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## **Local initiatives for motivating Danish house-owners for energy improvements**

Jensen, Jesper Ole; Gram-Hanssen, Kirsten; Friis, Freja

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## Local initiatives for motivating Danish house-owners for energy improvements. Extended abstract



Jesper Ole Jensen  
Senior researcher, PhD  
Danish Building Research Institute, Aalborg University  
Denmark  
[joj@sbi.aau.dk](mailto:joj@sbi.aau.dk)

Professor PhD, Kirsten Gram-Hanssen, Danish Building Research Institute, Aalborg University, Denmark, [kgh@sbi.aau.dk](mailto:kgh@sbi.aau.dk)  
PhD student, Freja Friis, Danish Building Research Institute, Aalborg University, Denmark. [frf@sbi.aau.dk](mailto:frf@sbi.aau.dk)

### Summary

Energy retrofitting of existing buildings is a central challenge for national and international climate policies. Although many countries have formulated national goals and policies for this, it is often on a local level and typically in a municipal context that these policies are implemented. In Denmark there are 1.1 million single family houses, representing 44% of all existing dwellings in the country. In this regard, this area is considered to have a huge energy saving potential. A growing number of municipalities have ambitions on reducing energy consumption in these buildings, and several municipalities have established initiatives for this. The paper presents the findings from a survey-based project on local initiatives to encourage Danish house-owners to save energy through energy renovation. The paper outlines actors, governance incentives and experiences related to local renovation-based policies. Based on a literature review on international research regarding home-owners motivations for energy retrofitting, the paper discusses how the municipal initiatives can promote energy renovation of detached housing. Methodologically, the research is based on interviews with municipalities and energy suppliers, whom are considered as some of the major actors to provide energy renovation among private house owners.

**Keywords:** Energy retrofitting, home-owners, single family houses, local initiatives, networks

### 1. Introduction

As for many other countries, national and international climate goals in Denmark turn attention to challenge of retrofitting the existing building stock. In spite of national and international initiatives to regulate and promote energy retrofitting and energy savings, evaluations and studies suggests that there have had limited influence on the actual renovation activity regarding energy retrofitting. Therefore it is interesting to observe that a number of local initiatives are taking place in cities, municipalities and regions to promote energy retrofitting of private homes. Therefore the aim of this paper is to identify and present some of the different local (and mainly municipal) initiative and policies for making house-owners energy retrofit their buildings.

## **2. Methodology**

This paper reports on a broader study of how both Danish local authorities and energy companies work with promoting energy retrofitting of owner-occupied detached housing, however in this paper the focus is primarily on the municipalities. The study builds on document analysis, telephone survey to municipalities and follow-up interviews with 12 municipalities selected out of the 98 municipalities in Denmark. The theoretical part of the study consists of a review of international and Danish literature on house-owners' motivations to carry out energy retrofitting.

## **3. Results and conclusion**

The initiatives launched by the 12 interviewed municipalities include the following core elements:

- Collaboration with energy suppliers on financing energy consultants that meets personally with the house-owner and makes individual reviews, suggestions for energy retrofit and financing plans
- Re-education of local craftsmen to give them more competences in guiding the house-owners towards energy retrofitting, and thereby generate more renovation projects and create more local jobs.
- Establish collaboration with banks and finance institutions
- Initiatives in villages using collective approaches to reach the house-owners

The municipal strategies demonstrate a profoundly different approach to make house-owners energy retrofit compared to the hitherto efforts on a national scale. The municipal strategies seem to fill the gaps reported in research on home-owners motivations to energy retrofit, as the municipal initiatives address many of the barriers for energy retrofitting outlined in these studies, including the direct contact to the home-owner, independent assessment of retrofitting solutions and qualified craftsmen to carry out the retrofit. An important precondition for the initiatives is that they are often embedded in ambitious climate plans and regional development strategies. Moreover, the municipal initiatives have been enabled by national and international regulation, especially the energy saving obligations amongst energy suppliers, but also national education facilities for craftsmen. Another important parameter is that the local housing market in many of these municipalities is dominated by low housing prices, where energy costs take up a much larger proportion of the household budget, compared to the housing market in the large cities, and thereby makes energy retrofitting more attractive, but also makes it more difficult to find external financing for the housing renovation. Nevertheless, the initiatives remain fragile, partly as the business case for municipalities and energy suppliers remains uncertain due to the high costs from contacting the house-owners. Therefore, we will probably see a continuous development and adaptation of these initiatives in the future.

