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*Initiatives, actors and experiences*

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## **Reducing energy use in private homes: Initiatives, actors and experiences**

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### **Abstract**

Reducing energy consumption in private homes represents an increasing dilemma for the worlds' cities in order to reduce climate changes; however, it also fosters a number of innovative policies and approaches on energy retrofitting in private homes. As traditional regulatory tools are insufficient when it comes to change of private property, other types of governance are needed.

The aim of the paper is to give examples on various local initiatives that have been launched by various actors (mainly municipalities) in recent years in order to motivate local home owners to take up energy retrofitting. Such initiatives, which typically combines national initiatives and local policies can be seen as examples on 'Urban Climate governance' (Kern & Alber, 2009; Bulkeley, 2009) that includes different governmental approaches for the local authorities. The challenge of local sustainability is that it is complex and defined on different levels (local, municipal, regional, national, and international), that requires a 'multilevel governance'-approach to succeed (Bulkeley & Betsill, 2005).

The paper will outline examples on different models being used in Danish cities, with the municipalities as primary actors, or facilitators, of local networks consisting of actors such as local financial institutions, craftsmen and SME's (Small and Mediumsized Enterprises), Energy suppliers, NGO's and others. Based on an on-going research project, it will discuss the different motivations from the actors involved, and the possibilities and challenges of such local initiatives.

**Keywords:** Home owners, buildings, energy retrofitting, municipalities, urban climate governance

## Introduction

In recent years, local authorities have on an international scale increasingly seen themselves as responsible for pursuing climate goals for the entire municipality as a *geographical* area, and not just the municipality as an *organisational* unit. This raises a number of challenges for the municipalities, as these challenges calls for new modes for approaching, planning and implementing sustainable urban development. One of the main challenges for the local authorities is to reduce energy use in existing buildings, which typically represents 40% of the energy use and CO<sub>2</sub>-emissions on a local scale. Traditionally, reductions of energy use in buildings have focused on new buildings, by implementing measures for energy use.

Generally, Denmark has a reputation for a strong regulatory framework towards energy efficiency in new buildings. As an example, a comparison between the Nordic countries leads to the conclusion on Denmark that “Denmark in particular is leading the way on implementing a combination of strong, strategic and innovative policy instruments and undertaking comprehensive evaluations” (McCormick & Neij, 2009; p. 45). When it comes to existing buildings, that represents the vast majority of buildings in general and on a local scale, similar regulation tools does not exist and the challenge is different as the public regulation is more limited, indirect and dispersed. Officially, the Energy labelling scheme for buildings and the building regulations (demands to implement energy measures when investment for renovation exceeds certain limits) have been main national tools for targeting energy measures in existing buildings. There is, however, a widespread recognition of these regulation tools as being insufficient to meet the challenges of massive energy reductions in existing buildings. This is documented in evaluations of these regulations, showing that the effects are limited (Ea energianalyse et al, 2008; Christensen, Jensen & Gram-Hanssen, 2012). Also, the ESCO-model is an oft-mentioned tool in national policies for energy improvements of existing buildings (Regeringen, 2005). Although the ESCO-model has shown a strong growth on the market for public buildings, attempts to take up the ESCO-model in private buildings have been limited. So far, only two ESCO-projects on housing are established in Denmark, and a number of barriers stand in the way for this model to be incorporated on a wider scale.

Instead, municipalities are increasingly looking for, and testing, new modes of governance to motivate local home-owners to increase energy efficiency of their homes. Initiatives for local climate change policies as well as initiatives for energy savings in existing buildings has been formulated in local climate plans and voluntary agreements, such as the “Climate Municipality” and “Curve Cracker” that demands annual energy savings on 2%. An important tool for these policies is the Energy Efficiency obligations for Energy Companies (introduced in 2006) which has made it mandatory for energy suppliers to contribute to energy savings amongst end-users, which has created opportunities for municipalities to establish partnerships with energy suppliers. The saving obligations have created a virtual market for energy savings, meaning that energy suppliers are willing to pay (however in various degree) for documented energy savings obtained amongst the end-users, can be used strategically by the municipalities.

Typical barriers for home-owners to take up energy retrofitting are:

- Limited knowledge about potential solutions, and how to prioritise and combine different solutions and technologies
- Other priorities for investments, typically that energy savings are not visible, in contrast to new kitchen og bathrooms

- Little trust that energy savings will actually be achieved, and thereby reducing the economic feasibility of the initiatives
- Limited time to investigate and plan such initiatives
- Limited time-horizon in home investments, compared to pay-back times, leading to focus on solutions with short pay-back times

Some of these barriers relate to lack of market-based solutions, e.g. limited knowledge on energy-saving solutions amongst SME's, no "packet-solutions" offered to the home-owner, limited support or knowledge from the financial part. The question is how the municipalities manage to overcome such challenges.

