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

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 into account in urban 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)

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.

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

Porvoo Energy Ltd

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

Other fuels:
- 28% natural gas
- 1% landfill bio gas
- 1% oil

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

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

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
- CO₂ emissions 34% lower

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

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
- CO₂ emissions 31% lower

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

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
- CO₂ emissions 48% lower

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

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 citizens of Porvoo.

Compared to Reference case:
- Primary energy consumption 45% lower
- CO₂ emissions 62% lower

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

**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 the 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](http://www.skaftkarr.fi)  [www.sitra.fi](http://www.sitra.fi)