## Local initiatives for motivating Danish house-owners for energy improvements



Jesper Ole Jensen  
Senior researcher, PhD  
Danish Building Research Institute, Aalborg University  
Denmark  
[joj@sbi.aau.dk](mailto:joj@sbi.aau.dk)

Professor PhD, Kirsten Gram-Hanssen, Danish Building Research Institute, Aalborg University, Denmark, [kgh@sbi.aau.dk](mailto:kgh@sbi.aau.dk)  
PhD student, Freja Friis, Danish Building Research Institute, Aalborg University, Denmark.  
[frf@sbi.aau.dk](mailto:frf@sbi.aau.dk)

### Summary

Energy retrofitting of existing buildings is a central challenge for national and international climate policies. Although many countries have formulated national goals and policies for this, it is often on a local level and typically in a municipal context that these policies are implemented. In Denmark there are 1.1 million single family houses, representing 44% of all existing dwellings in the country. In this regard, this area is considered to have a huge energy saving potential. A growing number of municipalities have ambitions on reducing energy consumption in these buildings, and several municipalities have established initiatives for this. The paper presents the findings from a survey-based project on local initiatives to encourage Danish house-owners to save energy through energy renovation. The paper outlines actors, governance incentives and experiences related to local renovation-based policies. Based on a literature review on international research regarding home-owners motivations for energy retrofitting, the paper discusses how the municipal initiatives can promote energy renovation of detached housing. Methodologically, the research is based on interviews with municipalities and energy suppliers, whom are considered as some of the major actors to provide energy renovation among private house owners.

**Keywords:** Energy retrofitting, home-owners, single family houses, local initiatives, networks

### 1. Introduction

As for many other countries, national and international climate goals in Denmark turn our attention to the challenge of retrofitting our existing building stock. The long-term energy policy goal in Denmark is that the energy by 2050 should be carbon neutral. An important precondition for this goal is that the total energy consumption is reduced. As the energy consumption for heating in buildings consists of app. 40% of the total energy use in the country, the energy retrofitting of the existing building stock is at the core of the energy policy. It is expected that coming initiatives (as suggested by the government committee "Network for energy renovation") will eventually lead to a reduction by 35% of the energy use in the existing building stock [2]. In this strategy, the single-

family houses represent a main challenge. Technical calculations shows that in 2011 energy use in single family houses presented more than 50% of the total energy use in the building stock. In spite of national and European initiatives to regulate and promote energy retrofitting and energy savings, evaluations and studies suggests that the actual renovation activity regarding energy retrofitting is still not widespread [3], [4]. Therefore it is interesting to observe that a number of local initiatives are taking place to promote energy retrofitting of private homes, in cities, municipalities and regions [5]. The decentral initiatives are varied, both in type and content, for instance being based on municipal engagement in voluntary agreements on energy savings and CO<sub>2</sub>-reduction in the municipal territory, which not only encourages the municipalities to carry out retrofitting on their own buildings, but also to promote energy savings in the local building stock amongst private house-owners. Besides being local policies with different approaches, they are also important for the national energy supply policy, as it is generally acknowledged that a sustainable transition of the Danish energy system requires a better integration by the state level and the municipal level [6]. However, so far there has been little overview of these local initiatives carried out by municipalities, energy suppliers, financial institutes, SME's, real estate brokers, NGO's etc., and therefore little understanding of the drivers, challenges, and potentials in such initiatives. Based on these insights we are interested in how different municipalities have worked more locally with communication and facilitation of networks of owner-occupiers or with networks of actors around the home-owners. Therefore the aim of this paper is to identify and present some of the different local (and mainly municipal) initiative and policies for making house-owners energy retrofit their buildings, but not to evaluate their success, e.g. in terms of their impact on local house-owners decisions. Although the municipal strategies are not quantitatively evaluated, many of them are referred to as "best practice" in the Danish debate, and thus inspire other municipalities to similar initiatives. The research that this paper is based on [1], had the purpose to collect and systematize the knowledge – empirically as theoretically – generated in the hitherto efforts to promote energy retrofitting amongst private house owners on a local level.

