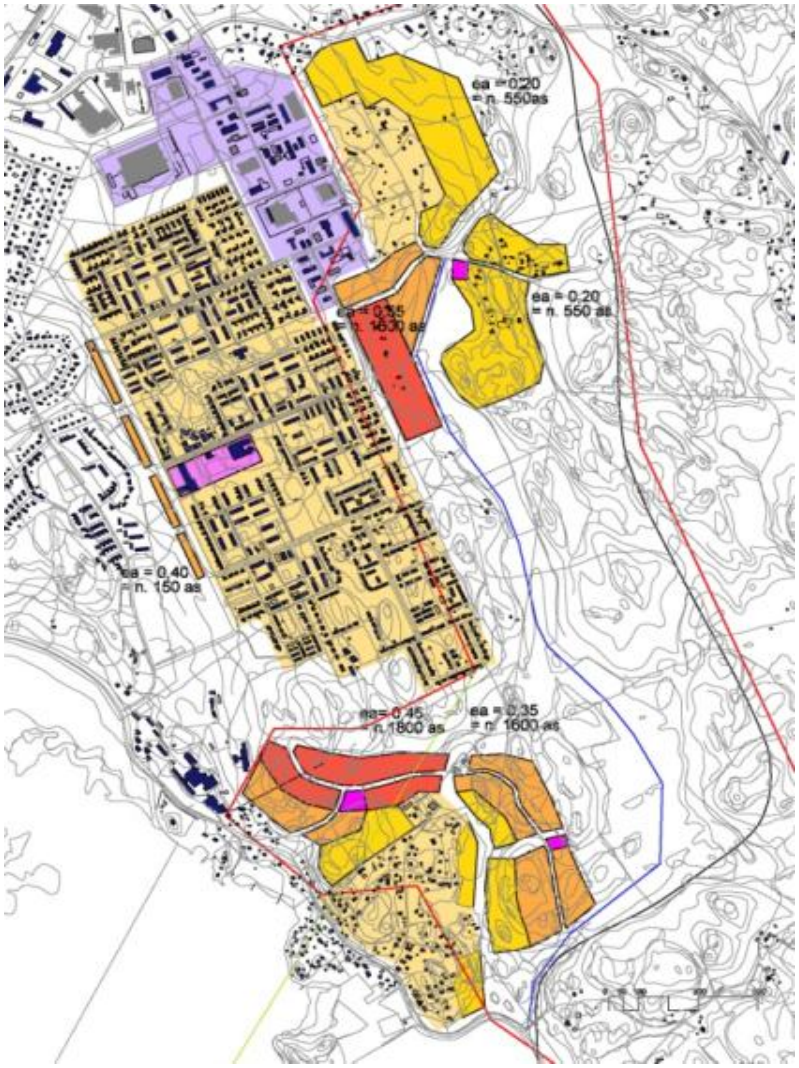
M3

Stratégies pour la réduction de la demande énergétique : le potentiel de l'urbanisme



Sommaire

1. Introduction

1.1. performance énergétique et Systèmes d'énergies renouvelables dans l'urbanisme

- L'Integration de l'EE et les RES à la planification urbaine permettra de réduire la consommation d'énergie primaire et les émissions de gaz à effet de serre, mais parfois aussi les coûts de construction et d'utilisation des infrastructures nécessaires.
- La municipalité ou la collectivité locale pourra bénéficier de la réduction des coûts de construction et d'utilisation des infrastructures.
- La réduction de la demande énergétique et des émissions ainsi qu'éventuellement de l'utilisation et de l'entretien des infrastructures permettraient d'augmenter le potentiel de la municipalité

Comment y arriver?

Nous allons démontrer les bénéfices de la planification urbaine avec intégration de l'EE et desSER à travers deux exemples: Freiburg, Allemagne et Porvoo, Finlande.