### **Theoretical perspectives**

As in other countries, climate mitigation strategies are increasing being formulated on a local level, with a number of innovative frameworks and initiatives being implemented (Schreurs, 2008). In at theoretical perspective the municipalities promotion of energy savings can be seen as an example on 'Urban Climate governance' (Kern & Alber, 2009; Bulkeley, 2009), that includes different approaches to municipal intervention in sustainable urban development. The challenges regarding sustainable development is that the concept might be difficult to specify and operationalize, and that issues related to sustainable development is dealt with on different levels, locally, regionally, nationally and internationally. Instead of seeing the planning levels individually, and e.g. focus only on the local level, the challenge is to orchestrate the different levels into a 'multilevel governance' (Bulkeley & Betsill, 2005). This demands horizontal as well as vertical integration of actors and policies. Horizontal integration might include networked governance and collaboration between different local actors such as the municipality, local energy suppliers, local banks, real estate agents, SME's, industries, NGO's etc., whereas vertical integration might include for instance integration of goals and policies on municipal, regional and national level.

It is necessary to make a distinction between the different climate change initiatives that a city might foster. For this, we refer to Alber & Kerns (2009) categories of urban climate management (Alber & Kern, 2009; Bulkeley et al, 2009):

- *Self-governing*, where the municipality acts as a consumer, and initiates climate goals on own buildings, as for instance energy optimisation of schools and administration buildings, establish networks with other municipalities, formulate green procurement policies etc. A number of initiatives have been implemented by Danish municipalities, for instance through ESCO-contracting or in-house energy efficiency schemes, and networks such as "Green Cities" that allows cities to share knowledge and formulate binding goals on green municipal initiatives. As municipal buildings accounts only for a few percentages on the entire building stock in the municipality, these measures however have limited influence on the total energy consumption and climate mitigation in the municipal area, and the initiatives need to be followed by initiatives targeting other actors in the municipality as well.
- *Governing through enabling*, where the municipality acts as a facilitator for establishing and facilitating collaboration and networks between the municipality, local companies and institutions, citizens, industries etc. This includes a number of different arrangements on different levels (local, regional, and national), formal as well as informal, public-private as well as public-public partnerships etc.

- *Governing through provision*, where the municipality acts as a provider of energy, transport, waste, water etc., and thereby has an excellent position to formulate and steer climate policies. With the increasing liberalization and privatisation of such services, the direct municipal influence through these channels has however diminished in recent years. In contrast, national and international saving obligation schemes has created demands and motivation for especially energy utilities to contribute to energy savings amongst end-users, opening an opportunity for municipalities to establish partnerships on this agenda.
- *Governing through authority*, where the municipality act as a regulator, exploiting its formal authorities in for instance by urban planning, land zone administration, building permissions etc. for instance, the municipality is able to decide through the local plans that new buildings (public as private) should be completed as low-energy buildings. It can also decide that subsidies to renovations under the urban regeneration scheme should include certain energy measures.

It can be discussed whether these categories are fulfilling to describe all possible municipal initiatives. For instance, the formulation of policies and strategic plans with little or no regulatory abilities (for instance climate policies stating that the municipality should become climate neutral in the year 2030) does not easily fit into these categories, as they are not regulation tools in a narrow understanding, but instead are important normative tools to indicate the direction of future municipal regulation, and thereby fulfils a goals as communication with other actors, for instance on formulating strategic partnerships. Nevertheless, these categories are useful as a starting point of understanding the different roles and challenges that the municipalities face.

As there is still limited research on local climate change strategies (Schreurs, 2008), the purpose of the study is to identify how climate policies directed towards private home-owners has been taken up by Danish municipalities, and discuss the outcomes in relation to future potentials for such policies.

The initiatives we study here will fall under the umbrella, "Governing by enabeling", where "enabling activities" according to Alber & Kern (2009) are primarily based on persuasion and arguments, seeking to persuade other actors to establish climate protection initiatives. These voluntary actions amongst other stakeholders can be supported by other public initiatives such as public education and awareness campaigns, facilitation of cooperation between stakeholders, and public-private-partnerships.

## Methodology

The paper is based on a survey amongst Danish municipalities regarding their policies on motivating local home-owners to take up energy retrofitting of their homes, combined with case studies of five selected initiatives. The aim was to establish an overview of the municipal initiatives, what the initiatives consisted of, and what the experiences were.

The survey included interviews with 22 municipalities<sup>1</sup> on their initiatives to promote energy savings amongst local home owners. In the choice of municipalities, some were known for their

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<sup>1</sup> Herlev, Rødovre, Hillerød, Furesø, Bornholm, Guldborgssund, Slagelse, Jammerbugt, Brønderslev, Hjørring, Lemvig, Horsens, Herning, Samsø, Haderslev, Aabenraa, Kolding, Sønderborg and Morsø.

initiatives, and other municipalities had no initiatives of which we had heard. These groups also included municipalities of which some had joined the voluntary agreement with the Danish Nature Conservation Association (Danmarks Naturfredningsforening) of becoming an "Climate Municipality", and some municipalities that had not joined this agreement. Finally, the municipalities were chosen to form a balanced geographical and regional composition. The interviews with the municipalities were completed using a semi-structured interview-guide.