## **2. Theory and background**

In the international research there were for a long time relatively little attention on retrofitting single-family housing, however, recently there have been more focus, probably along with the renewed political interest following from the claimed high potential for energy reductions in many countries (see e.g. special issue of Building Research and Information July-August 2014 [7]). Much policy builds on the claim that it is economically feasible for the individual owner occupier to energy retrofit, however, at least within the German context this has been questioned [8]. Part of the problem is that many calculations on the potential savings built on theoretical assumptions of the energy consumption primarily relating to the theoretical energy efficiency of the buildings, whereas research show that people living in less efficient buildings use much less energy than expected [9] and the potential savings thus also will be considerably lower. The problem might be that there are many different types of homeowners and their interest and resources for doing anything with their home will thus vary accordingly [10]. Several studies have in different ways looked at how information and economy can explain energy retrofitting activities [11], [12], [13]. A general conclusion is that information campaigns just giving more information have little influence and that economy in itself cannot explain why some people energy retrofit and others do not, though in different ways the economic situation of the household and their knowledge of types of solutions can be important together with other things as a which to have a more comfortable home and to do different types of esthetical improvements [14]. This also points towards that energy retrofitting most often is not something that is done just for the sake of reducing energy

consumption, but should be seen in combination with what other interest the family have in their home and the renovation of it [7]. On a European level, research suggests that home-owners involve in retrofitting projects for a number of other reasons than to save energy, and also that major challenges for energy retrofitting are the lack of skilled workforce amongst craftsmen and SME's on energy retrofitting, as well as an absence of public support schemes [3].

Following the insight that owner occupiers and their energy retrofitting activities cannot be understood in a purely individual economic perspective other researchers have pointed out how the energy retrofitting activities can be understood in a practice theoretical perspective [4],[14] where the individual is viewed as someone carrying through activities which are seen as normal in their networks, and which are supported by different structures around the owner-occupier, as e.g. professional building companies with specific knowledge [15]. It have also been argued that to promote energy retrofitting activities among owner-occupiers focus should thus not so much be on the individual households as on the local communities and networks around the home owners [16].

Across Europe, a number of climate-oriented local municipal policies and initiatives have emerged, which has been labelled as "local climate governance"-initiatives [17]. This include a shift from government to governance, where more actors are taking part in the policies, and a collaboration based on networks rather than hierarchies [18], [19], and also giving public institutions new roles where facilitation of networks are more important than traditional regulation through authority. Working with the local area and networks around the home-owners the local authorities becomes a key player, and different relevant roles for the local authorities can be identified. The municipalities can include educational activities, facilitating activities, as well as focus on their own activities and how to change them in a more sustainable direction, or they can focus on a more area-based approach working holistically with many different approaches in the same locality [20]. The municipal initiatives are often embedded in various commitments and agreements on international, national or regional scale. The committing nature of these arrangements has contributed to establishing new types of arrangements and partnerships on energy retrofitting.

### **3. National framework to promote energy retrofitting**

A main policy approach to promote energy retrofitting has been a combination of information and economic measures, with variation between countries on the type and amount of economic measures. The Danish national energy policy has over the last decades included various arrangements and tools to motivate private house-owners to energy-retrofit their buildings. Some of these arrangements are important to understand the municipal initiatives formulated locally across the country in order to promote energy retrofitting initiatives amongst the house owners, in collaboration with other actors:

- *Building regulations*: The Danish Building Regulations has since 1961 included energy demands for all new buildings, with significant tightening of demands in 1979 and 1999. Since 2006 the building regulations has also included demands for energy efficiency when existing buildings are renovated, but so far this part has had limited effect.
- *Energy Performance Certificate*: The Energy Performance Certificate (EPC) was established in Denmark in the 1980ies. Since 2006 it has been a part of an EU-directive on the energy performance of buildings (the so-called EPBD directive). Various evaluations have looked at the

effects of the EPC-scheme, and the general impression is that the scheme only to a limited extent makes house-owners energy renovate.