2. Cas pratique Freiburg

2.1. Les données urbaines

Freiburg en quelques chiffres

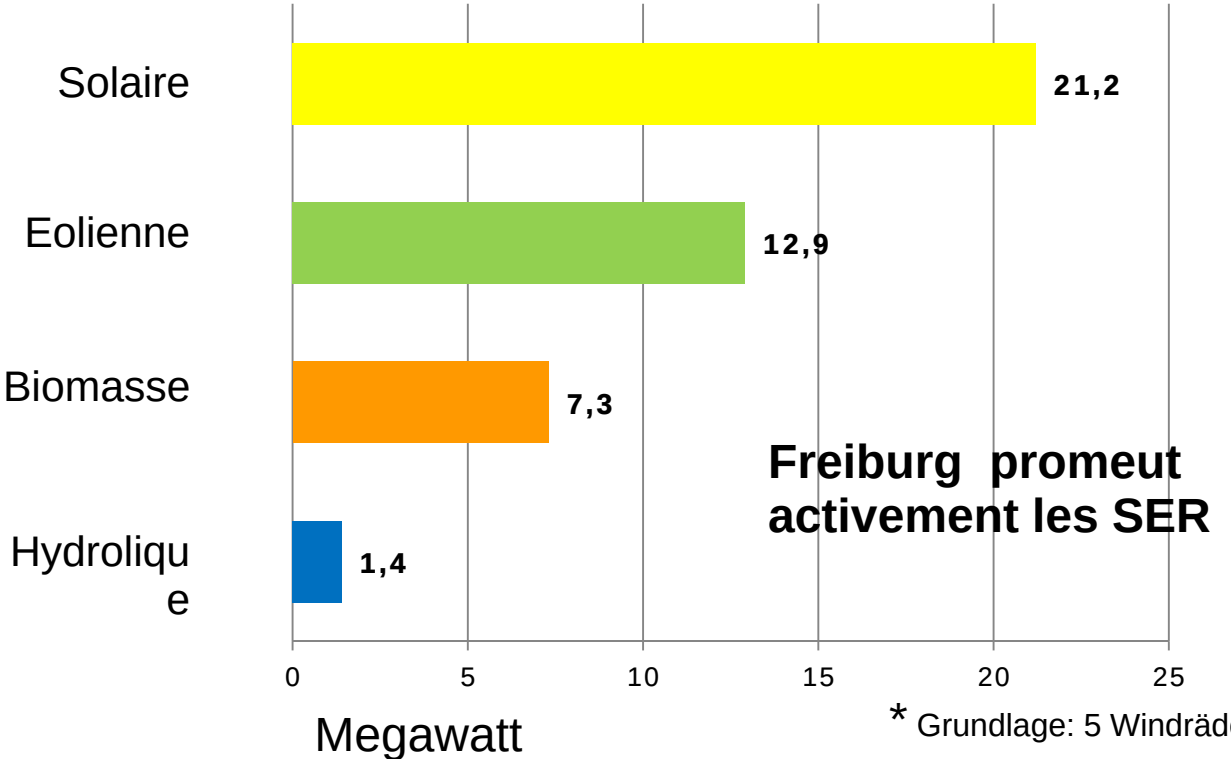
Freiburg est située au sud de l'allemagne à proximité des frontières avec la France et la Suisse

Source: Innovation Acedemy e.V., Freiburg

2. Cas pratique Freiburg

2.2. SER intégrés à l'urbanisme

Electricité produite par les sources d'énergie renouvelable (2011)



Freiburg promeut activement les SER

* Grundlage: 5 Windräder auf Freiburger Gemarkung

Source: Innovation Acedemy e.V., Freiburg

Source: Stadt Freiburg

2. Cas pratique Freiburg

2.3. Stratégie de réduction des émissions de CO2

La stratégie de réduction des émission de CO2 comprend 63 mesures dans les domaines suivants:

1. Municipal development planning: solar optimization in development areas while arranging and orienting buildings, avoiding shadows, orienting/inclining roofs as well as introducing new EE standards to buildings

2. Municipal buildings and facilities: pilot EE projects and solar panels on public roofs, building modernization to meet passive house standards

3. Mobility: Extension of public transport network to cover all citizens with not more than 500 m walking distance

4. Internal organisation and communication: Exhibition on low energy building and refurbishment,

5. Supply – disposal: development of district heating and micro-scale CHP

In the following slides some examples of the ”1. Municipal Development Planning” and ”3. Mobility” are illustrated.

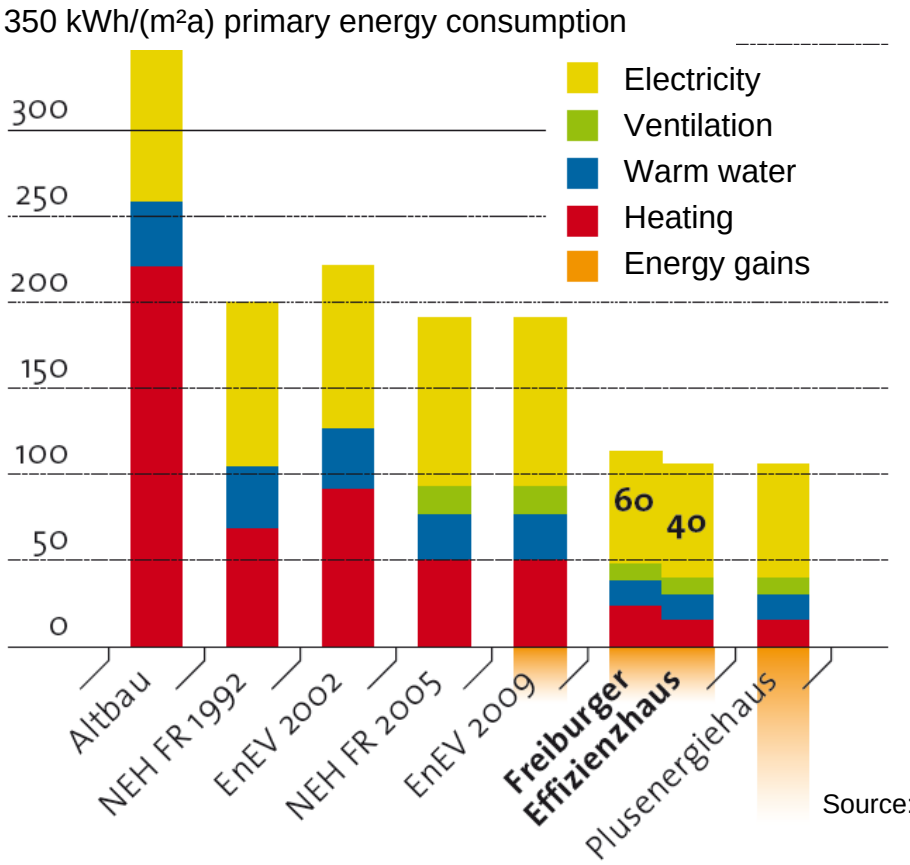
Source: Innovation Acedemy e.V., Freiburg