Beside the survey, the initiatives in five municipalities<sup>2</sup>, known from other sources, were studied in details. This included document studies as well as interviews with representatives from the municipalities and the energy consultants having the direct contact with the home-owners, in total eight interviews. In these cases we have collected information about the results from the initiatives, in terms of the amount of saved energy.

## **Findings from survey**

In the survey we have asked the 22 municipalities whether they have any initiatives directed towards local home-owners, what type of houses they are targeting, how they contact the home-owners, whether an energy check is offered, and if the initiatives are coupled with education of local SME's. From the answers, the 22 municipalities can be separated in three almost equal parts:

- Eight municipalities who have (or have had) direct outreach to the local homeowners, typically offering an energy check, in combination with other initiatives such as energy messes, local seminars, education of local SME's etc. In two municipalities, the initiatives take place in selected villages ("Energy villages").
- Seven municipalities have established initiatives with general information and calls to the citizens on the possibilities for energy optimisation of their homes. Of these seven, three municipalities are specifically targeting holiday homes
- Seven municipalities have no efforts, but in one municipality initiatives are being planned.

As the municipalities have been selected somehow representatively, the answers indicates that about two thirds of the Danish municipalities have established initiatives towards home-owners, and one third of all municipalities have established different types of "Urban Climate Governance", that includes more ambitious efforts in terms of networks, partnerships with energy suppliers and efforts to educate local SME's.

## ***Type of initiatives***

The survey shows that the municipalities are addressing the homeowners in various ways. This includes dissemination of general information (flyers, internet pages etc.), energy-exhibitions (events on a central place in the city where home-owners can meet energy consultants, local SME's and craftsmen, energy consultants, representatives from the municipality, financing institutes etc., or local arrangements in selected neighbourhoods, e.g. in community houses, where local homeowners are invited to be told about the potentials and practical elements in energy

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<sup>2</sup> Energibyen (Frederikshavn), ESCO-light (Middelfart), Ringkøbing-Skjern, Project Zero (Sønderborg) and 2100.nu (Østerbro, Copenhagen).

optimization of their homes. Also, the types of houses and homeowners varies; some municipalities are focusing mainly on holiday homes, others mainly have their efforts in selected villages (often labelled “Energy Villages”), but the main part are addressing single family houses. Most of the municipalities are addressing the owners individually, others are focusing on collective forms of collaboration, for instance with local land-owner associations.

A central element in addressing the home-owners is offering an “Energy check” by an energy consultant. Several municipalities are collaborating with an “energy consultant”, who is typically financed by the local energy supplier. Due to the energy saving obligation all energy providers are obliged to save a certain amount of energy amongst end-users. According to an agreement from 2009 with the Climate-and Energy Ministry, the energy distribution companies in Denmark are obliged to save 5,4 PJ energy annually amongst end-users. There is a wide-spread freedom for choice of method, including the use of grants to pay for energy savings. Many suppliers are therefore willing to finance an energy consultant, who will work to achieve the savings. By collaborating with the local energy supplier, the municipality can get the energy consultant to work for motivating local home owners to implement energy saving solutions on their homes, e.g. improving the insulation of the building, improving the boiler system, changing the heat system, converting the energy supply to more sustainable sources (district heating, PV’s, heat pumps etc). The deal for the local energy supplier is that the energy consultant will be able to generate a certain amount of energy savings that can be attributed to the local energy supplier. In some municipalities, the energy check is free from the home-owner, in other municipalities the owners have to pay a (typically small) amount of money for the consultation. The energy check will typically consist of a screening of the house with the owner, a report about suggested energy optimizations and an estimation of the energy saving potentials, as well as estimated costs for the initiatives.

Another often-used element in the municipal strategies is the education of local SME’s and craftsmen in energy optimization of houses. There is a widespread accept of a need for such qualifications, which will enable the SME’s to suggest energy saving initiatives to the homeowners, for instance when they are carrying out more traditional maintenance assignments. Moreover, the energy consultants might use the local craftsmen with a “green certificate” to check the energy improvements, and send the necessary documentation to the energy consultant, who will report the improvements to the National Energy Agency. There are several examples on such green education networks being established, e.g. the Energiprofferne (Frederikshavn), Zero Bolig (Sønderborg), Grøn Erhvervsvekst (Kolding, Odense and Middelfart), energiforbedring.dk (Hjørring) and Passivhus Nordvest (Morsø). The networks are established and organized rather differently, for instance some are initiated in a regional network, where others exist only within the border of the municipality (Strandgaard, 2012). The energy consultant might also suggest the home-owners to look for local craftsmen with a “green certificate”, to complete the energy optimization.

As a part of the study, five spearheading initiatives on promoting energy savings amongst home-owners were studied more in detail. Table 1 summarises the main characteristics of these five initiatives.

