Note

the PLEEC Project – planning for energy efficient cities

Kullman, Mikael; Campillo, Javier; Dahlquist, Erik; Fertner, Christian; Giffinger, Rudolf; Große, Juliane; Groth, Niels Boje; Haindlmaier, Gudrun; Kunnasvirta, Annika; Strohmayer, Florian; Haselberger, Julia

Published in:
Journal of Settlements and Spatial Planning

DOI:
10.19188/09JSSPSI052016

Publication date:
2016

Document version
Publisher's PDF, also known as Version of record

Citation for published version (APA):
Kullman, M., Campillo, J., Dahlquist, E., Fertner, C., Giffinger, R., Große, J., ... Haselberger, J. (2016). Note: the PLEEC Project – planning for energy efficient cities. *Journal of Settlements and Spatial Planning*, *5*, 89-92. https://doi.org/10.19188/09JSSPSI052016

Centre for Research on Settlements and Urbanism

Journal of Settlements and Spatial Planning

Journal homepage: http://jssp.reviste.ubbcluj.ro

Note: The PLEEC Project – Planning for Energy Efficient Cities

Mikael KULLMAN[1], Javier CAMPILLO[2], Erik DAHLQUIST[2], Christian FERTNER[4], Rudolf GIFFINGER[3], Juliane GROSSE[4], Niels Boje GROTH[4], Gudrun HAINDLMAIER[3], Annika KUNNASVIRTA[5], Florian STROHMAYER[3], Julia HASELBERGER[6]

[1] *Eskilstuna Strängnäs Energy & Environment, Stockholm, SWEDEN*

[2] *Mälardalen University, School of Business, Society and Engineering,Västerås, SWEDEN*

[3] *Vienna University of Technology, Faculty of Architecture and Spatial Planning, Department of Spatial Planning, Vienna, AUSTRIA*

[4] *University of Copenhagen, Faculty of Science, Department of Geosciences and Natural Resource Management, Copenhagen, DENMARK*

[5] *Turku University of Applied Sciences, Faculty of Technology, Environment and Business, Turku, FINLAND*

[6] *Hamburg University of Applied Sciences, Faculty of Life Science, Hamburg, GERMANY*

E-mail: mikael.kullman@eem.se, javier.campillo@mdh.se, erik.dahlquist@mdh.se, chfe@ign.ku.dk, rudolf.giffinger@tuwien.ac.at, jg@ign.ku.dk, nbg@ign.ku.dk, ghaindlm@intern.tuwien.ac.at, annika.kunnasvirta@turkuamk.fi, florian.strohmayer@tuwien.ac.at, julia.haselberger@haw-hamburg.de

Corresponding author: mikael.kullman@eem.se

DOI: 10.19188/09JSSPSI052016 http://dx.medra.org/10.19188/09JSSPSI052016

K e y w o r d s: *zero carbon cities, local energy, energy self-sufficiency, urban planning, sustainable development*

A B S T R A C T

Globally, more than 50% of all people are living in cities today. Enhancing sustainability and efficiency of urban energy systems is thus of high priority for global sustainable development. The European research project PLEEC (Planning for Energy Efficient Cities) focuses on technological, innovative, behavioural and structural capacities of European medium-sized cities in their transition towards Energy Smart Cities. The variation of strengths and weaknesses of cities' capabilities as well as practices and tools for enhancing energy efficient performance of urban energy systems were at the centre of the project. This short note summarises its main findings.

1. THE PLEEC PROJECT

The PLEEC project is a three-year project funded by the 7th Framework Programme of the European Commission - led by Eskilstuna Energy & Environment, the public energy company of the city of Eskilstuna in Sweden. The project started in April 2013 and ends in March 2016.

The general aim of the project is to make European cities more energy efficient. Therefore PLEEC uses an integrative approach to achieve the sustainable, energy-efficient, smart city. By connecting scientific excellence and innovative enterprises in the energy sector with ambitious and well-organized cities, the project aims to reduce energy use in Europe in the near future, contributing to the EU's 20-20-20 targets.

The main project outcomes are Energy Efficiency Action Plans for each of the six PLEEC partner cities (see below), aiming to improve their energy efficiency in a strategic and holistic way. In order to further make this knowledge available to other European cities, the project team has developed a general model on energy efficiency and sustainable urban planning - accessible through an online model website.

The core objectives of the PLEEC project are:

- to assess the energy-saving solutions and potentials for a comprehensive city planning;
- to demonstrate how integrative planning is more efficient than separate measures;
- to develop a synergized model for energy efficiency planning considering city key aspects;
- to create Action Plans to be presented to decision-makers in the cities;
- to identify the future research agenda on the issue of energy-smart cities.

To achieve these objectives, the project methods included gathering information from the six partner cities through the analysis of energy relevant indicators, stakeholder engagement and an intense dialogue and collaboration with the city partners.

