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User preferences in Stenløse Syd

- House owners' and tenants' perspective on energy efficient dwellings

CONCERTO INITIATIVE

Class 1

Cost-effective Low-energy Advanced Sustainable Solutions

DTU Management Engineering

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Resume

This report studies the preferences of house owners and tenants in Stenløse Syd (Stenløse Syd) - a new urban development project with low energy dwellings. The aim of the study has been to create more knowledge about aspects that may promote or hamper low energy dwellings in order to develop the market for this type of buildings.

The report is a delivery of work package 1 in the European Concerto project called 'Class 1'. This project was launched on the basis of the experiences of the Danish municipality of Egedal who initiated an urban development project explicitly promoting energy efficient buildings.

The main focus of the study is the target groups that these dwellings have appealed to, and it reports on basic demographic and socio-economic features of the residents as well as their set of motivations to buy/rent a dwelling in this particular settlement, including the importance of the low energy perspective.

The report concludes that the residents generally are very positive towards low energy dwellings, and the low energy requirements posed in Stenløse Syd do not per se seem to discourage any potential buyers. However, the survey also concludes that the environment is just one aspect of choosing a dwelling, and for most residents the environment is not the most important. Therefore the report argues that environmental perspectives by themselves do not work as a motivating factor for most people. Another important point is that the clients develop knowledge and competences about the environment during the building process.

The report confirms the complexity of residents' preferences in relation to their choice of dwelling and to the patterns of moving, and draws some interesting pictures of role of environmental aspects. As this has not been the focus of many investigations, hopefully this report will contribute to the knowledge basis about user preferences and further inspire national and European authorities and other stakeholders on how to support low energy dwellings.

A survey has been carried out among the people initially interested, focusing on how they became aware of the settlement and what their motivations and criteria for buying/renting are. Secondly a survey among the actual buyers as well as the tenants has been conducted to analyse their preferences.

DTU Management Engineering has conducted the study. A large number of interested residents, house owners, and tenants have taken the time to answer a questionnaire, and some have also been interviewed. Key persons from the municipal have also contributed supportively to the study. We wish to thank all of the involved partners for their participation.

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Introduction

Promoting energy efficient buildings represents a key area of interest in the European Union, since the Commission has recently set up the ambitious target to reduce the European energy consumption by 20% by 2020, according to the newest Action Plan for Energy Efficiency (European Commission, 2006). Although much emphasis is put on international and national initiatives to reduce energy inefficiency, large challenges exist in order to realise these ambitions by changing perceptions, preferences and practices among the involved groups - not at least the residents.

In Denmark, most buildings are built after the minimum demands in the building code and only very few low energy dwellings are built. The concept of low energy buildings simply has not gotten hold of the housing market due to historical, political, and economic factors. There has been a deadlock in the building sector, where the building industry has not had any interest in abandoning well-known standards to build low energy, and the clients seemingly has not had the knowledge or motivation to demand low energy dwellings. As an example, the sales manager of Lind and Risør, one of the major Danish standard house manufacturers, explains how the company will not market low-energy houses unless there is a demand from their customers (Bertelsen, pers. comm.) This illustrates how the building industry is driven by customer demands and regulation demands, and mainly, adjust their building designs to compel these demands. This situation represents a widely acknowledged deadlock of supply and demand in the market for sustainable buildings where neither customers nor producers take the lead, since both players are awaiting initiatives from each other (Rohracher 2001, Balslev Nielsen et al 2009). Hence the municipality of Stenløse took on quite a challenge to develop low energy buildings in Stenløse Syd.

The urban development project in Stenløse Syd is one of the first attempts in Denmark to promote low-energy buildings on mainstream market terms. The project is based on the municipality facilitating the process mainly by implementing strict requirements regarding energy performance in the buildings in the area. This involves a markedly different approach than in typical demonstration projects, where such requirements have beforehand been accepted by the involved players.

In Stenløse Syd, the project is reliant on involvement of clients and building professionals on ordinary terms of supply and demand. This project is hence path breaking in the sense that ordinary clients have taken up the challenge of building low-energy buildings. Therefore, while the report from wp2 (Quitza et al. 2009) focuses on the perspective of the municipality as facilitator, this study reports some of the experiences from the process from the perspective of the residents.

There have been constructed a series of low-energy dwellings in Denmark over the past few decades, but most of them have been built as experimental projects using straw, clay and recycled materials. This “deep-green” approach to low-energy housing has not, and probably will not, have any large appeal in the larger population, due to among other things, the huge dedication it takes to build your own house. Since the Stenløse Syd project is targeting ‘ordinary people’, rather than a deep-green segment, it is especially interesting to learn about why these people chose to get involved in the project, and how they have tackled and responded to the energy performance requirements in the area.

Hence the aim of the study is to “*Report on the preferences of the buyers/tenants of the demonstration*

project, including aspects of hampering and promoting low energy dwellings” (Class1 project description).

Stenløse Syd energy requirements

When the municipality of Stenløse (today the municipality of Egedal) planned the Stenløse Syd project in 2001 it was to be the biggest low energy building project in Denmark. 750 dwellings of different sizes and shapes, from privately developed single family houses, to a non-profit housing complex¹, were all to be build to live up to strict energy requirements. Furthermore, municipal institutions such as kindergartens and a centre for the elderly are included.

In the third and fourth phase of the project, which this report is about, the dwellings were to be built based on the requirements formulated in the Danish building code as low energy class 1² (35 + 1000/A) kWh/m²), which is about half of the energy spent in a house built after the minimum demands in the building code. In addition to the demands from the building code, the municipality registered other requirements:

- There must be established a ventilation system for recovery of heat and heat pump.
- There must be established a minimum of 3m² solar panels pr. Dwelling.
- Every dwelling must install a system for intelligent management and surveillance of water and energy consumption. Data from the meters must be forwarded to a municipal server.
- All water from roofs must be collected into an approved facility for use of rainwater for flushing toilets and possibly washing of clothes. Surplus of rainwater will be led to a fascine on the private property.
- Materials that contain PVC cannot be used in the buildings.
- Pressure impregnated wood cannot be used in the buildings.

To be able to set these requirements, it was necessary for the municipality to buy the property in Stenløse Syd and then register easements for the plots, as it was not possible to do so in the local plan at that time. The municipality has hence been the main driver in the project which would never have been realized through ordinary means.

In the report ‘Municipalities as promoters of energy efficient buildings - Idea catalogue for proactive planning practices’ (Quitzeau et al 2009), the process of facilitating the urban development in Stenløse Syd is described and a series of planning and regulations tools are described. The report also includes case studies of low energy building projects from Estonia, Romania, France, and Italy.