	Collaboration partners	Background and ambitions	Targets	Types of improvements
Energy City, Frederikshavn. Start 2011	The municipality of Frederikshavn, local energy supplier, "Energy Proffs"	Pursue climate goals, create local jobs, train local SME's, support settlement strategy	Single family houses	Insulation of building shell (25%), also conversion to new types of supply (district heating, PV's, heat pumps)
ESCO-light, Middelfart 1.1.2012-31.12.2012	The municipality of Middelfart, four local energy suppliers, network for "Grøn Erhvervsvekst", National Knowledge center for Energy savings	Establishing "Green growth", creating local jobs, upgrading skills amongst local SME's	Single family houses	Primary insulation of building shell, limited improvements of regulation, boilers etc.
2100.nu, Copehagen May 2010-May 2011	The Agenda Center for Østerbro, local energy supplier, Teknologisk Institut and local SME's	Part of larger campaign in 2010 to save 10 tons of CO <sub>2</sub> , and to create innovative solutions to climate changes	Apartment buildings: Private co-ops, owner-occupied apartments, private rented accommodation	Technical insulation, energy management, adjustment of boilers, limited improvements of building shell
"Houseowner in focus", Municipality of Ringkøbing-Skjern. 2011-2012	Municipality of Ringkøbing-Skjern and Scanenergi (energy consultant)	Political ambition to become self-sufficient with energy by 2020	Single family houses	Improvements with payback time < 10 years, only limited improvements on building shell
Project Zero, Sønderborg. Start: Ultimo 2010	Project Zero fund, Futura South (Regional think tank), Syd-energi, Danfoss, Sønderborg Municipality, DONG Energy, Nordea Fund	Creating local growth Pursue in the region, based on climate neutral development. Create local jobs, upgrading skills amongst local SME's	Single family houses	N.A

Table 1. The characteristics of five Danish spearhead initiatives aiming at improving energy efficiency in private houses.

### Case study: "Energy City", the municipality of Frederikshavn

To illustrate some of the general issues in the municipalities' initiatives to encourage private homeowners to energy optimize their homes, we will present a case-study on one of the frontrunners, the municipality of Frederikshavn. The municipality is located in the Northern part of Jutland. It has 60.000 inhabitants and 30.000 households, of which 18.000 are detached houses (and 16.000 with private ownership). Moreover, there are app. 4.000 empty dwellings in the municipality (Statistikbanken. dk). The municipality of Frederikshavn has since 2011 initiated efforts towards local home owners, urging them to complete energy retrofitting of their homes. It is framed by the organisational unit "The Energy City Frederikshavn", a municipal industrial development project about changing the energy supply in the municipality to 100% sustainable energy, established in



2007. The aim of the "Energy City" is to *"..initiate, facilitate and coordinate projects that contributes to green growth and new local jobs in the energy sector"* ([www.energiby.dk](http://www.energiby.dk)). The efforts towards the private home-owners are composed of different elements, including an energy consultant offering free energy checks of the houses, education of local SME's and craftsmen as well as visibility and information towards home-owners. The efforts can be seen as an example on urban climate governance, where especially horizontal networks play an important role, but are also deeply dependent on regional and national frameworks. Moreover it illustrates how climate might be deeply intertwined with urban politics, in this case maintaining local settlements. Situated in a peripheral region, the city has over the recent decades experienced a massive loss of industrial jobs and residents. From this development, an urban strategy focusing on green growth was established in the late 1990ies, and from this "The Energy City" started in 2011. The concept of hiring an energy consultant in collaboration with the local energy supplier, with the purpose of improving the energy efficiency in private homes, in combination with establishing a network for upgrading the skills of local craftsmen, was fostered after a meeting between the municipality, home-owners, banks, real-estate dealers and SME's in order to discuss possible strategies for motivating home-owners to take up energy retrofitting. The input from this meeting was an eye-opener for the municipality, and was a main inspiration to start the initiative.

With a visit from the energy consultant, the home-owners receive a free consultancy on saving options, including an assessment of the building, assessment of the saving potential, a saving report, and suggestion from financing and pay-back times. In order to attract the attention from the local home-owners, different information activities are established, including a magazine (Energimagasinet e+) published three times annually, with local success-stories of energy retrofitting, with the aim of spreading inspiration to other home owners. Another initiative is a map in Google Maps ([www.energiby.dk](http://www.energiby.dk)), showing the different retrofitting initiative. This information is linked to the annual energy bills are sent out. Home-owners with a high bill can in the e+ magazine read about the options to get assistance from the energy consultant. This is also disseminated on energy exhibitions, held on a regular basis, as well as meetings arranged locally in community houses etc., where local home-owners are invited to a meeting with the energy consultant.