- *Knowledge center for energy savings in buildings*: The “Knowledge center for energy savings in buildings”, a center under the Danish Energy Agency, was established in 2008 with the purpose to collect and communicate knowledge on practical possibilities to reduce the energy consumption in buildings. The center offers internet-based consultancy, advice and re-education of craftsmen.
- *The Energy saving agreement*: In 2009 an arrangement was made between the ministry for Climate and Energy and the energy-suppliers and –distributers on achieving energy reductions amongst end-users. The savings are documented by a “standard value catalog”, which through a simple on-line calculation defines the theoretical amount of energy saved by different types of improvements of the building or replacements of old installations with new more efficient technologies. It is important to stress, that the savings calculated by the standard value catalogue are theoretical in the sense that they are based on general technical knowledge rather than measurements in real life retrofitting. The calculations, in line with the calculations in the Energy Performance Certificate, is a measure for the energy-technical improvement of the building, measured in kWh on the basis of standard assumptions of the house, the users etc.; studies however show that there is typically a large gap between the calculated energy reductions, and the actual energy savings [21]. The suppliers can choose from different methods to achieve the energy savings amongst the end-users [22].

#### **4. Methodology**

This paper report on a broader study of how both local authorities and energy companies work with promoting energy retrofitting of owner-occupied detached housing [1], however in this paper focus is primarily on municipalities. This part of the study builds on document analysis, a telephone-based survey to municipalities and follow-up in-depth interviews with 12 municipalities selected out of the 98 municipalities in Denmark. The selection of these 12 municipalities was based on previous knowledge on how municipalities work with this field, including a pre-study among 22 municipalities where the selection included a wish to cover both the most and the least active municipalities. The present study thus purposively chose among the municipalities who were most active in motivating homeowners to energy retrofit, and also among those who were most focused on how this could be done in a way including networks and village oriented initiatives. The sample should thus not be seen as representative of all Danish municipalities, but as case-studies of frontrunners among the municipalities. Telephone interviews were carried out with an interview guide focusing on what activities the municipalities have directed towards retrofitting of owner occupied housing and who they cooperate with. Interviews were not recorded, but detailed notes were taken and case descriptions were afterwards approved by the municipalities. Furthermore a study was made among energy companies including a telephone based survey to 11 companies, a focus group interview with four companies and interviews with two other companies. Results from this material are only indirectly reported in this paper which focuses on the municipalities.

#### **5. Findings**

An overview of the initiatives directed towards house-owners by the 12 interviewed municipalities is presented in table 1. The initiatives are overall categorized in initiatives directed towards the individual house-owners (general informative approaches, outreaching approaches or initiatives in villages), initiatives directed towards craftsmen (establishing networks or re-education), energy

consultancy (from the municipality or independent consultants), and collaborative initiatives (energy suppliers and financial institutions). These approaches represents a departure from former “traditional” information campaigns towards house-owners, and addresses thus some of the issues that are raised in the previously referred literature, e.g. lack of competences on energy retrofitting amongst craftsmen, lack of financial support, lack of knowledge and independent advocacy on energy retrofitting.

Table 1: Overview of initiatives to promote energy retrofitting of single-family houses in 12 Danish municipalities. By independent energy consultant is meant that the energy advisor do not have own economic interest in advising the house owner.