The consortium consists of 18 partners from 13 different European countries representing six medium-sized cities (Eskilstuna/Sweden, Tartu/Estonia, Turku/Finland, Jyväskylä/Finland, Santiago de Compostela/Spain and Stoke-on-Trent/UK), nine universities (Mälardalen University, Turku University of Applied Sciences, Hamburg University of Applied Sciences, Vienna University of Technology, University of Copenhagen, Delft University of Technology, University of Rousse, Santiago de Compostela University and University of Ljubljana) and three industry partners (LMS Imagine (now part of Siemens), Smart Technologies Association SMARTTA, Eskilstuna Energy & Environment (now Eskilstuna Strängnäs Energy & Environment).

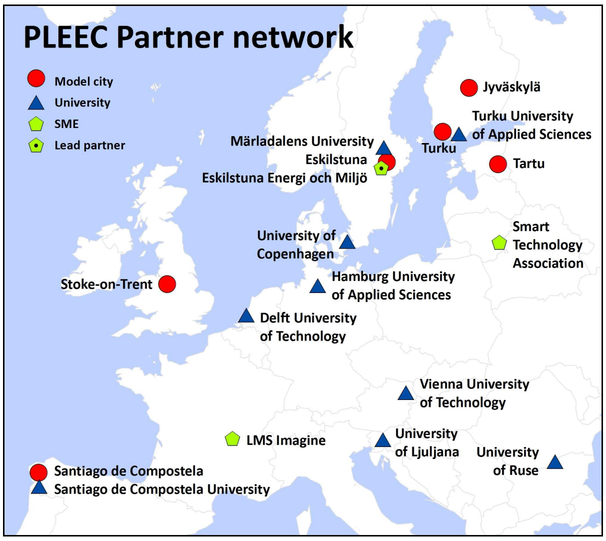

Fig. 1. PLEEC partner network.

2. PLACE-BASED APPROACH AND ORGANIZATIONAL LEARNING PROCESSES

The PLEEC project follows a place-based approach to enforce endogenous urban development by considering local conditions [1]. By supporting a forward-looking and evidence-based strategic planning approach, cities have identified their strengths and opportunities. Five key fields of urban development have been identified in which energy efficiency is supposed to become important: (1) Green buildings and settlement structure, (2) Mobility and Transport, (3) Technical infrastructure, (4) Production and Consumption and (5) Energy Supply [1].

The multidimensional description of the most relevant assets and deficits of cities through factors and indicators, respectively the identification of comparable and typical profiles, helps selecting other cities for learning and transferring relevant strategies. City profiles provided impulses for further discussion and research; in particular, the identified deficits and assets have been discussed and assessed by local stakeholders.

3. CAPABLE AND SUSTAINABLE URBAN ENERGY SYSTEMS

Technological capability is the capability to achieve outcomes based on technical equipment, methods, competencies and systems, while innovation capabilities refer to abilities and practices to improve performance capacities and capabilities continuously, technological as well as organizational and social.

The outcome in this case is efficiency in producing and using basic energy related services in a city (heating/cooling, transportation, recycling and waste management, light, power etc.) which achieve core outcomes of a sustainable city energy system; low cost and resource use of different services rendered including both per unit service and total use in service production (thus also including decreasing service use necessary), low fossil use and the use of other nonrenewable resources, low climate gas emission and other material leakages and pollutants. The outcomes should also be performed in an integrated way, based on a capability for synergistic production and use which additionally enhance efficiency.

Energy efficiency should be seen in relation to the transition to a fully sustainable city energy system, where different measures for improvements in capabilities and performances are steps in such a sustainability transition. Technological capabilities need to be coordinated with behavioural and structural abilities in energy efficiency improvements as these are embedded in improved practices, e.g. building and using houses in a sustainable way, in which technological, behavioural and structural factors are integrated as different dimensions.

Energy efficiency is also significantly affected by different city conditions of a structural character. A dispersed city structure tends to require more transportation and it is less favorable in efficiency terms for public transportation. It also tends to lead to more distributed heating solutions rather than based on common infrastructural solutions like district heating, which can increase efficiency based on economies of scale.

4. STRUCTURAL ASPECTS OF URBAN ENERGY CONSUMPTION

There are many measures in spatial planning to improve energy efficiency in cities, as a review done in the PLEEC project summarizes – ranging from climate-optimized urban design, mixed and compact urban development to planning measures supporting small-scale energy production [2].

However, these measures must not be seen in isolation, and potential counteracting trends have to be considered. For example, efficiency gains through improved heating in housing can be outpaced by the increase of floor area per capita [3], and while, for example in Denmark, the average kms driven per car are decreasing in urban areas, the number of cars is increasing at the same time. These are partially rebound effects [4] where the efficiency gains by improving one system are out-balanced by the use of these (energy in our case) in another system.