Another part of the concept is education of local craftsmen, organised around the network "The Energy Proffs" ([www.energiproffer.dk](http://www.energiproffer.dk)), with focus on energy optimisation of private homes, with different professions as members (carpenters, electricians, insulation, plumbers etc.). The companies leaders must go through training as an energy consultant, and the employees must complete different courses. The strength of the networks is that when the craftsmen visit home-owners they can refer to other "green" craftsmen, and thereby offering home-owners a package of the different professions needed for an energy renovation. The Energy Proffs is supported by two other professional education schools, specialized in respectively energy renovation of the building shell and energy-technical regulation HVAC, the latter has become the leading on the country.

The assessment from the municipality is that there is a large variation how much the SME's uses the education to get new jobs with home-owners; some does not see the possibilities, where others do. Some companies have promoted themselves as specialists in energy renovation. Moreover, the networks has gradually become independent from the municipality, e.g. by running the local energy exhibitions on own initiative. Also outside the network there are local companies having specialized in energy solutions (the company "Green Source", who has made their domicile self-sufficient with energy, [www.greensource.dk/www.trigon.dk](http://www.greensource.dk/www.trigon.dk))

### **Results**

The result of the efforts is documented from the reports from home-owners reporting to the energy-consultant on the completed initiatives. In 2012 energy saving initiatives were completed in 500 homes, saving 1 mill kWh (or 2.000 kWh per house in average). The savings comes mainly from after-insulation (25% of the retrofittings), and from change in energy supply, including PV's, heat-pumps, or conversion to district heating. The savings implies income to the energy supplier through the national implementation of the EU saving obligations. This income can largely pay the salary of the energy consultant, so that the expenses for the energy supplier and the municipality is almost cost neutral, but also puts a pressure on the energy consultant to reach a certain volume in energy savings. A central ambition of the initiative is to create local jobs, and the municipality has assessed that the projects have created a turnover amongst the local SME's on app. 10 mill. Dkr. (1.5 mill.€), corresponding to app. 10 jobs. If, however the whole value chain is included, the effect is rather creation of 18 jobs. The Energy City has in 2012 published their concept in "Handbook on energy retrofitting of private houses" in collaboration with Håndværksrådet og Region Nordjylland, and are also disseminating their concept and experiences with other municipalities in the region (through the regional network "Smart Cities Nordjylland").

### **Challenges**

As a result of the location in a peripheral region, the housing prices in the city are generally low, and it can be a hard job selling your house. In several villages the number of residents is falling, leading to loss of services, closing of schools etc. With the low housing prices and low interest rates, the energy expenses takes up a high proportion of the monthly cost for the home-owners, making energy retrofitting attractive. For some home-owners, it may be decisive to reduce the energy costs, if they want to stay in the house. There are examples on families with children buying a house, where the energy label and the real estate dealer informs about low heating costs, but where the reason for the low costs is that the family having lived there "closed" down several rooms for heating, in order to save money for energy. When the new owner move in, they occupy and heats up all rooms, and therefore later will face a much higher energy bill than expected. Eventually, this might force them to leave the municipality, and look for a house with a higher standard and lower energy costs.

Another segment influenced by the possibilities for energy retrofitting is the 60+ home-owners, whose housing-strategy has been to sell the house when they got older, and find something closer to the city, with better services etc., and therefore have not been interested in improving their houses. As housing prices continues to fall and energy prices continue to rise, it becomes increasingly unrealistic to sell their houses at the prices they once expected, they may change their housing strategy in order to stay in their house some more years, and becomes interested in the possibilities to reduce energy costs. There is a large potential to reduce the energy costs, as many houses in Frederikshavn are built in the 1960-70ies, and little has been done to improve they energy efficiency.

The low housing prices and the uncertain future for peripheral regions however means that it can be difficult to borrow money to finance the energy retrofitting. According to the municipality, there are several villages and settlements where the local banks and finance institutions are not willing to lend money, as they see a large risk in continuous decreasing housing prices. Moreover, in peripheral regions many financial institutions denies to finance houses, or finances only up to 60% of the expenses with 30-years loans with a low interest rate (normally the limit is 80%). The remaining investments needs financing with traditional bank-loans with higher interest rates (or finance with equity), which makes it even more difficult or expensive for the home-owners to

finance energy retrofitting. The planner from the “Energy City Frederikshavn” estimates, that only houses located in the three largest cities in the municipality are able to finance energy improvements through the traditional channels. Part of this reluctance from the local financial institutions is a limited understanding about the “value” of energy reducing initiatives. The municipality, however, has established an informal collaboration with a couple of local banks who are willing to finance energy improvements. This illustrates the large influence that local finance institutions have on the local housing market, but it is also an example on the different alliances that the municipalities are able to establish in order to strengthen the conditions for the local house-owners.

In the near future the municipality expects to continue the efforts, but also have considerations on slight changes in the strategy. They will try to focus specifically on two villages as pilot projects, where they will use the energy initiatives to start “a positive social process”. They hope that the individual energy saving initiatives might impose a “neighbourhood effect”, where the residents mutually inspire each other to take up different initiatives, which will also improve the social capital in the village. It is, however, first time that the municipality collaborates with villages.