2. Cas pratique Freiburg

2.4. Planification urbaine

New energetic standards for new buildings to come were issued:

Fotos: Innovation Academy

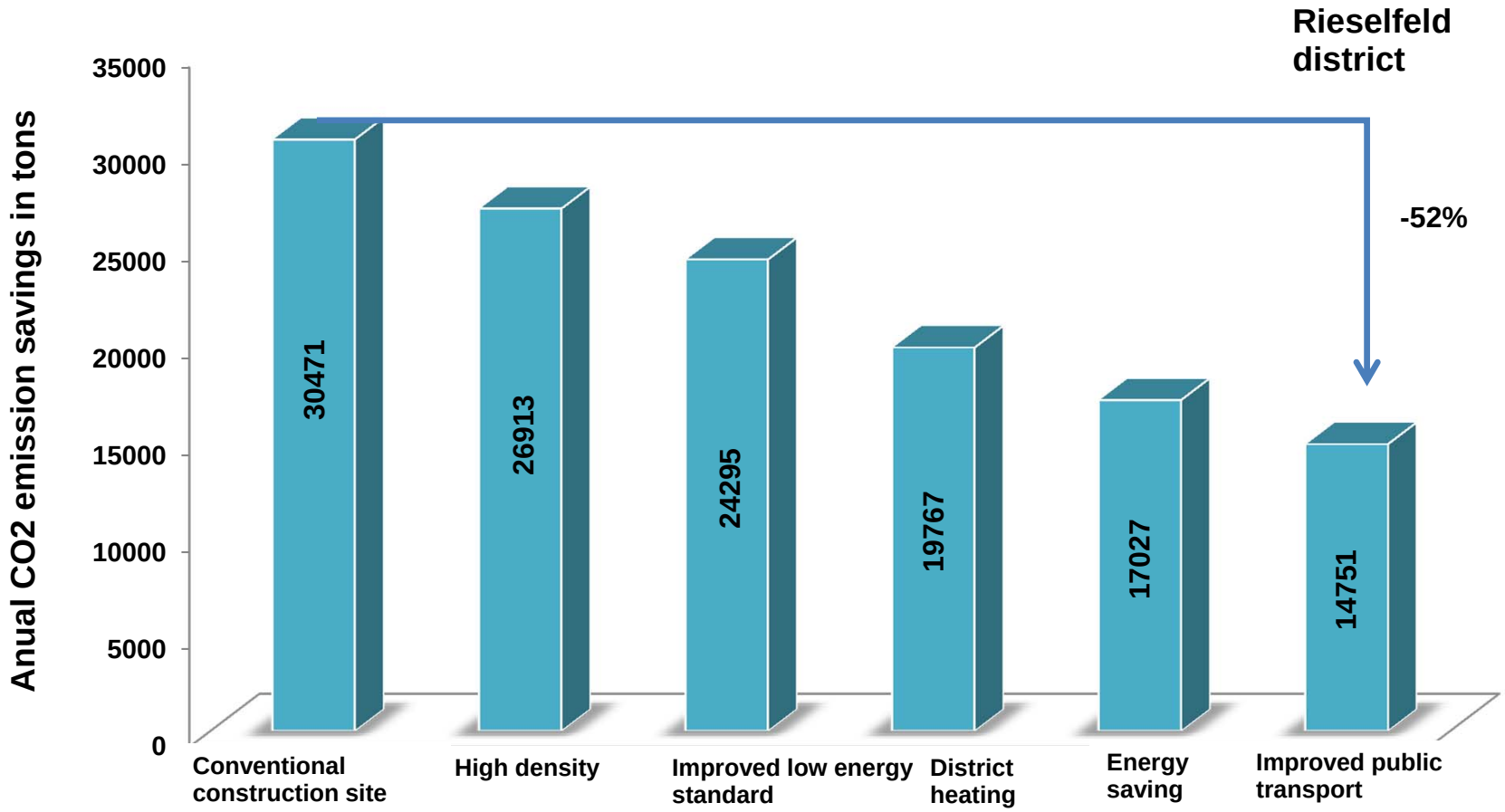


Source: Stadt Freiburg

2. Cas pratique Freiburg

2.4. Planification urbaine

Freiburg-Rieselfeld – CO_2 Emissions reduction



Source: Innovation Acedemy e.V., Freiburg

Source: Stadt Freiburg

2. Cas pratique Freiburg

2.5. Mobilité

Public transport (VAG Freiburg) achievements:

- In 2010 some 74,4 million passengers travelled with the VAG's trams and buses. On average, that meant 200,000 passengers a day who saved the environment from exhaust emissions and traffic noise! This is an astounding number for a city with a population of 215,000.
- The backbone of the network is based on four tram lines providing services every seven and a half minutes. Optimally coordinated with the tram service are 26 bus lines taking passengers from the most important interchange points to surrounding areas

Source: Innovation Acedemy e.V., Freiburg

Source: VAG Freiburg 2011

2. Cas pratique Freiburg

2.5. Mobilité

Local public transport in Freiburg

Tramway

- 36,4 km railroad network
- 83 vehicles
- 7,5 minutes interval during the day
- 70% of all passengers

Bus

- 274,3 km bus network
- 73 buses
- 30% of all passengers

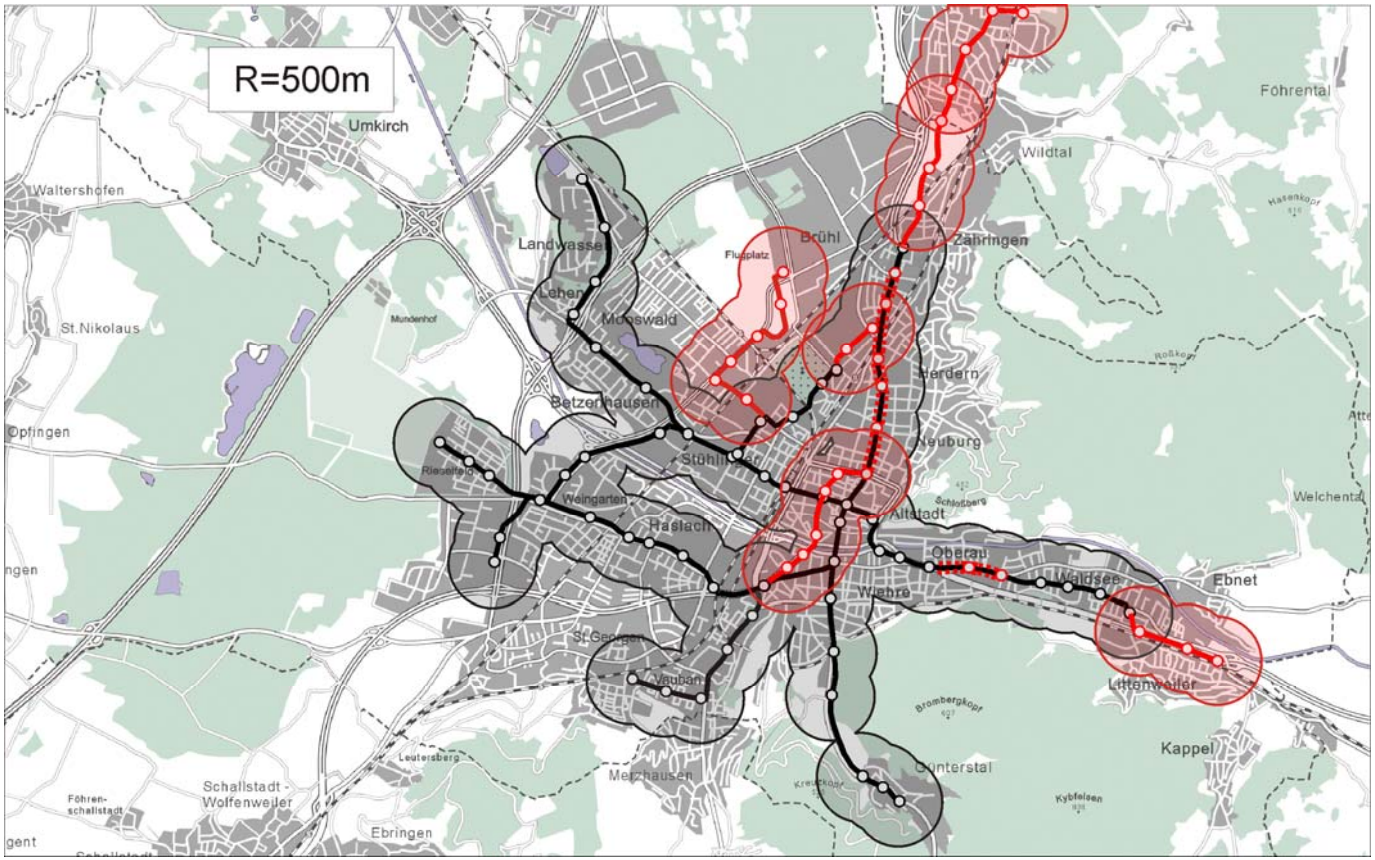
Source: Innovation Acedemy e.V., Freiburg

Source: VAG Freiburg 2011

2. Cas pratique Freiburg

2.5. Mobilité

Extension of public transport network (red) to be reachable by the inhabitants in less than 500 m walking radius