Initiatives	Towards citizens			Towards craftsmen		Energy consultancy	Collaborative initiatives	
	General	Outreach	Villages	Establishing networks	Re-education	Independent (!)	Energy suppliers	Financial institutions
Frederikshavn	X	X	X	X	X	X (!)	X	X
Herning	X	X	X				X	
Hjørring	X	X		X			X	
Kolding	X	X	X	X	X	X	X	X
Middelfart	X	X	X	X	X	X	X	X
Morsø	X	X	X	X	X	X (!)	X	X
Skanderborg	X				X			
Sønderborg	X	X	X	X	X	X (!)	X	X
Guldborgssund	X	X	X	X	X	X	X	X
Roskilde	X	X	X	X	X	X	X	
Slagelse	X	X	X	X	X	X		
Bornholm	X	X	n.a.	X	X	X	X	X

### 5.1. Energy consultancy and collaboration with energy suppliers

A core element in the municipal efforts is the use of energy consultants, especially in the outreaching efforts towards house-owners. Typically, the municipalities offer the house-owner an energy review of their house, which is either free or at a reduced price. In some municipalities the energy consultant is co-financed by the municipality and one or several local energy suppliers. As mentioned previously, the Energy saving agreement implies saving obligations for the energy suppliers and thereby creates a market among energy suppliers for energy savings at end-users. This enables the energy suppliers to pay for the energy savings reached through house-owners energy retrofitting. Therefore, some municipalities use this mechanism in collaborating with energy suppliers, so that the energy consultant is financed partly or fully by the energy supplier, and the energy savings that comes out of the energy advisors visits is attributed the energy supplier, thereby helping the company to reach their saving obligations. This is the model being used in the municipalities of Frederikshavn and Sønderborg. The energy consultant reviews the energy saving potentials of the house, and writes a report with suggestions for improvements and for financing of the various retrofitting initiatives. In ZERObolig, a public-private partnership including the municipality of Sønderborg which started in 2010, the energy consultant has visited app 1100 private homes (per summer 2013), and the secretariat estimates that this has led to 250 house-owners energy retrofitting their house, and another 250 house-owners are in the process of energy retrofitting. The estimated investment from the house-owners is a total of app 14 mill. € (100 mill. DKR). Based on the calculations in the standard value catalogue, energy reductions



amounts to app 1.200 MWh. This is, as explained previously, not to be confused with the actual energy savings as experienced by the house-owner. In Frederikshavn it is estimated that the efforts have led to energy retrofitting of app. 500 houses, and theoretical energy reductions on 1.000 MWh in total. In general, the municipality states that the results mainly rely on that the energy consultants have given the house-owners personal, professional and independent advices, as well as holistic solutions, instead of single solutions.

## **5.2. Collaboration with local craftsmen and SME's**

The re-education of local craftsmen is an important element for most municipalities' efforts, as it will give the craftsmen more competences in guiding the house-owners towards energy retrofitting, and thereby generate more renovation projects and create more local jobs. Several municipalities encourages the local craftsmen to join the energy consultant program, a 3-day course, offered by the Danish technological institute, as a part of the national initiative "Knowledge Center for Energy Renovation of Buildings" (as previously described). This will give the craftsmen the title of approved "Energy Guide". This re-education has allowed the craftsmen to perform the final approval of the energy savings, calculated through the standard value catalogue. Other municipalities offer education programs at local education centers. As an example, the municipality of Sønderborg cooperates with the local trade training center (EUC Syd) through "Projekt ZeroByg", which aims at promoting development and sale of energy efficient solutions and create market-based concepts aimed at export. One of the main assignments is to establish and run programs to qualify craftsmen, and to go from single solutions to system solutions, and emphasize the collaboration between different types of skills. The efforts for re-education are often supported by ambitious municipal demands on energy efficiency in new buildings and retrofitting of public buildings. In the Sønderborg-region, 65 % of the craftsmen have now completed an energy-guide education. According to the municipality, the increase in the number of housing renovation projects has further encouraged the craftsmen to take the education. As a part of the re-education, some municipalities have helped to create local networks amongst craftsmen with different skills, in order to strengthen knowledge-sharing and collaboration competences. So far, four difference networks have been established [23]. Some of the experiences are that house-owners are convinced by documentations on payback-times on different energy solutions which the craftsmen learn at the program, as well as they learn how to communicate the "success"-stories from other renovation projects.