General approach

In this study of the residents’ preferences, we are inspired by a multilevel perspective on environmental innovation. A conventional view of technical change is that it is a one-way process of technology transfer (Shove 1998), however, this technology deterministic view of change does not acknowledge the con-

¹ KAB is a customer owned non-profit manager of non-profit housing associations.

² In phase 1. and 2. of the project, the requirements for the dwellings was somewhat lower as formulated in the Danish building code as low energy class 2.

textual complexity of system innovations (see e.g. Geels 2005; Hughes 1993). In large socio-technical systems such as the building sector, innovation obviously implies complex processes of change integrating technical innovations as well as also social and organisational innovations (ibid.). Technology gets a function only in association with human agency and social structures : “Socio-technical systems consist of technology, regulation, user practices and markets, cultural meaning, infrastructure, maintenance networks, supply networks.” (Geels 2005:365).

While the transition of the building sector in Denmark has been very slow to integrate aspects of environment, there are some examples of incremental or radical sustainable changes in such systems. One distinct example is that renewable energy has had a major breakthrough in the supply network, as wind turbines changed from being ridiculed to be a major source of supply as well as a Danish export success. While a large series of very different initiatives and conditions supported this process, the enrolment of local actors to support a market was an important step (Jensen 2003).

One way to conceptualize processes of change in socio-technical systems is to conceptualize these as processes of reordering prevailing networks. According to Actor Network Theory, socio-technical systems should be conceptualized as heterogeneous networks of both human and non-human constituents (Callon, 1986; Latour, 1987; Law, 1992). This conceptualization points to the significance of specific details in the process of change. This draws attention to ever-changing network constellations in socio-technical systems, where existing relations are continually broken up and replaced with new ones. From this theoretical perspective, the process of implementing low energy design solutions can be seen as a process of translation; meaning that certain innovators take a leading role in order to create a platform to change and stabilize new networks (Law, 1992). The process in Egedal can be seen as a process of translation, where the municipality of Egedal has acted out as an innovator and to a large degree succeeded in reordering the existing actor network in order to support implementation of low energy dwellings (Balslev-Nielsen et al 2009, Quitzau et al 2009).

Themes in the report

From this theoretical perspective we have focused on the users as a group of key actors, and this report reviews the low energy dwellings as well as the building process from their perspective. It reports on their preferences and practises as they engage in the process of developing Stenløse Syd as a low energy settlement - some by simply moving in, others by building a house interpreting the requirements.

Instead of seeing the users as one homogeneous group we aim to identify the different motives, conditions, perceptions and visions embodied in the group. Hence the study provides insight into the complex processes of developing contexts, storylines, technologies, skills, etc.

We have explored the process through a series of themes that combined tells the story of the newcomers to Stenløse Syd, and the processes they have gone through. Through the report we try to elaborate on conditions that are particular for Denmark and supplement the analysis with a review of Danish theory on user preferences, moving patterns and low energy projects - in order to inspire strategies of promoting low energy buildings.

Demographics

Who are the new residents in Stenløse Syd and what are their backgrounds? What different family stories have been identified through the interviews?

Motivations

Why did people want to move to Stenløse Syd? What wants and needs did they have for a new home and what drove them to move from their old dwellings?

Environmental profile

Which influence did the environmental profile in Stenløse Syd have on the residents' motivations? Are the newcomers to Stenløse Syd more environmentally conscious than average?

Regulation, production system and industry structure

Which aspects of the regulation and the structure of the building industry have, in the perspective of the newcomers, promoted and hampered the building processes in Stenløse Syd?

Information and involvement

How do the residents in Stenløse Syd experience the (level of) information and the facilitation by the municipality during the process? What advice can be identified in relation to improving the facilitation from the perspective of the residents?

Methodology

The survey has consisted of three phases. An explorative phase in which preliminary interviews were conducted, a primary phase where questionnaires were sent to the different target groups in Stenløse Syd, and the last phase where follow-up interviews were conducted.

At the beginning of the project we were working with a population of more than 500 dwellings in the survey, a number which represented the amount of new dwellings in Stenløse Syd when all the properties were sold and built upon. The process did not turn out as expected and we have ended up with a lower population in the survey than anticipated, as a lot of the properties in Stenløse Syd have not yet been sold. The economic crisis also hitting in Denmark may very well be a key factor, as this have had a severe impact on building projects around the country.

We have supplemented the quantifiable data with more qualitative data from the interviews. Further we have used other contemporary sources from Denmark to mirror our own results. All cites from the survey have been translated from Danish.

Preliminary interviews

In the first part of the survey, we conducted three preliminary interviews to obtain insight into the central aspects of the building processes in Stenløse Syd. The interviews were conducted with three families, who had bought parcels in the third phase of the project. The interviews provided a general picture of the bidding and building processes and some statements that seemed particularly interesting in the class 1 context. Some central statements/characteristics stood out:

The motivations for the clients to build in Stenløse Syd were primarily the opportunity to build a new home, where the residents could decide on the design and the inside finish themselves. The environmental profile was not the main reason for the families to choose Stenløse Syd, but was perceived as a bonus even though the families experienced problems in the building processes.

The families have had a hard time finding building companies that were able to and wanted to build in Stenløse Syd due to the environmental requirements. One family experienced that their building company pulled out of the project after they had signed a contract.

Although the interviewed families were generally positive about the personal contact to the municipality through the project coordinator, they also perceived a lack of dialogue with the municipality - waiting for building permits or getting specific information about which solutions were acceptable and which were not.

Questionnaires

The second phase of the survey consisted of the quantitative measures by three questionnaires directed at the different interest groups in Stenløse Syd. The answer rates on the questionnaires also differ a lot in the different target groups:

1. People who had shown interest in buying property - but had not ended up buying. We contacted 54 people who were initially interested in building, and received 13 completed questionnaires, which is an answering percentage of 27 %.
2. The clients who had bought plots in the area. We sent questionnaires to 42 clients; 3 were returned, as they were wrongly addressed, and 21 of the remaining respondents answered, which gives us an answering percentage of 54 %.
3. The tenants in the social housing estates. We sent 65 questionnaires to tenants and got 17 back, which is an answering percentage of roughly 26 %.

The percentage of answered questionnaires is thus quite acceptable in the case of the house owners, but less satisfying when it comes to the tenants. As most of the initially interested people (that ended up not buying) have no part in the Stenløse Syd project anymore, and might only have had a sporadic interest to begin with, it was to be expected that the return rate would be rather low.