Source: Stadt Freiburg

2. Cas pratique Freiburg

2.5. Mobilité

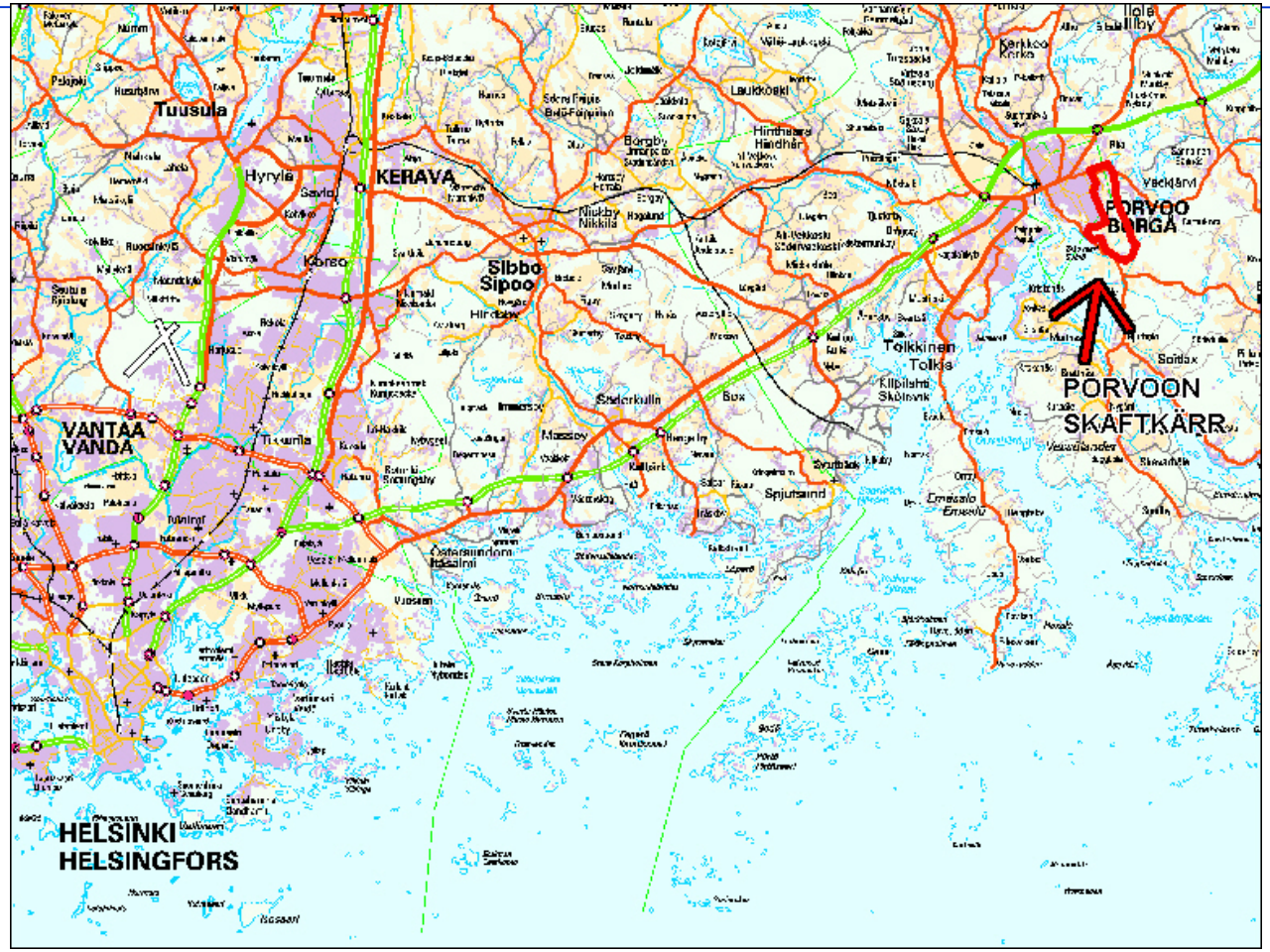
Other CO2 reduction strategy achievements in Mobility:

- In Rieselfeld, thanks to improved public transport, the car density is as low as 28,5 cars/inhabitant compared to the average of 35 in Freiburg.
- The bicycle parking house for some 1.000 bikes was built near to the main railway station in year 1999 already. It is in constant use to integrate rail transport to biking.
- Additionally, a city biking system and extensive biking routes reduce the need of private cars.