### **Lessons and discussion**

The example from Frederikshavn, as well as the other initiatives listed in table 1, are all examples on the “Governing by enabling”-mode, outlined by Kern & Alber (2009). The perspective of ‘Multilevel Governance’ (Bulkeley & Betsill, 2005) is also obvious these cases, although less dominant. Obviously, these local initiatives are all based on national and international regulation concerning for instance the saving obligation amongst energy suppliers that enables financing of the energy consultants and the subsequent energy savings in private homes. However, these are structures that the municipalities have little chance of influencing. Instead, the municipalities have the opportunity to make partnerships with the local energy suppliers, and find arrangements of shared interest. The regional level has a larger impact on the initiatives, as several important actors for the initiatives, including energy suppliers, banks, SME’s, education institutions and others, operates on this level.

As indicated in table 1, initiatives as Energy City in Frederikshavn are relatively new, and not necessarily permanent. In order to assess their liveability we will discuss the challenges and possible future of such initiatives, based on a discussion of the outcomes and challenges.

The results in terms of energy savings obtained per household and in total for the five municipal initiatives are illustrated in figure 1. The figures are the based on the documented results that the energy consultants have reported to the national Energy Agency, by calculating the initiatives from the housing owners to expected energy savings by using the “standard-value catalogue” ([http://svk.teknologisk.dk/Pages\\_open/Default.aspx](http://svk.teknologisk.dk/Pages_open/Default.aspx)).

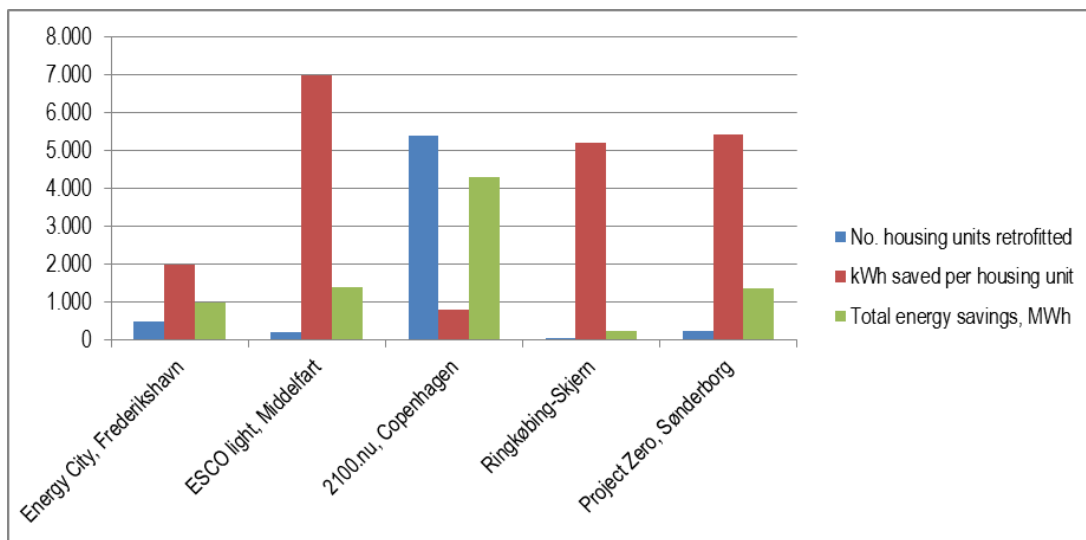


Figure 1. Results from the five different municipal initiatives towards home-owners. The figures for each municipality represents results obtained over a whole year (for 2100.nu in 2010, for the other municipalities in 2012). Note: The number for Sønderborg is the amount of finished renovations (249). According to the statistics, there are 492 ongoing projects (by the end of 2012). The number for Ringkøbing-Skjern (50 houses) will be larger, as the contract was on 100 houses, but at the time of the interview the energy consultant did not have an updated status.

### **Energy savings**

As the figures show, there are large variations between the municipal initiatives, both on the number of housing units retrofitted, the obtained energy savings per unit and the total amount of energy saved. Amongst comparable municipalities with same type of houses (Fredrikshavn, Middelfart, Ringkøbing-Skjern and Sønderborg), the savings per house have rather different, ranging from 2.000 kWh per house in Frederikshavn, to 7.000 kWh in Middelfart. One reason for the relatively low savings per house in –Frederikshavn might be that many improvements include conversion of energy sources, which does not save energy, only CO<sub>2</sub>.

Compared to the others, the initiative 2100.nu in Copenhagen stands out, as it has been able to include a far larger number of households (+5.000 compared to 100-500 for the other municipalities), and although the savings per household is remarkable smaller in 2100.nu (app. 700 kWh as compared to 2.000-7.000 kWh in other municipalities), the result is that 4.300 MWh has been saved through the initiative (as compared to 260-1.400 MWh in the other municipalities). It illustrates that in dense urban areas consisting of multi-storey buildings, such as the location of 2100.nu in Copenhagen, it's easier to reach many home-owners. Knocking on the doors of the home-owners can be a heavy job in areas with detached single-family houses.