The purpose of the questionnaire surveys were to test statements from the preliminary interviews and provide quantitative information about the newcomers in the new neighbourhood. The questionnaires are not designed in exactly the same way. The questionnaire for clients are longer and more complex than the questionnaires for initially interested. All questionnaires include questions about demographic and socio-economic factors, motivations to buy/rent in Stenløse Syd, and the level of information about the project.

To take the discussion of building low energy buildings on market terms to a more general level, we support the survey with other studies of building preferences, moving patterns and environmental approach in the Danish population.

Follow-up interviews

The last part of the survey was a new series of interviews which aimed both at elaborating on the results from the questionnaires as well at gaining knowledge of how the residents of the new houses experience their house, especially regarding the low energy installations. We have conducted 5 interviews in this phase; 2 with clients, 2 with tenants in the social housing project, and one with the project leader in the social housing project.

The interviews generally support the conclusions from the questionnaire.

Demographics and profiles

In this section we present some basic demographic features of the residents. Further 4 profiles of residents are presented in order to demonstrate some personal stories.

The clients

The clients in Stenløse Syd are with few exceptions well educated couples with one or more children (80%) and a high annual income (19 of 21 households have an income of more than 700.000 DKR a year). We see the same picture when looking at the group of initially interested people (who did not end up buying a plot), even though they on average are a bit older. In comparison, only 18 % of Danish households consist of working couples with children (Kristensen 2007 - 2), but on the other hand it is unlikely that any household without two working adults would be able to afford a building project costing 3-5 mill. DKR. The clients in Stenløse Syd are a little younger and have more children than the average household living in a single family house, possibly due to the fact that few people move from single family houses after their children move away from home. The average age of people living in this type of dwelling has increased over the last few decades (Kristensen 2007).

The houses in Stenløse Syd are bigger than the average single family house of 139m² (Kristensen 2007) as 19 of the 21 houses are bigger than 150m². This follows the trend in house-building where the floor areas are getting increasingly larger. The average size for new houses was 156m² in 2007 (Kristensen 2007) so most of the houses are also bigger than the average for new houses, which might reflect that the house owners have the capital to build big, and that they are building in a part of Greater Copenhagen, where there is space for bigger houses.

The residents

When looking at the tenants in the non-profit housing project in Stenløse Syd it is striking that all but one respondent household consists of only one adult, about half of which have one or more children. This picture differs a little from the Danish average where 54 % of all residents in non-profit housing are single people without children and only 11 % are single parents (Kristensen 2007).

The tenants are less educated than the clients, although most of the tenants (60%) have a short higher education, and they have a significantly lower annual income.

The average Danish non-profit housing apartment is 77m² and only 4 % is larger than 110m², due to a cap limiting the size to 110m² that were issued in the mid 80's (Kristensen 2007). The apartments in Stenløse Syd are 85m² or 100m² and thus larger than average. The size itself might have been an incentive for people to move there.

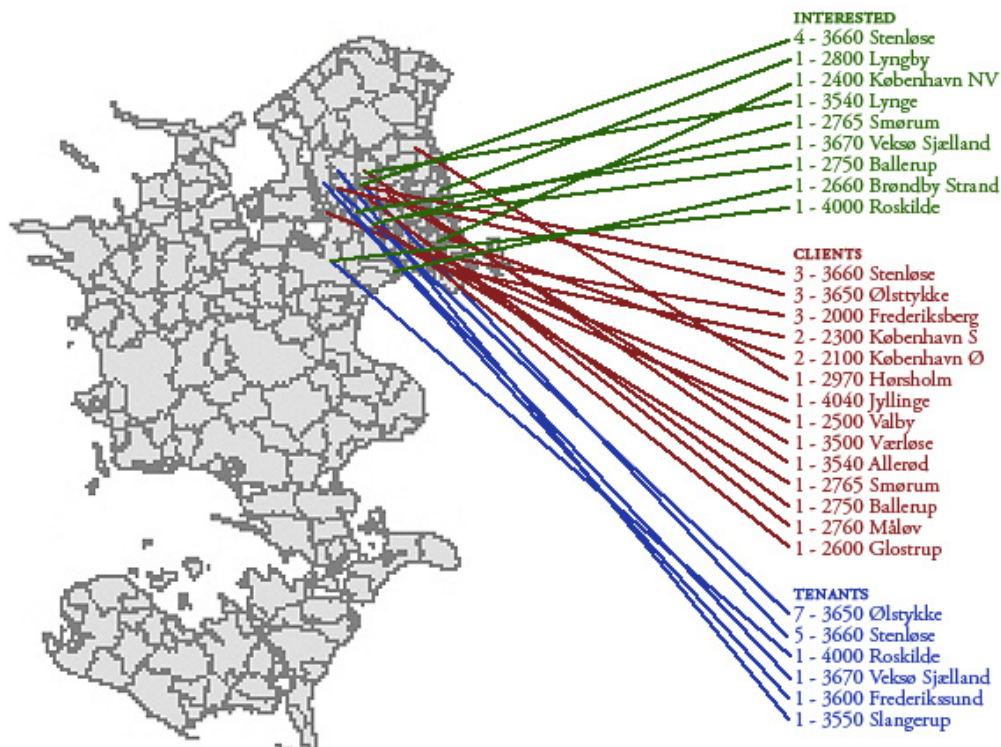
In 35 % of the apartments the inhabitant is older than 50. There are very few young people (20-30) represented in the survey, even though it is normal for young people in Denmark to leave home at a young age. Hence 90 % of all 25 year olds have moved away from home (Kristensen 2007). This might reflect that this group generally has not settled down yet and thus have no need for a bigger dwelling, or can afford it for that matter. It might also have something to do with the fact that Stenløse Syd is rather far away from educational facilities and that the area is not very close to public transportation, which young people tend to prioritize (Haagerup and Ærø 2009).

Generally the Stenløse Syd project can be said to maintain the social geography of the city, even though it is a new residential area. Hence it does not seem to be the deep green segment, which has moved to Stenløse Syd, but rather perfectly ordinary households.

Local newcomers

Most of the newcomers to Stenløse Syd come from the local area as seen illustrated in the figure below.

Former dwellings of the newcomers to Stenløse Syd



This fact is mirrored by the report “Newcomers to new buildings in the municipality of Køge” (Haagerup & Ærø 2009) which concludes that most of the newcomers came from the areas close to Køge and that 40% lived there already.

Profiles

As previously mentioned, we conducted interviews with four of the new inhabitants in Stenløse Syd. The respondents were selected for interviews as they had many of the common characteristics from the questionnaire, but also serve to show the different stories, attitudes and perspectives among the newcomers in Stenløse Syd.

