloja, päiväkoti sekä Kehä III:n lähelle sijoittuva 20 000 k-m2 liikerakennusten kortteli.
- Kokonaisrakennusoikeus n. 44 200 k-m2
- Asukkaita 2030: n. 676

Nepperinportti









Beyond GHG-analysis..

- There's more to EcoCities than just expected low GHG-emissions...

- Visual amenity / wellbeing of dwellers?

»How to measure / value?

Value your own choices → ”Wellfare Index”

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Summary

Step 1

- The program reads your plan (bitmap/numeric)
- Define land use forms, FSI, population, density variation

Step 2

- Adjust the parameters for building types, traffic, energy, agriculture, industry

Step 3

- Energy demand, net emissions and cost as a result
- Check your scenarios against long term goals and refine the starting values

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Use cases in Finland

- Tampere: Ecocity Evaluator in use since May 2011, applied in land use planning and energy assessments in several projects
- Mikkeli: integration of ecological planning with the entire planning process, May 2012
- Lahti: general plan 2025 assessment, September 2011
- Espoo: development of North Espoo general plan, 2011-2012
- Oulu: Assessing all zoning plans and the new general plan for the city, February 2012
- Helsinki: pilot trial in city planning
- Vantaa: zoning level climate assessments 2011-2012
- Jyväskylä: Ecocity Evaluator in use in March 2012
- Turku: Ecocity Evaluator in use in March 2012
- Numerous consulting assignments for construction, traffic and retail industries

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Partners

UPM

SRV

rethink storaenso

Tampereen kaupunki

Paloteknikan Insinööritoimisto Markku Kauriala Oy

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Tekes

LAHTI

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