Nevertheless, the challenge for the municipality, the energy consultant and the energy supplier is to create a business case based on the documented energy savings in the private households. The different cases suggest different answers to such business case has been established:

In Frederikshavn and Sønderborg, the initiatives continue, but are increasingly focusing on villages, partly caused by the fact that approaching home owners individually is a relatively expensive process, and that collective initiatives including more homeowners at one time, might be less expensive, as measured by costs per saved kWh. Nevertheless, the energy consultant in Frederikshavn states that he is able to keep up his own salary through the obtained energy savings.

In Middelfart, the partnership between the municipality and the four local energy suppliers was established over a period of two years, and has now ended. The municipality argues that the arrangement now is able to work on market conditions, as all local craftsmen and SME's has been educated, and therefore the partnership does not need the municipal engagement. However, it is uncertain whether the four energy suppliers are willing to continue the efforts, as they may not be able to agree on a shared policy. The municipality is instead engaged in other initiatives towards home-owners. One is evening-courses for home-owners to be trained as an energy consultants, another initiative is developing Smart Energy-solutions using ICT technology, enabling remote steering and consultancy to the owners.

In the initiative 2100.nu at Østerbro in Copenhagen, the local energy supplier (formerly "Københavns Energi", today "HOFOR") has calculated that the expenses for each saved kWh has been 0.5-0.6 Dkr (0.7-0.8€), which is slightly higher than for their reference price for saving initiatives in general (the average prize for district heating). The reason is mainly that the 2100.nu was a broader campaign, including more themes that cannot all be measured and documented in terms of energy savings, but seen in this perspective the expenses were seen as acceptable. The project won the "Green Cities" prize in 2010, and was awarded by the European Environmental Agency because of its innovative model and large impact in an urban settlement. Because of the positive results, the municipality was considering to implement the model overall in the city. As the campaign was run by one of the ten local Agenda-21 centres in the city it could have easily been reproduced in the Agenda-centres in the city districts. For a number of different reasons this did not happen. One of the reasons was that the energy supplier applied for EU-funding to continue the project, but did not get it. They could have tried a second time, but decided to spend their resources on campaigns reaching a larger part of the population. Also the municipality could have funded a continuation, but instead decided to implement the experiences in their existing policies, e.g. to put a larger focus on energy savings when completing urban regeneration with public subsidies.

In spite of these variations, the results suggests that the direct contact between the energy consultant and the individual home-owner seems to have overcome some of the barriers for private energy-retrofitting, for instance increasing the knowledge about possible solutions, having them described and assessed in economic terms, and suggesting possible financing for them. Some energy consultants say that when they visit home-owners they often also discuss other technical and physical aspects of their houses with the owners, and give ideas on how to solve various problems. Such informal talks help to increase the trust and reliance of the energy consultant, and to pave the way for the home-owner to actually complete the suggestions. An evaluation of the Project Zero stated that the energy consultant's personal meetings with the home-owners had been the overall most important element so far for the achieved energy savings. The difference made by personal visits was also estimated in the project in Ringkøbing-Skjern, where the energy consultant company ScanEnergi (operating in several municipalities, including Ringkøbing-Skjern), stated that 77% of the homeowners they visit completes energy retrofitting projects. In houses where the same calculations on savings potentials and financing is communicated only through calculations on ScanEnergi 's web-site "Husets Energi", 25% of the home-owners decides to implement the suggestions. The figures from the energy savings in figure 1 might be considerably larger, as several energy consultants argue that the documented energy savings represents only a limited part of the actual savings, partly as not all completed projects get their documentation send in, and partly because some home-owners, after the visit from the energy consultant, decides to carry out the projects as DIY-projects or as "black" labour. On the other hand, some of the documented savings could have happened without the visit from the energy consultant, and therefore the documented savings might exaggerate the meaning of the consultant.

### *Strategies and implementation of secondary benefits*

There are, however, a number of other factors to consider in the discussion of the obtained results in the five initiatives. Firstly, as stated previously, the selected initiatives have all been part of overall politics and initiatives, often with broader aims that obtaining energy reductions in private homes, but also to create jobs, upgrade skills in the local labour force, and to give the municipality a green profile, which again is meant to attract potential residents. Therefore, the documentation of the job-creating from the initiatives is as important parameters to document (if not more) than the amount of energy savings completed – see also figure 2.

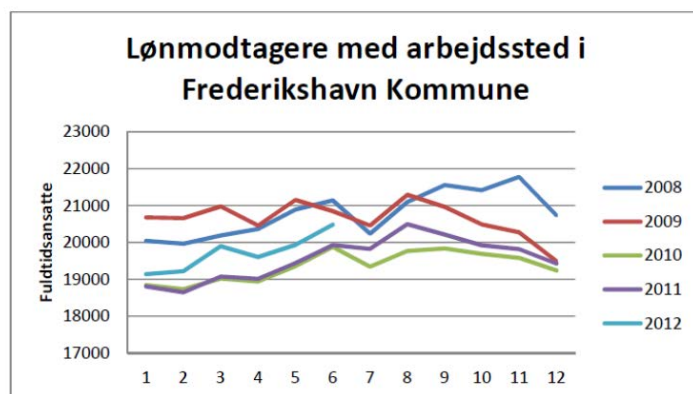


Figure 2. Development of jobs in the Frederikshavn municipality, used by the municipality as documentation for the effect of the initiatives towards home-owners. The initiatives towards local home-owners started by 2012.