Karen (tenant in the non-profit housing project in Stenløse Syd)

Karen is a single mother in her thirties with two children. She has recently been divorced and has therefore been forced to move from her former dwelling, a single family house in Stenløse, where her former husband lives at the moment while they are trying to sell it. Karen says that she has temporarily rented an apartment in Stenløse Syd because it was in the local area and available when she needed it.

Thomas (tenant in the non-profit housing project in Stenløse Syd)

Thomas is 61 years old, disability pensioned and single. He moved into Stenløse Syd from another rented apartment in a neighbouring city (Slangerup), where most of his family lives. He chose to move because of the condition of the former building and the high costs for heating and hot water. Thomas says that he chose to rent an apartment in Stenløse Syd mainly because of the environmental profile and the location.

Kasper (client in Stenløse Syd)

Kasper is 37 years old, and married with two children. He and his family have lived in Stenløse Syd since oktober 2008, when their house was ready. They moved out of their old home (in the neighbouring town of Smørum) mainly because of lack of space after their children were born. When they looked for a new dwelling they prioritized more space and low maintenance. Therefore they ended up buying a plot in Stenløse Syd and started to build themselves. The environmental requirements did not play any significant role for their choice, and they consider themselves as an ordinary family when it comes to environmental concern, and action, in general.

Flemming (client in Stenløse Syd)

Flemming and his wife are in their thirties and have two children. The family has been living in Stenløse Syd since March 2009. They moved from their old house (in Jyllinge, a neighboring town) because the maintenance was too much for them, and choose to move to Stenløse Syd mainly because of the price of the plots. It also meant a lot that there are a lot of other families with children in the area and that they do not have to spend a lot of time maintaining their new home. The environmental profile of the area did not play a significant part in the choice of the area, but according to Flemming they would probably have built low energy anyway, as the family has had positive experiences with alternative energy-supplies from their former dwelling.

Motivations

Newer research indicates an increasing diversity of priorities and arguments connected to the choice of dwelling due to both material and cultural emancipation. Today there is a multitude of understandings of how the good life is supposed to be and with that of how the good dwelling should be (Mazanti et al 2004). On the other hand single family houses are the most common type of housing in Denmark (42 %). The single family house is also the preferred form of dwelling for a vast majority of the Danes (Kristensen 2007). When asked, house owners focus on the opportunity to decide how their dwelling should look and to decorate the home and garden. In a survey made by the Danish Building Research Institute in 2001, 88 % of home owners, and people who expected to be home owners in 5 years, said that a central element of owning their own home was to be able to handle the dwelling freely (Kristensen 2006).

...for moving

" [I choose the apartment] ...because it was the only place that was vacant. I needed a place to stay. I had rented a place at a couple of friends and urgently needed a place to stay within 14 days ... for me it is only a temporary dwelling, but my children have become very happy about it. I had not thought that I would still be living here by now." (Karen, tenant in Stenløse Syd)

The stories of moving to Stenløse Syd include moving from another dwelling, and the motives for moving are an important part of the process. Hence many of new residents in Stenløse Syd were "forced" to move from their former residence.

The clients mention lack of space (71%) as the deciding factor. This is probably because almost all the clients in the survey have young children. A reason which is also seen in the municipality of Køge, where the 30-39 years old typically have moved from an apartment to a single family house because of family increase (Haagerup and Ærø 2009).

The main reasons why tenants moved were firstly divorce (41 %), which accounts for most of the single parents in the apartments, secondly, the wish to move to a new apartment (29 %), or thirdly, the wish to move into a smaller dwelling (24 %) which accounts for the older, single people with no children living with them.

Thus, in the interviews it was evident that the newcomers to Stenløse Syd (both the tenants and the house owners) have moved because of significant changes in their lives or dissatisfaction with their old dwelling, and not mainly because of the positive aspects of the new dwelling. This corresponds with known literature about moving habits, which claims that people will rarely move if not induced by their current living conditions. Moving has social, economic and personal costs which have to be weighed up by the gains of the new residence (Ærø 2002).

...for choosing Stenløse Syd

The foremost reasons that people became aware of the settlement were through the homepage of the municipality or other websites, advertisements in papers etc. and through friends. When looking at where people got their information from, it is important to note that most of the newcomers to Stenløse Syd were actively looking for a new dwelling, and that they may have had a more active approach to gathering information than other people.

“We did not have many alternatives, if it were to be reasonably close to Copenhagen, with a fair price, the plot of a fair size etc.” (Kasper - Client in Stenløse Syd)

Since 1993 the price of single family houses has risen continually in most of Denmark, but especially in the large cities and their suburbs. Even though interest rates have fallen and real income has increased in the same period, it has been more expensive for first time buyers to acquire a single family house - especially in greater Copenhagen where the average increase in price rose by close to 45% from 2000-2005 (Kristensen 2007) The rise in prices has not diminished the fact that dwellings for many people are seen as social markers where you show off your success to the outside world. In Stenløse Syd, 52% of the clients in the survey state that the price was the main reason for choosing the area. The Stenløse Syd project made it possible to realise their dream of a new single family house near Copenhagen.

It is to be expected that the amount of work and effort put into the building projects in Stenløse Syd will contribute to a mental anchorage to the dwellings. Through the personal imprint on the planning and construction activities the clients get an emotional connection to their houses, and the dwelling is transformed to a home (Bech-Danielsen 2006). The dwelling is not just a physical space, but a home with networks in the local community and the history of the families embedded. When generalising over the clients' answers and the interviews conducted with them, it seems that the motivation for choosing Stenløse Syd can be summed up to “the possibility to build the house of our dreams”. Some perceive the energy requirements as a bonus, as they consider that their house will be prepared for the future. Others have seen them as a hindrance as they made the projects more expensive. However the environmental profile has not been a central factor for the clients when buying plots in Stenløse Syd.

“It [the environmental profile] did not play a significant role. Of course we thought about it, that it would be a low-energy house and that we would probably get a cheaper heating bill. It was not the primary motivation.” (Kasper - Client in Stenløse Syd)

The tenants

A large share of the tenants in the survey (71 %) find that the most important motive for them to move to Stenløse Syd was the opportunity to move into a newly built apartment. Newly built apartments are associated with more comfort, better facilities and less maintenance, elements which are typically prioritized by people over 50 that are moving (Haagerup and Ærø 2009). It is also worth mentioning that the Stenløse Syd project is the first expansion of Stenløse in more than 20 years, and as most tenants are local, and as 47 % say that “the wish to stay in the area” was their main reason for choosing Stenløse Syd, it may have increased the interest for the project a lot. Hence, the fact that the supply of new dwellings has risen might have had a significant influence on the decision to move in the first place.