Source: Innovation Acedemy e.V., Freiburg

3. Cas pratique Porvoo – Planification intégrale urbaine et énergétique

3.1. Le site de Porvoo et la planification de la zone Skaftkärr



Porvoo Skaftkärr Case in Finland

- 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

3. Cas pratique Porvoo – Planification intégrale urbaine et énergétique

3.2. performance énergétique et SER dans l'urbanisme municipal

Objectives

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

3. Cas pratique Porvoo – Planification intégrale urbaine et énergétique

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

3. Cas pratique Porvoo – Planification intégrale urbaine et énergétique

3.3. La source d'énergie – 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.

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

3. Cas pratique Porvoo – Planification intégrale urbaine et énergétique

3.4. Référence **0⁺** – configuration typique en Finlande

Reference Case:

OLD CITY PLAN FROM
YEAR 2007

BUT WITH PASSIVE-
ENERGY BUILDINGS

Energy in reference case:

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

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

3. Cas pratique Porvoo – Planification intégrale urbaine et énergétique

3.5. Référence **0**$^{+}$: Consommation énergétique et bilan carbone de Porvoo

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

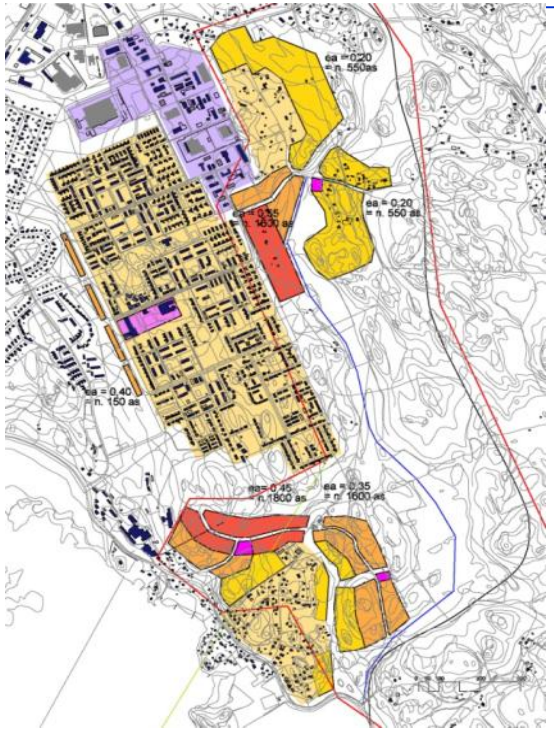
→ Focus on three components:

- private cars,
- heating
- electricity.

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

3. Cas pratique Porvoo – Planification intégrale urbaine et énergétique

3.6. Variante urbaine **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:

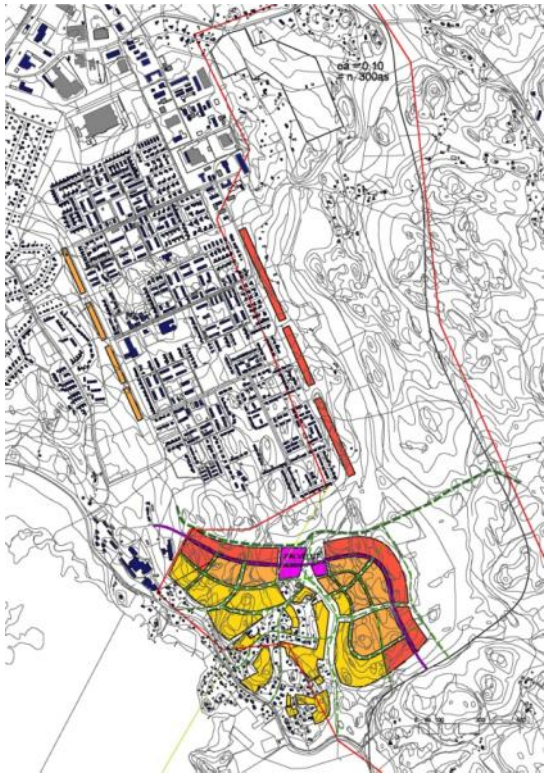
- Primary energy consumption 40% lower
- CO_2 emissions 34% lower

PÖYRY

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

3. Cas pratique Porvoo – Planification intégrale urbaine et énergétique

3.7. Variante urbaine **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:

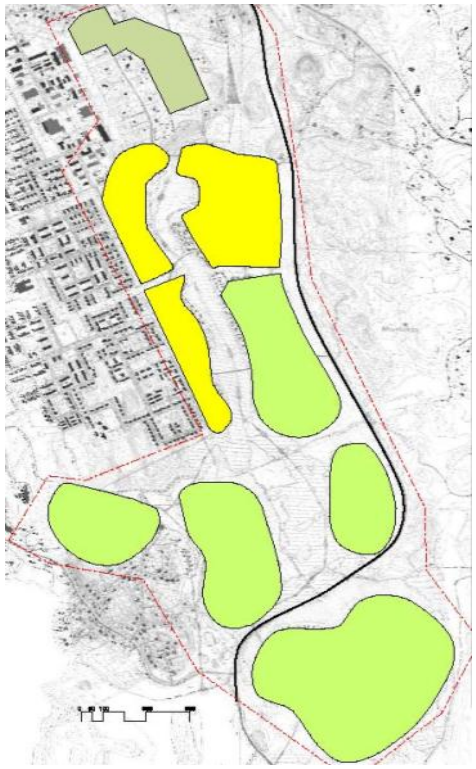
- Primary energy consumption 36% lower
- CO_2 emissions 31% lower