Many of those aspects are related to the municipalities being located in peripheral regions, where the initiatives to improve energy performance of private homes fits well in a number of other strategies. Secondly, the initiatives have generated a number of “secondary effects” (Sharp et al, 2011; Bulkeley and Betsill, 2003) or spin-offs, that has generated benefit to the project and the partners involved. One example from Copenhagen is that the 2100.nu initiative resulted in a good collaboration with local housing organisations, where the energy supplier subsequently held courses about insulation of buildings and better management of the heating system for the housing organisations. According to the energy provider Københavns Energi (today HOFOR) this collaboration has been at least as valuable in a future perspective as the documented savings in 2100.nu, although the effects from the collaboration and courses are difficult to document.

As the cases illustrate, the municipality is able to influence energy suppliers on how much they will pay for energy savings, and how they will use these fees; either as direct subsidies to support the energy retrofitting, or as free help to the home owners to get an independent help on initial thoughts and plans, feasibility in terms of potential energy savings, choice of technologies, financing issues etc. As the regulation does not say anything about how the savings amongst end-users are reached, the Danish energy suppliers have very mixed strategies (CM analyse, 2010). This includes for instance the extent to which the focus on homeowners as a segment at all, as many suppliers prefer to focus on larger building owners in order to reduce transaction costs in relation to the persuasion and documentation process. Some energy suppliers have web-sites where home-owners can get information about possible improvements of their home, and the payment they can receive if they “sell” their energy saving initiatives to the energy supplier. Others suppliers have more active policies, for instance in relation to partnerships with municipalities. This opens room for the municipality to seek influence on the way the local or regional energy supplier fulfills his demands for energy savings.

Choosing between different ways to reach the home-owners therefore is not up to the municipalities alone, but needs to be orchestrated with other stakeholders, not only the energy suppliers, but also other actors such as financial institutions and local SME's.

To sum up the possible future of the initiatives towards private home-owners: The statements from the different initiatives seems to suggest three different development strategies: Firstly, the involved actors can remain on the track, and optimize their operations in order to maintain the arrangement as a business case (for instance by focusing on villages and more collective home-owner groups), as several municipalities are considering. Secondly, as an alternative, they can accept that that the business case is less obvious, and add municipal subsidies to the arrangement (for instance to pay the salary of the energy consultant), argued by the secondary benefits obtained by the arrangement. Finally and thirdly, they can decide to change the institutional arrangement in order to save costs, for instance to include similar initiatives in existing institutional arrangements. As argued by van Bueren & ten Heuvelhof (2005), the more the governance arrangements for sustainable cities respects the institutional context in which they are used, the better quality and the higher effect. The decision in the municipality of Copenhagen to integrate climate demands in the urban regeneration schemes is an example on such an institutional change. Finally, as a part of a multi-level governance, the municipalities and regional actors could engage in networks for sharing the experiences from these initiatives, such as Frederikshavn municipality's engagement in "SmartCityDK", where other municipalities in the region can learn from the experiences in Frederikshavn.

## **Conclusions**

The initiatives for achieving energy-savings amongst private home-owners are often embedded in overall climate goals for the municipalities, as well as policies for sustainable urban development. However, an equally important framework and background for the initiatives are policies for the urban and regional development, including issues as developing local competences amongst the industries, creating more attractive settlements, attracting residents to the region and branding the city. Therefore, in contrast to perceptions of international climate networks as being drivers for local climate initiatives, we argue that the climate initiatives are to a much larger extent formulated as a part of local goals for urban and development, linked to the challenges of being a peripheral region. As the cases shows, the initiatives have had a number of other benefits besides the energy savings. This include creating local jobs, enabling people to stay in their homes in spite of increasing energy prices, and therefore improving the settlement strategy of the municipality, creating better relations between suppliers and home-owners, and empowering the local SME's to take up energy improvements as a service, as well as improving the networking across professional competences between craftsmen. We argue that the "back against the wall"-experience in many of the peripheral municipalities is a driver for innovative and ambitious climate initiatives, where however the national and international structures made available (regional funding from EU, saving obligations, carbon markets etc.) are exploited.

The initiatives studied are however fragile and therefore alternative ways to reach home-owners will probably be developed and tested, e.g. integrating initiatives in existing policies, or using strategies that reach a larger array of residents. Furthermore, the initiatives underline the potentials and importance for the municipalities to formulate ambitious climate policies, and to engage in new modes of climate governance.



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