Regarding the environmental profile, the tenants seem to be have weighted it differently.

“I do not think that I would have moved here if it did not have the environmental profile. You see I am moving away from Slangerup, mainly because of the heating and hot water, the environment and CO2. If it was not because of the environmental profile I do not think that I would have moved from Slangerup. In that case I would have moved to something else.” (Thomas - tenant in Stenløse Syd)

Thomas states that the environmental profile have been the deciding factor for choosing Stenløse Syd, even though other factors also play a big role, i.e. location, new building and so on. It does not seem to be the general picture, and in addition the motivation for moving in the first place seems to be disconnected from the choice of the new dwelling.

The non-profit housing market in Denmark is in general facing challenges as they to a large extent have become social housing projects with the consequence that few “normal” people move in, and thus have a tendency towards the formation of ghettos. This does not seem to be the case in Stenløse Syd. The explanation might be that the interest for the apartments has been relatively high, and that the apartments are rather expensive. Further, the Stenløse Syd project is attractive because of the location and the fact that the apartments are new.

It seems quite clear that the special environmental profile of Stenløse Syd was generally not one of the main motives for the respondents, especially not for the clients. Concerning the clients, it is more likely that they bought plots in Stenløse mainly because they were rather cheap compared to other plots in Greater Copenhagen. Furthermore, many of the respondents were used to the local area and wanted to stay. The locality seems to have played a rather big role for the newcomers to Stenløse Syd, even though it is not prioritized that high in the survey. Most of the newcomers come from the municipality of Egedal and thus have some kind of relation to the local area. The personal network of family, friends, institutions, and so on gives the individual anchorage in the local area, where a big part of the individuals biographic projects have been played out.

The Environmental Profile

“People don’t live here because of the environment; I don’t think anyone does.” (Karen - tenant in Stenløse Syd)

“You bet it was because of the environment I moved out here. I chose it because of that...When I saw this building and everything, I liked it right away. And I thought “my god, if I could only get out there”. And it did not take me long to decide.” (Thomas - tenant in Stenløse Syd)

Although there are noticeably different attitudes towards the environmental profile, the general response to the energy requirements in Stenløse Syd is positive. A big majority of the people related to the third and fourth phase of the Stenløse Syd project (92 %) are positive about the municipality’s decision to enforce environmental standards in the settlement. In a similar survey from the first two phases of the project, 84 % of the respondents answered “yes” to that the municipality should influence the market to build environmentally sound dwellings (Egedal Kommune 2007). This is consistent with the results from the report about newcomers to new buildings in the municipality of Køge, where more than half the respondents agree that the municipality should enforce that new buildings are environmentally correct from the beginning (Haagerup and Ærø 2009). Half of the respondents in the Køge survey also state that they will pay a little more for an environmentally correct dwelling if the monthly expenses for electricity, water, and so on are reduced. Just as interesting is it that 65 % of the newcomers say that they to some or a high degree agree, that they do not know how or whether low energy dwellings influences the price on the dwelling and the following operating cost (ibid.) This could point towards increased information on long term cost efficiency as a means of promoting energy efficient buildings.

A large amount of the respondents in the Stenløse Syd survey (47 % of the tenants and 76 % of the clients³) say that they are conscious about the environment, and more so than an ordinary family.

These statements need to be viewed in a critical light.

It is more likely that the respondents underestimate the environmental consciousness of the general population, than they themselves are more conscious than average. In comparison, the report “Are we taking responsibility for the environment? - the knowledge, attitudes and behaviour of the population (Sørensen et al 2006 - 2) shows that 99 % of the respondents think of themselves as persons who take care of the environment in their everyday life. 79 % says that they do this most of the time or always (ibid.).

Furthermore, it is also evident that there is a clear difference between viewing yourself as eco-friendly and acting in an eco-friendly way.

“A massive majority has a very friendly attitude towards the environment, 97% find it important or very important to take care of the environment. But the more we zoom in from this general point of view onto the personal obligation towards a specific act - the less we have left. When the obligation exemplifies as

³ The rather big difference between tenants and clients might have a methodological reason as the answering options for the question were different. The tenants only had three options (conscious, neutral, critical) while the clients had four (very conscious, conscious, neutral, critical).

“always buying environmental labelled products, when it is possible”, only 67 % are left. Though, it is still a significant majority that declare them self willing to buy environmental labelled products if the possibility is present. The question is what meaning the respondents ascribes to the word “possibility”. None of today’s environmental labelled products have market shares close to 67 %.” (Sørensen et al 2006 -2)

The environmental profile seems to have inspired the tenants’ choice of Stenløse Syd more than it did the clients, as it does not seem to have had any significant influence on the choice to move to Stenløse Syd for the majority of the clients. The general opinion towards personal engagement in environmental issues seems to be that it is fine to act on behalf of the environment, as long as it does not mean that you have to lower your living conditions and/or pay too much for it. This is consistent with the conclusions in the report “The knowledge, attitudes and behavior in relation to the climate question in the Danish population” (Sørensen et al 2006), where the respondents generally are very positive about initiatives which can reduce or limit the global warming, but less so when it comes to initiatives which will have cost for the individual, economical or in the form of sacrifices in general (ibid). When choosing their new dwellings the environmental profile has been viewed as a bonus, but has not been the main factor for choosing Stenløse Syd.

Clients

According to one of the interviewed clients in Stenløse Syd, the main concerns when building their new homes have been about the interior details of the house, rather than the energy performance.

“As a client you do not think much about the environmental requirements ... When you are building a house you are primary thinking about how the drawers and the cupboard doors should work and that the bedrooms for the children should be large enough. You do not think about the other stuff, so I think it is fine with these requirements ... [We would] probably not have built a low-energy house if it had not been a requirement. We might have put up a solar panel, but I am not even sure that we would have done that, because we did not have any previous experiences with solar panels. I think it is fine that a public authority tells us that we have to build in certain ways.” (Kasper - client in Stenløse Syd)

When asked if they would build low energy if they were to build a new house Kasper answered “absolutely”. It could seem as if one of the big problems facing low-energy buildings to become more popular is that the energy performance of the dwelling does not make very much sense for the clients (and possible consumers in general). They lack competences for making choices concerning energy which seems to be far more complicated for clients than the look of the kitchen or bathroom. However, it is interesting that the process of building low energy seems to have changed the client’s attitudes towards the concept; previous experiences with low energy technology seem to have significant influence on future choices, as the clients are much more positive towards building low energy than before they built.

