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Impacts of City Planning on Energy Consumption and GHG Emissions

Case PORVOO

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Common Challenges

- Micro size training budgets of municipalities
- Current financial crisis has cut the budgets even smaller if possible
- In general, the planners are busy – difficult to get them out of office for several days
- New type of training product – needed comprehensive and intensive marketing to commit trainees

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Common Successes

- Great interest every where in inclusion of EE and RES to urban planning
- Comprehensive understanding of the new task: EE and RES have to be taken in to account in urgan planning to fight the climate change
- Several other universities and planning schools have expressed their interest in using the training material and to learn on the different training approaches.
- Materialized success stories could be used as training material (best practices)

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Porvoo Skaftkärr Case

- Land area 400 ha
- Population target: > 6000
- Mainly small houses
- About 1000 lots
- Distance from the city center 2,5-5 km

Source: 11.2.2011, Mr. Eero Löytönen, City Architect of Porvoo, Finland at the UP-RES Training Course

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Energy Efficiency Integrated City Planning in Porvoo

4 OBJECTIVES were adopted to Create:

1. A city area that can be used both as **national and international pilot** of energy efficiency integrated city planning;
2. **Instructions** to energy efficiency integrated city planning;
3. **"The Living Lab" area**, where the constantly improving energy efficiency will be targeted; and,
4. **Business models** to the local energy utility (Porvoo Energy) that respond to the challenges of the low-energy buildings to come.

Source: 11.2.2011, Mr. Eero Löytönen, City Architect of Porvoo, Finland at the UP-RES Training Course

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Porvoo Energy Ltd

PORVOON ENERGIA
BORGÅ ENERGI

Heat production:
- **92% from CHP that is 70% based on bio fuel (wood ships)**

Other fuels:
- **28% natural gas**
- **1% landfil bio gas**
- **1% oil**

The plan is to add solar collectors to the heating mix.

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0+ Business As Usual

Reference Case:

OLD CITY PLAN FROM YEAR 2007

BUT WITH PASSIVE-ENERGY BUILDINGS

Energy:
A mix of DH, electric and heat pump heating as typical in Finland in loosely built one-family house districts

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Reference Case 0+:
Energy Consumption and Carbon Balance of Porvoo City

Based on research carried out:

- Private cars: 30% of energy but 50% of emissions
- Heating: 27% of energy but 19% of emissions
- Domestic hot water: 12% of energy but 9% of emissions
- Electricity: 30% of energy but 21% of emissions

↳ Focus on three components:

- private cars,
- heating
- electricity.

Source: 11.2.2011, Mr. Eero Löytönen, City Architect of Porvoo, Finland at the UP-RES Training Course

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Planning Option M1

Features:

A dense new area that is supported by the existing city structure.

The passive energy buildings are connected to the DH.

Effective public and light transport routes are created to the city center.

↳ Compared to Reference case:

- Primary energy consumption 40% lower
- CO_2 emissions 34% lower

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Source: 11.2.2011, Mr. Eero Löytönen, City Architect of Porvoo, Finland at the UP-RES Training Course

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Planning Option M2

Features:

Effective small-house characterized Option, where 50% of heat is based on DH and the balance of other 50% on ground water heat pumps.

Effective public and light transport routes are created to the city center.

↳ Compared to Reference case:

- Primary energy consumption 36% lower
- CO_2 emissions 31% lower

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Source: 11.2.2011, Mr. Eero Löytönen, City Architect of Porvoo, Finland at the UP-RES Training Course

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Planning Option M3

Features:

A loose land use Option, where heat and power are produced inside the buildings 100% based on RES.

Passive energy houses.

Traffic like in Reference Case based on private cars and a little public transport.

↳ Compared to Reference case:

- Primary energy consumption 67% lower
- CO_2 emissions 48% lower

PÖYRY

Source: 11.2.2011, Mr. Eero Löytönen, City Architect of Porvoo, Finland at the UP-RES Training Course

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Planning Option M4

Features:

Community type land use Option, in which the focus was on reducing the need of transport and by locating working places and services in the area.

Effective public and light transport routes are created to the city center.

Passive energy houses served 100% by solar heating. The area will supply solar heating to all citicens of Porvoo.

↳ Compared to Reference case:

- Primary energy consumption 45% lower
- CO_2 emissions 62% lower

PÖYRY

Source: 11.2.2011, Mr. Eero Löytönen, City Architect of Porvoo, Finland at the UP-RES Training Course

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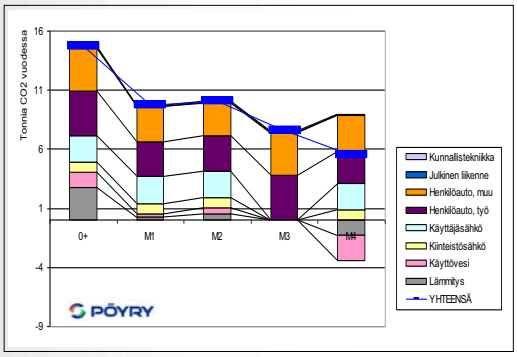
CARBON BALANCE



Infra tech
Public transport
Private cars, other
Private cars, work related
Electric applications
Electricity of common building parts
Tap water heating
Room space heating
Total

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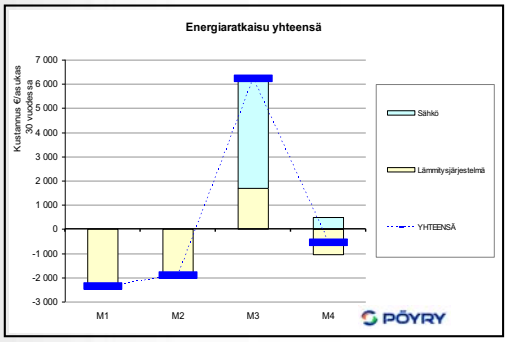
THE COSTS OF THE OPTIONS (€/Resident during 30 years)



Light blue – Electricity

Yellow – Heating

Dark blue – In total

In Table the additional costs compared to the 0⁺ reference option are presented.

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LESSONS LEARNED

- **Energy Efficiency has its price;**
- **Carbon Footprint costs as well;**
- **Down-sizing the Footprint may reduce the costs of living;**
- **EE integrated city planning costs more but may reduce the costs of implementation;**
- **The city plan options were communicated to the decision makers in quantitative terms: not only investment cost but energy consumption and emissions of each option as well.**

Source: 11.2.2011, Mr. Eero Löytönen, City Architect of Porvoo, Finland at the UP-RES Training Course

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RECOMMENDATIONS

1. **Quantitative** energy and emission calculations have to be included into urban planning process as a means to provide quantitative information to decision makers;
2. **Energy analysis** have to become an integral part of urban planning to fight Climate Change;
3. Both urban and energy planners have to **co-work** from te early beginning! Co-operation alone is not enough;
4. **Training** of both urban and energy planners is one way to facilitate such co-working.

More: www.skaftkarr.fi www.sitra.fi

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