## **5.3. Collaboration with other actors**

Financial actors such as credit institutions and banks can play an important role as financiers of the energy retrofitting. Therefore several municipalities have tried to establish collaboration with these actors, to make them aware about the benefits related to energy retrofitting, and to make house-owners aware about the possibility for energy retrofitting when they come to the bank for loans to buy or rebuild their home. The knowledge on energy retrofitting and the possible positive financial benefits related to this is generally limited amongst bank and financial personnel, and therefore various initiatives to increase their knowledge have been made. Many municipalities invite the financial institutes to the annual energy exhibitions and generally the municipalities describes the banks as being increasingly proactive and open in relation to financing energy retrofitting. There are several examples on banks and credit institutions who on own initiative establish favorable loans for energy retrofit for private home-owners, arrange courses to increase energy-knowledge for the staff, or strongly promote energy retrofitting towards local home-owners. In Sønderborg, the municipality has addressed all local banks and offered them courses on e.g.

pay-back times for different energy-retrofitting solutions, or the increased value obtained by an energy renovation of the home. In the municipality of Morsø, the four local banks have been presented for the energy review offered by the energy consultant, which has made them aware about the solutions and logic in the review. This, reportedly, has increased the banks' willingness to loan money for energy renovations of the houses. Also local real-estate dealers have been involved in some municipal strategies, although to a smaller degree, and several municipalities also emphasizes the need for a larger involvement of these actors. The rationale is that the real estate dealers can convince banks as well as house-owners about the value of a higher energy label, especially when it comes to housing trade in the outskirts of the country. With low sales prices and a poor physical condition of the houses, the costs for heating the houses might be the largest post on the budget, and therefore potentially have larger influence on the households' total economy, as compared to the larger cities, where sales-prices are much higher, and energy costs therefore relatively lower.

#### **5.4. Initiatives towards villages**

Most of the interviewed municipalities have initiatives directed towards entire villages, typically on shifting energy supply in the village from individual oil-boilers to Combined Heat and Power supply (CHP), but also in relation to promoting energy retrofitting for the house-owners. The initiatives might consist of meetings for the house-owners in the village, with participation from the municipality, energy suppliers, local craftsmen and local banks, where different types of retrofitting models are presented and promoted, included a free energy review for the house-owners. In other cases, more longstanding efforts are carried out, e.g. by denouncing the village as an "energy village". This concept has been used by a number of municipalities, implying a long-term collaboration between the village, the municipality, energy supplier etc. The character of the initiative and the selection of the villages to participate is typically a result of bottom-up initiatives where active villages contact the municipality, as most municipalities acknowledge that the village-based initiatives on energy retrofitting and change in energy supply should start with an interest and engagement among the residents. This is in line with findings from other studies, emphasizing the importance of embedding the projects locally [3]. The idea with the initiatives in the villages is that it will encourage house-owners to share knowledge, instead of informing each house-owner individually, and thereby also help strengthen local networks and social capital in the village. However, according to the municipalities, one of the challenges is that in many villages in rural areas, the houses are in a rather poor condition, meaning that renovations are rather costly, and a demolition might be a more relevant solution. Also, the residents are often DIY-oriented, meaning that they might have listened to the advices from the energy consultant, but decide to carry the energy retrofit as DIY-work, and in this case the retrofit and the savings are not registered in the standard value catalogue", and therefore not documented.

## **6. Discussion**

### **6.1. Regional dimensions**

As indicated earlier, the municipal initiatives reported in our case-studies are typically embedded in overall climate goals for the municipalities, as well as policies for sustainable urban development. In Sønderborg, ProjectZero, in Frederikshavn, "Energiby", in Middelfart "Grøn Vækst", they all have ambitions municipal strategies of which the initiatives directed towards local house-owners is only one part. And the climate strategies are typically connected to overall-development plans for the municipalities, regarding job-creation, developing local competences,

creating more attractive settlements, attracting residents to the region, branding the city etc. This reflects that several of the municipalities have a location outside the growth areas in Denmark. In these years, we see a strong movement from smaller to larger cities, leaving many municipalities outside the larger cities with declining population rates, an ageing population, falling housing prices etc. Some of the most ambitious municipalities on promoting retrofitting amongst local house-owners, including Sønderborg and Frederikshavn, belong to this group of municipalities. This gives certain conditions for the municipal efforts: Housing prices in these areas are generally low, compared to other parts of the country. 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. On the other hand, the low housing prices and the uncertain future for peripheral regions means that it can be difficult to borrow money to finance the energy retrofitting. According to the municipalities, 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. Part of this reluctance from the local financial institutions is a limited understanding about the value of energy reducing initiatives. Therefore, initiatives to inform financing institutions about the value of energy retrofitting, e.g. through collaboration with the municipality, might prove valuable. This again underlines the important role that the municipality can play in order to improve the local framework for local house-owners to energy retrofit.