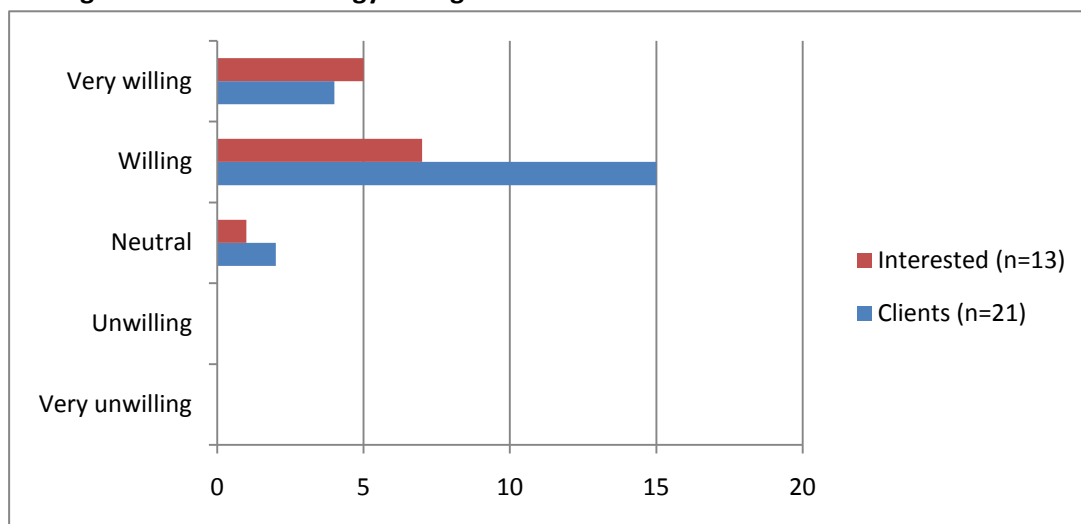
One might question the clients’ positive attitude towards low energy projects (38 % say that they would probably or certainly have built low energy regardless of the requirements and 33 % says “maybe”). At least from the interviews it seems that low energy would have been interpreted in another fashion by the private clients, and mainly prioritised with basis in economy rather than the environment. When looking more thoroughly at the questionnaires and after conducting interviews with a few of the clients,

it seems that newcomers' definition of low-energy varies a lot and is hardly comparable with the formal low-energy class 1 requirements in Stenløse Syd.

“Then we would not have been categorized as low-energy class 1 ... and we would not have had any focus on the exact density... but rather that the running costs should be as low as possible.” (Flemming - client in Stenløse Syd)

Hence, building low energy buildings can mean a wide array of solutions, which does not necessarily meet the requirements that have been fashioned for Stenløse Syd. There is also a high degree of willingness to invest in energy saving measures although the interest for the solutions has been rather low. This could signify a slight indifference towards the environmental profile of the individual dwelling. In the questionnaire only a few of the 21 clients have answered that they have been interested in the energy-saving measures, compared to other parts of the building project.

Willingness to invest in energy saving measures



In the building projects it seems like the environmental requirements have been met, but nothing more. The energy consumption has, for most of the clients, been a low priority subject, where the demands dictated the level. Only a few have reflected upon the possibilities of making the house use even less energy, and in those cases it seems that it was mainly because of the possible economic advantage.

Furthermore, when looking at the sizes of the houses built in Stenløse it is obvious that the energy consumption is not a main priority. The 'Class1 measure' relates to the use of energy per m² and not the total consumption. A house uses more energy the larger it is and one of the easiest ways to save energy would have been to build smaller houses. One might subscribe this to lack of information about the connection between house size and energy consumption, but it seems more realistic that one of the motivations for building a new home were to have more room and that this factor has had priority over the environmental concerns.

Tenants

The project leader on the non-profit building project has a clear impression that other factors meant

more to the new tenants' choice of the dwellings than the environmental profile.

"I think that many of those who move into our buildings do so, because they need a new dwelling - of one reason or the other. My impression is not that it [the environmental profile] has had a crucial significance...Most people say "what is the rent?", and if it is more expensive to make sustainable building projects, people choose something else." (Project leader on the non-profit building project in Stenløse Syd)

The tenants in the non-profit housing project generally seem satisfied with the environmental profile and some have even stated that they chose the project because of it. Hence it seems rather unproblematic to initiate environmental projects when it comes to non-profit buildings. The tenants were positive about the environmental profile before they moved in and view it as a bonus in the long run. It is worth mentioning that they have taken less initiative in regards to gathering information about the environmental requirements in the project than people interested in building in the area. We may point to the possibility that the tenants say that the environmental profile is seen as a bonus because it does not imply any restrictions, barriers or costs for the tenants. The main problem is that the rent for the apartments is rather expensive. If low energy dwellings are to be promoted it seems to be essential that they are cost competitive with ordinary dwellings. People are seemingly not willing to pay more to live in a low energy dwelling per se and hence a fruitful strategy for marketing low energy dwellings is more information about the savings on living expenses.

Most tenants have chosen the apartments because they wanted something new and nice to live in, but it seems that some tenants found the low energy aspect of the dwellings important when choosing the area.

It is clearly the environmental profile out here [that was important for the choice]. That is actually why I chose it. I would rather pay a bit more in rent and less for heating and water. And in addition, that the insulation is tiptop and so on. And that you can see how your expenses will be in the long run, when it comes to heating and hot water." (Thomas - inhabitant in the non-profit building project in Stenløse Syd)

In addition it also became obvious during the interview that Thomas was very unsatisfied with his old apartment and had a family in the neighbouring town which bound him to the area. Hence, even though the environmental profile probably played a bigger role in his choice than for many other tenants, his choice was influenced by a series of other factors. In Thomas' case it might have tipped the scale from choosing a new dwelling in Slangerup (the neighbouring town), but it seems to be an exception from the rule, that the environmental profile has this large an impact.

The non-profit housing project and this survey on the tenants preferences have been hampered as the entrepreneur went bankrupt during the building process. This means that the building project is not finished yet. In both the questionnaire and the following interviews there were complaints about the condition of the KAB-project. Some of the apartments are unfinished and the area around the buildings is still not ready for use.

Both clients and tenants say that living in their new low energy homes is mostly like living in any other dwelling. From the interviews it seems that the environmental profile of the new dwellings has had some impact on the general behaviour of both clients and tenants. Consumption of water and waste separation is some of the new behavioural patterns mentioned by the tenants in the interviews. None of the participants in the interviews have lived in their dwelling long enough to have a clear image of their energy consumption, but the conception of how much the energy measures mean for the consumption differ a lot. Some say that they expect to pay much less while others state that it does not seem to make any difference for their consumption.