Urban structure is framing energy use and a city's possibilities for the implementation of measures. This includes the legal system, cultural differences or behavioural preferences. The physical and functional structure of a city, and the region it is located in, influences transport and commuting patterns. Also the coverage of the municipal territory is crucial, giving cities very different possibilities (and limitations) to influence aspects of urban structure. A major question is therefore the scope of a municipal energy action plan [5].

The most efficient actions can be achieved within the municipal cooperation (e.g. targeted towards the municipal heating system). However, if we aim at long term sustainable development, we have to work with citizens' direct and indirect energy consumption. Cities like Jyväskylä or Turku aim at this broader perspective with their 'one planet living' approach.

5. BEHAVIOUR CHANGE AS A DRIVER FOR ENERGY SAVING

Energy smart cities start with behaviour change of both individuals and organisations. Urban systems, however, are complex and human behaviour even more. Behaviour is very much context-driven and subject to a multitude of situational and structural drivers. Understanding how people make choices on their energy consumption – whether consciously or unconsciously – is therefore essential for designing energy saving policies in cities, as well. More often than not, however, these efforts at city level have not been planned strategically but are rather sporadic, scattered and often lacking in long term effectiveness.

There is a growing body of evidence on the potential of behavioural interventions on promoting energy efficiency. Naturally, both technological interventions and urban infrastructure play a crucial role in facilitating – or hindering – energy saving measures of the behavioural kind. However, there is evidence that technological interventions alone have rather low impact without any accompanying plan to promote behaviour change [6].

This does work the other way too – no matter how well planned and realised a behavioural campaign is, it might not achieve its goals if the energy infrastructure does not permit changing one's behavioural patterns. In an ideal situation in any city, behaviour, structures and technology complement each other. PLEEC set out to find Best Available Practices to promote behaviour change in the context of energy efficiency in European cities. As all cities possess their own unique combination of technological solutions and planning practices to promote energy efficiency, the behavioural drivers also vary. However, coherence and consistency in the design and use of policy instruments is crucial. Moreover, the power of social influence should not be underestimated – we do care about what our neighbours or colleagues think and do. Providing people with proper information is essential: messages need to be framed right, their context and timing carefully considered – they need to be meaningful, engaging, encouraging and personalized.

Building upon the positive instead of preaching, making energy saving a habit and paying attention to possible rebound effects will set the process in motion. Also acknowledging various barriers to energy saving may help overcome them with different measures, such as incentives or improved information [7].

6. LEARNING AND INTEGRATING

During the project, several mutual learning procedures have been integrated into the PLEEC methodology to promote sustainable planning for energy efficiency, such as: cities – cities (study visits, local dialogue forums, opponent groups), researchers – cities (workshops, skype meetings) as well as experts – cities (city groups). However, the (challenging) integration of technology, structures and behaviour seems to be crucial for a sustainable transition into a more energy efficient smart city.

7. ACKNOWLEDGEMENTS

The PLEEC project (www.pleecproject.eu) was supported by the European Commission's 7th Framework Programme, GA no. 314704.

REFERENCES

[1] **Giffinger, R., Hemis, H., Weninger, K., Haindlmaier, G.** (2014), *Methodology for monitoring* EU-FP7 project PLEEC, Deliverable 2.4.

[2] **Meijers, E. J., Romein, A., Stead, D., Groth, N.B., Fertner, C., Große, J.** (2015), *Thematic report on urban energy planning: Buildings, industry, transport and energy generation* EU-FP7 project PLEEC, Deliverable 4.3.

[3] **EEA** (2010), *The European Environment - State and Outlook 2010. Synthesis Report* European Environment Agency. Available online at: http://www.eea.europa.eu/soer/synthesis/synthesis

[4] **Fertner, C., Große, J.** (2016), *Compact and resource efficient cities? Synergies and trade-offs in European cities*, European Spatial Research and Policy, 23(1).

[5] **Fertner, C., Groth, N. B., Große, J., Meijers, E. J., Romein, A., Fernandez Maldonado, A. M., Rocco, R., Read, S.** (2015), *Summary report on urban energy planning: Potentials and barriers in six European medium-sized cities* EU-FP7 project PLEEC, Deliverable 4.4.

[6] **EEA** (2013), *Achieving energy efficiency through behavior change: what does it take?* Technical report 5/2013. European Environment Agency. Available online at: http://www.eea.europa.eu/publications/achieving-energy-efficiency-through-behaviour

[7] **Kunnasvirta, A., Kiviluoto, K., Mieskonen, T., Vitliemov, P.** (2015), *Planning behaviour-driven energy efficiency interventions in a city context* EU-FP7 project PLEEC, Deliverable 5.5.