## **6.2 Energy reductions**

The energy reductions defined by the standard value catalogue has proven an important element in the strategies for promoting energy retrofitting - however, this also include some challenges. As mentioned earlier, there is often a large difference between the calculated energy reductions and the actual energy savings for the house-owner. There can be many reasons for this: Primarily, the calculations only serves a technical purpose of driving the energy efficiency of the buildings, but are frequently used also as measures for the actual energy savings, but also house-owners might include many other changes in the home than just the energy-saving devices, e.g. expanding the house and adding more space, that might affect the heating bill negatively, as well as change his or her' comfort practices after the renovation. The question is whether this will affect the house-owners post-assessment of the energy retrofitting, and if that possibly will affect other house-owners decisions. Especially, the economic rationales of the energy retrofit, including the involvement from banks and financing institutions, are challenged by this issue. Also, this might affect the municipal climate strategies, as the calculated energy reductions might not be followed by a real decrease in the energy use amongst home-owners. However, the opposite argument is often heard also: That the initiatives leads to more energy retrofitting projects, as residents complete the ideas through DIY (Do It Yourself) or by using the craftsmen they normally use (and not the craftsmen with an energy certificate), which means that the energy saving projects that are actually carried through are not documented by the standard value catalogue, and reported to the authorities.

## **6.3 Benefits and costs of local efforts?**

The direct contact to the house-owners has been a crucial element in the municipal strategies, but it is also a relatively resource-demanding strategy. Especially for the energy suppliers, the involvement in the initiatives towards the home-owners can be an unsecure business-case, and we have seen some examples on initiatives where the design of the initiatives has been changed

due to this. As the regulation does not say anything about how the savings amongst end-users should be gained, the energy suppliers use very mixed strategies [22]. This includes the question if the energy suppliers at all focus on homeowners as a segment for energy reductions, as many suppliers prefer to focus on larger building owners in order to reduce transaction costs in relation to the persuasion and documentation process. As a result of this, many municipalities are increasingly focusing on initiatives in villages, hoping that local knowledge-sharing can make it up for individual visits to the house-owners. The challenges of maintaining a business-case can therefore lead to different strategies [24]: 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, using social media to communicate etc.), 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). Thirdly, they can decide to change the institutional arrangement in order to save costs, and leave it for “traditional” institutional arrangements, for instance to let craftsmen take care of the contacts with the house-owners.

## 7. Conclusions

The municipal strategies demonstrate a profoundly different approach to make house-owners energy retrofit compared to the hitherto efforts on a national scale. The municipal strategies seems to fill the gaps reported in research on home-owners motivations to energy retrofit, as the municipal initiatives addresses many of barriers for energy retrofitting outlined in these studies, including the direct contact to the home-owner, independent assessment of retrofitting solutions and qualified craftsmen to carry out the retrofit. An important precondition for the initiatives is that they are often embedded in ambitious climate plans and regional development strategies. Moreover, the municipal initiatives have been enabled by national and international regulation, especially the energy saving obligations amongst energy suppliers, but also national education facilities for craftsmen. Another important parameter is that the local housing market in many of these municipalities is dominated by low housing prices, where energy costs takes up a much larger proportion of the household budget, compared to the housing market in the large cities, and thereby makes energy retrofitting more attractive, but also makes it more difficult to find external financing for the housing renovation. Nevertheless, the initiatives remain fragile, partly as the business case for municipalities and energy suppliers remain uncertain due to the high costs from contacting the house-owners. Therefore, we will probably see a continuous development and adaptation of these initiatives in the future.

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