Resume

Generally it seems that the newcomers in Stenløse Syd like the environmental profile, but are not particularly interested in doing something extra to spare the environment if it is not economically rentable. Even people, who seem to be very environmentally conscious, focus more on the economic aspects of low energy dwellings, than the broader sustainability aspect. The newcomers generally seem positive about the environmental improvements in their new homes even though many would not have prioritised them had the municipality not set up the requirements and some even say that it was a barrier for their project, especially since the building companies seemed unprepared for building low energy dwellings when the clients began their projects.

Regulation, production system and industry structure

In the report "The building industry of the future in a globalization perspective" from 2009, the authors conclude that there are alarmingly few documented total solutions that are environmentally sound, and that *"there is an urgent need for solutions that the market cannot deliver"* (Fuhr 2009:45). Furthermore, the report stresses the importance of implementation of the idea of sustainability in legislation, as the building sector rarely builds more energy efficient buildings than demanded in legislation on a voluntary basis. The projects in Stenløse Syd seem to have been marked by this trend, as clients have had significant challenges with their building projects due to the special requirements in Stenløse Syd. On the other hand it seems like the process has encouraged some building companies to start working with low energy housing.

The building companies

A majority of the private building projects in Stenløse Syd were built by Danish companies and most (71 %) by standard house companies. A single house has been built by a German company and in an interview with the owners it became obvious that this company was a lot more experienced with building low-energy dwellings than any of the Danish companies they had been in contact with. It seems that a lot of Danish building companies did not (and probably does not) have the necessary experience to build low energy class 1 houses. Two thirds of the clients have been in contact with one or more Danish building companies, which did not want to build in Stenløse Syd due to the environmental demands. In addition, some of the companies who ended up building in the area have been unwilling to make changes in their standardised products.

"They [the building company] were not very willing to change the passive installations - that is windows, insulation and the whole construction. Those parts they were very unwilling to change." (Kasper - Client in Stenløse Syd)

The municipality of Egedal met its largest challenge when almost all of the clients wanted to implement floor heating in their new dwellings. The clients simply could not perceive how you could build a modern house without floor heating and the municipality had not foreseen this in the energy cost-effectiveness calculations for the dwellings, which had been used in the sales material for clients.

In the end the municipality of Egedal resolved the problem by holding a public meeting where clients, building companies, and the technical experts from the municipality found common ground and succeeded in making solutions, which permitted floor heating without becoming too expensive for the clients. It seems important that the low energy dwelling live up to the same demands and have the same functionality as the standard on the market if it is to compete on market terms. In an interview with a tenant in one of the non-profit apartments, missing floor heating is also mentioned as a shortage of the dwelling.

"I do not understand why they have not made floor heating, there is not even heating in the bathroom, below the quarry tiles." (Karen - tenant in Stenløse Syd)

Thus, it seems to be important to be aware of the comfort-related demands of one's contemporaries,

when planning low-energy projects, as they can have crucial significance for the success. If the dominant perceptions are to be challenged, at least other qualities must be presented as just as attractive.

The non-profit project

The non-profit housing project made by KAB experienced that there were fewer building companies willing to build than usual. In an interview with the project manager from KAB it is also mentioned that the building industry has had no incitement to think in low energy products. For example the KAB project had trouble finding doors and windows, produced in Denmark, which met the requirements. According to the respondent the very busy building before the economic crisis caused that the demand for ordinary products was sufficient for the industry, but that they are beginning to see the advantages of low energy products, as demand is falling. In regards to the non-profit project in Stenløse Syd, it is important that the project manager notes that it is not more expensive to build low-energy buildings in a non-profit housing perspective, as it is possible to stay within the maximum sum that can be used pr. m² on non-profit buildings. Stenløse Syd has according to the project manager been a forerunner for future building projects, as Stenløse has shown that it is possible.

Low energy requirements

Building companies have generally had little incitement to develop low energy solutions, as most clients do not see how building a low energy dwelling would be an advantage to them and therefore does not demand these solutions. It is solely because of the demands from the municipality of Egedal that the dwellings in Stenløse Syd have been built as low energy dwellings. When the Stenløse Syd project was initiated, it was not possible for the municipality to set demands for energy efficiency in building projects. Today, municipalities can regulate energy standards in the local plans; though this does not necessarily mean that we will see more projects like the one in Stenløse Syd as it needs both political and organizational backing.

Most of the building processes seem to have been hampered by the environmental requirements as most (86 %) of the clients agree or strongly agree that they have had significant challenges in their building process due to these. The main reason seems to be that the involved building companies did not have the experience to build this sort of dwellings at the time. In some of the interviews it was mentioned that the building companies viewed the projects in Stenløse Syd as an opportunity to develop low energy houses as a long term investment. They also mention that it might be getting easier to build low energy dwellings as more companies embrace the concept and develop solutions that fit low-energy requirements. The building projects in Stenløse Syd has meant that a lot of building companies and their craftsmen have needed to learn and familiarise themselves with new building methods. Thus, the Stenløse Syd project has contributed to a development in the socio-technical system of the building industry, as several building companies and producers of materials have developed low-energy products. In due time, this might mean more standardisation in the production of low-energy dwellings and materials, and thus reduce the costs significantly. The role of the municipality has been central to the whole project, but especially to force building companies and clients into getting experiences with low energy buildings. Without the special requirements in the area there would hardly have been made any houses that matched energy class 1.

Information, involvement and satisfaction

There is generally a high degree of satisfaction with the information level regarding the environmental demands in Stenløse Syd. About half of the respondents were satisfied with the information, and with a percentage of unsatisfied respondents below 10 %, the information level seems to have been satisfying for those respondents who sought information from the municipality, though it is worth noticing that not one respondent answered that he/she was “very satisfied”. In addition there has been quite a lot of dissatisfaction with the municipal management of the project.

“The municipality was not in control of the situation at all. They have made all these demands, but the tender documents were more a misrepresentation than guidance.” (Flemming - client in Stenløse Syd)

The municipality of Egedal has put a lot of effort into informing about the special environmental requirements in Stenløse Syd. The municipality has gone far beyond the local plan and the tender documents, probably because the many new aspects of the project required extra municipal attention. Most clients, on the other hand, have not perceived the information as very useful.

“The only information we have received is the tender documents that say something about the local plan, and some other documents about pressure impregnated wood and environmental solutions. But it was not very much and it was written in very general terms. There was no specific information that we could use.” (Kasper, client in Stenløse Syd)

In the follow-up interviews it became obvious that the attitude towards the information level depends greatly on how the clients viewed the role of the municipality. Some find that the energy requirements were enough and that the rest should be up to the clients and their building companies. Others claim that the municipality should have played a more active role in the whole process, for instance they emphasise the dialogue meetings held by the municipality as very productive and as a method that could have been used more extensively.