PÖYRY

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

3. Cas pratique Porvoo – Planification intégrale urbaine et énergétique

3.8. Variante urbaine **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:

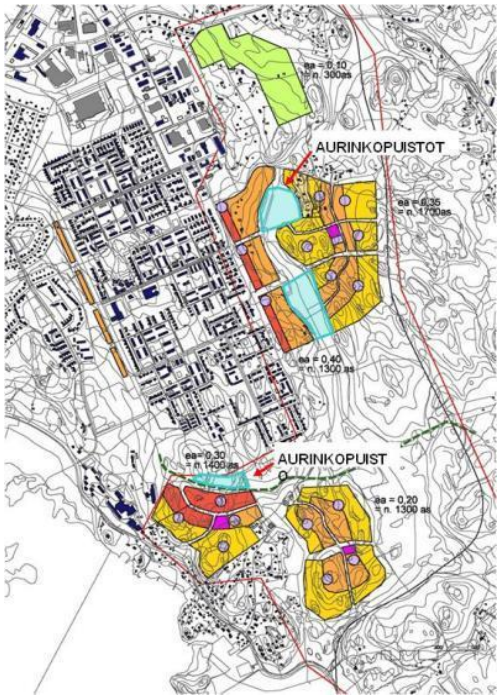
- Primary energy consumption 67% lower
- CO_2 emissions 48% lower

PÖYRY

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

3. Cas pratique Porvoo – Planification intégrale urbaine et énergétique

3.9. Variante urbaine **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.

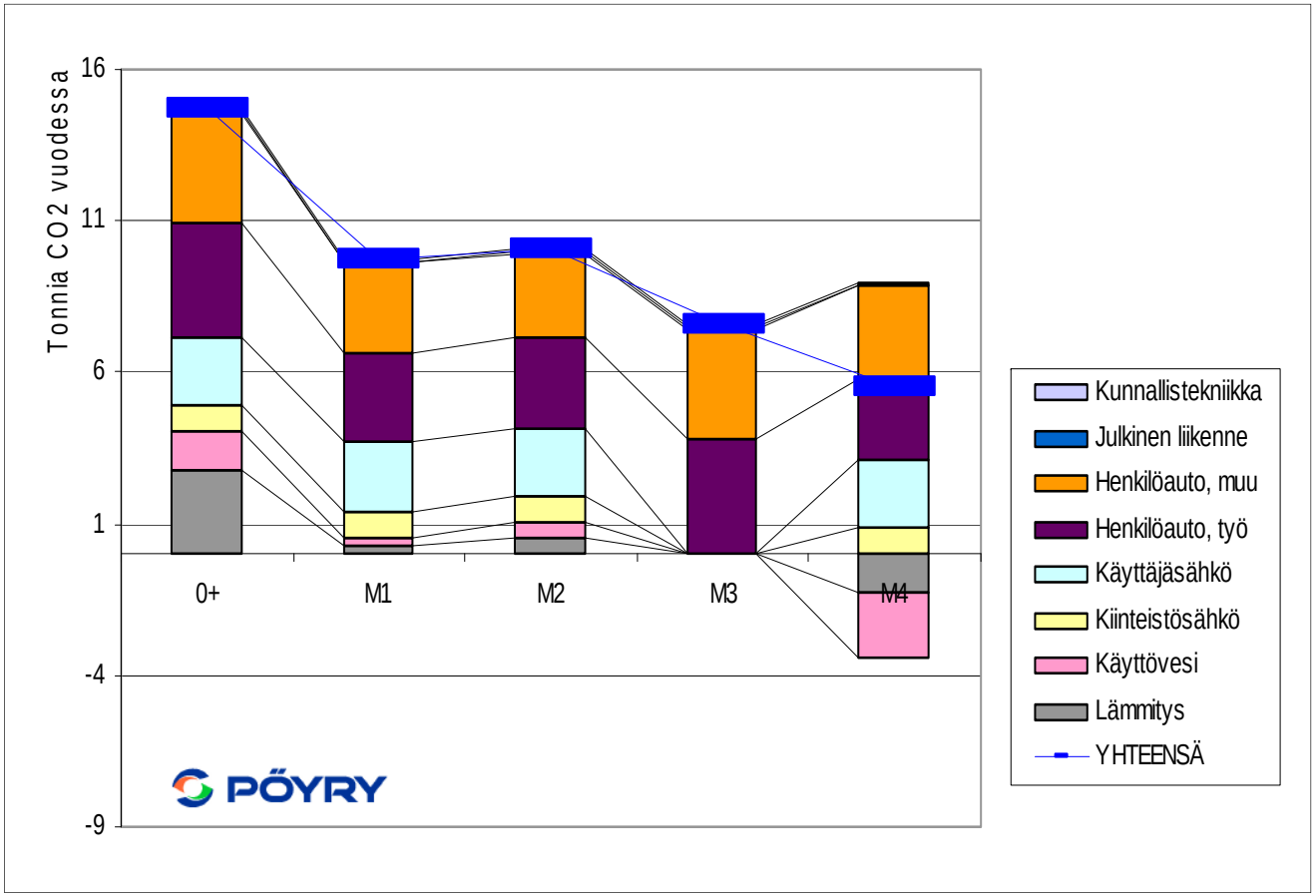
Compared to Reference case:

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

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

3. Cas pratique Porvoo – Planification intégrale urbaine et énergétique

3.10. Bilan carbone des variantes



All four Options cause lower emissions than the Reference case.

Infra tech

Public transport

Private cars, other

Private cars, work related

Electric applications

Electricity of common building parts

Tap water heating

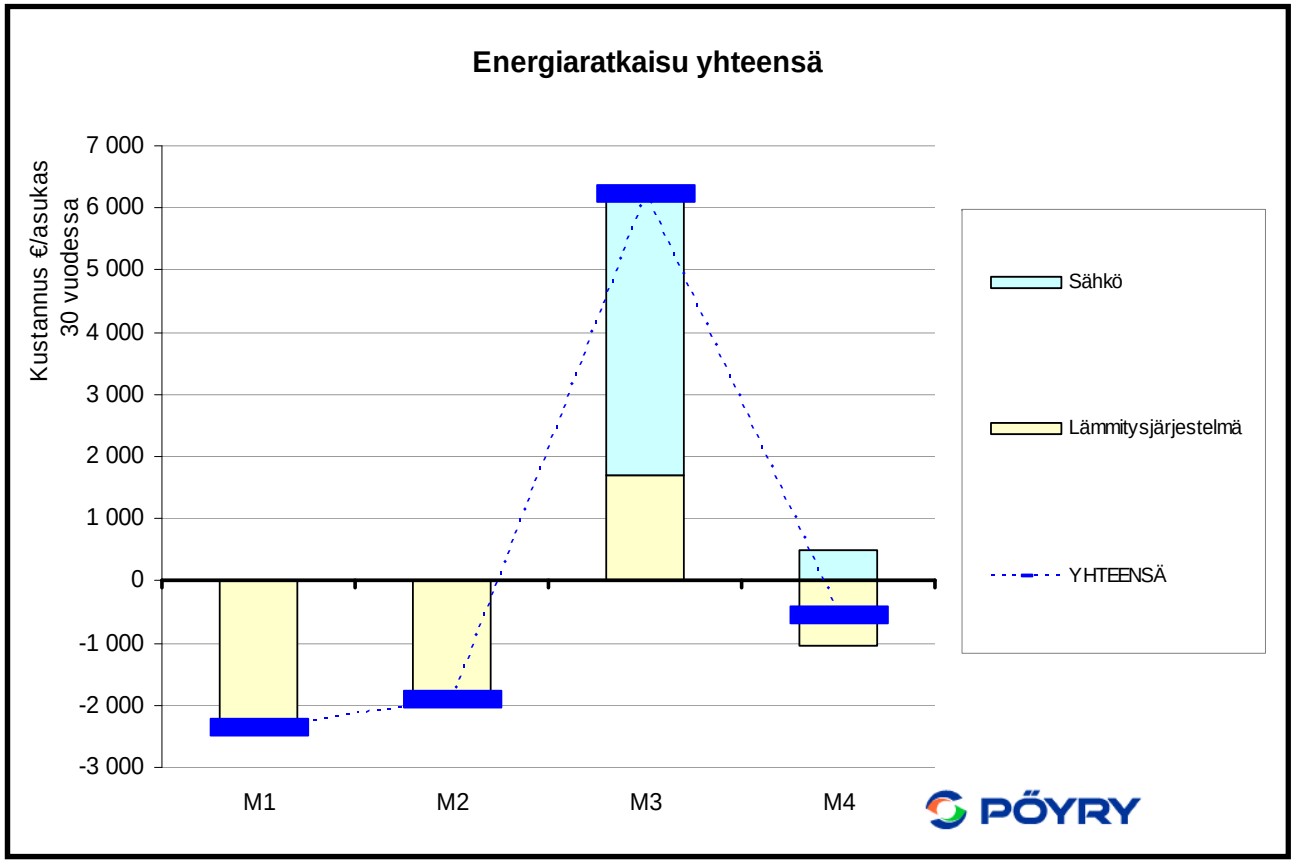
Room space heating

Total

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

3. Cas pratique Porvoo – Planification intégrale urbaine et énergétique

3.11. Coûts comparatifs des variantes en € par habitant sur 30 ans



Cost savings obtained in Options 1, 2 and 4 but substantial excess costs in Option 3.

Electricity

Heating

In total

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

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

3. Cas pratique Porvoo – Planification intégrale urbaine et énergétique

3.12. Conclusions

- Low 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 (consulting, meetings) but may reduce the costs of implementation (shorter utility pipelines, benefits of scale, etc.);
- The city plan options have to be communicated to the decision makers in quantitative terms: not only investment cost but energy consumption and emissions of each option matter much as well.

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

Le Consortium UP-RES

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  www.bre.co.uk
- **Allemagne :**

  AGFW - German Association for Heating, Cooling, CHP
  www.agfw.de

  UA - Universität Augsburg www.uni-augsburg.de/en

  TUM - Technische Universität München http://portal.mytum.de
- **Hongrie : UD University Debrecen**

  www.unideb.hu/portal/en