“I think that it is fine that the municipality makes the general guidelines and after that it is up to the client and the building company to find a solution. I do not think that they need to do any more.” (Kasper, client in Stenløse Syd)

It is hard to say how much influence the information material, from the municipality, have had on the clients and their building projects. It seems that quite a lot of the advisory information material have served to confuse the clients rather than help them, as it have not always been in accordance with their view of the process. Some clients have complained that many of the building companies suggested in the material would or could not build low energy class 1, and many of the suggested solutions for reducing energy consumption was not available or did not live up to the requirements after all. The information which the clients would have liked during the process is mainly about different concrete solutions and how they were to be implemented. Another wish is about practical advice concerning for instance how much space the heating system takes up and how much noise the water system and ventilation

makes. In an interview the respondent said that he would have build a shed outside for all the installations if he had known in advance how bothersome they would become.

Later in the process there has been a great deal of frustration with the lack of information from the municipality about the state of the building project as a whole. This is mostly because the technical solutions (and requirements for these) have been changed during the process. The clients in Stenløse Syd currently seem a bit unsatisfied as only a few plots have been built upon and the rest are dormant. In addition, the clients fear that the municipality of Egedal has been forced to postpone the building of roads, parking lots and so on because of lack of income from the sales. (www.raadyrleddet18.dk)

Ambassadors

It seems clear that a large majority of the clients in Stenløse Syd are much more informed about energy saving measures than before they bought the plots. The process of getting building permits, negotiating with the municipality and the construction company, and choosing specific solutions have, even though it for many of the respondents have been frustrating, given them new competences when it comes to low energy building and may have been a strong promoter of environmental consciousness.

This is especially interesting as there has been a peer-to-peer advisory process in Stenløse Syd. A family who built their house in one of the first phases of the project, has taken the initiative to make a public discussion forum (www.raadyrleddet18.dk), which has served as a hub for information about Stenløse Syd, low energy dwellings, and building processes in general. The forum has 63 users who have posted 1840 contributions to different topics. The forum is particularly interesting as clients of the third and fourth fase of the project have been able to get advice from the clients from the first two phases and to discuss different solutions among themselves. It has also served as a tool for coordination, when the clients have found that the municipality made changes in the project, which they thought did not seem fair.

Even though the tenants in this survey have not been through the same process as the house owners, they still serve as promoters for the project. In an interview one of the tenants emphasized that people were surprised to hear about his small energy bills, and that he took pride in informing family and friends about the advantages of low energy housing.

"...I tell everybody that it is 2015. You can call it construction of the future. I use a great deal of time telling family and friends about the energy savings. I speak proudly of it and ask everybody what they pay for their heat compared to me. I pay 100 DKR on my heating bill." (Thomas - tenant in Stenløse Syd.)

Thus, if standards are satisfactory, it seems that the inhabitants can prove to be a valuable means of information and promotion for low energy housing. Incorporating the inhabitants/users as ambassadors of low energy housing might be a strategy worth exploring.

Involvement

It does not seem as though there has been any significant involvement of the clients during the process of planning. Only one of the 21 clients in this study says that he/she has been involved some in the de-

velopment of the Stenløse Syd project in general. The dialogue meetings with the municipality have in their perception mainly been informative meetings where the clients could ask questions, but not influence the process.

In relation to the concrete development processes only 2 in 21 say that they have been active in selecting technical solutions for their house, whereas the rest have had the opportunity to choose between different options as presented by the building company (43 %), or no influence on the technical solutions (43 %). Hence, the development processes, even though they have been important for the clients, have mainly been taken care of by the building companies. This might also reflect that few of the clients have had the competence to pick specific solution themselves, and, even though most were interested in the processes, choices have relied on advice from their building companies. This is not to say that the clients have been completely alienated from their own building projects, but rather that they have been less involved in the technical solutions than designing and furnishing their new dwellings.

One of the interviewed clients mentioned that the process could have benefited from more cooperation between the clients and the municipality and collaboration between the clients themselves. Collective research, development and implementation of solutions could have contributed to reducing the frustration for the individual client and collective low-energy measures such as a central heat supply could have helped to strengthen the environmental profile.

Satisfaction

The degree of satisfaction with both the process and the actual dwellings vary a lot, both among tenants and clients. It is hard to say if the disagreement about the process has something to do with the concrete processes, different expectations, or just different attitudes towards the concept of a new dwelling. Both the interviewed clients are currently having problems with the use of their heating systems, as it is rather complex to handle.

“The heat pump, wow - you need an extended janitorial degree to adjust and use it. I have a lot to learn and a lot to acquaint myself with.” (Flemming - client in Stenløse Syd)

Even though both clients find it hard to understand how the heating system works, they do not view the general building project in the same way. Their attitudes towards the results of the low-energy building projects are very different.

“Well - the system does not work properly yet, and I do not think that it will. I am rather disappointed regarding our overall economy, both the investment and the day to day running.” (Flemming - client in Stenløse Syd)

Flemming is especially disappointed as the costs for heating and hot water in their new house seems to be the same as in the old one - an old leaking single family house from the 70'ties, where the only energy saving effort they had made was to install a wood pellet heating system. While Flemming is disappointed with the results of his building project, Kasper is very positive about his new home.

“We have become really happy about it [the environmental profile] - also because it gives a better degree of comfort with the well insulated house we have and the solar panels that produce a lot. In addition, we have ventilation and it all actually contributes to more comfort. And off course we expect to be able to see the effect on our bills.” (Kasper - Client in Stenløse Syd)

Oddly enough, the interviewed tenants also seem to have very different experiences with living in the non-profit building project.

“There is no luxury in it at all - in the apartment - neither the kitchen, the bathroom, or anything ... It is half-made and the apartments are constructed sloppily. Not a single apartment is as it should be, the walls are starting to crack, the floors come apart, and all those sorts of things...I have never lived in a place where there is as much dust as in this apartment...they say that it is not necessary to open doors, but we cannot stand it - it gets too hot. Even when the system is turned off it is extremely hot on the first floor, and the windows are constantly open everywhere.” (Karen - tenant in Stenløse Syd)

As mentioned, the building company went bankrupt during the building process, which means that the whole non-profit building project looks very half-made at the moment, but regardless of that it still seems like the experience of the dwellings are rather different.

“...I called out here and got the brochure, which is good guidance, where they write about CO2 emission and heat and hot water. And about the rent, and how much you pay for heat and hot water. They made it possible to see how it was really like...It [the new apartment] is only an advantage. And I also believe that it is very well built - I am ill, and might end up in a wheelchair and the building is perfect for that.” (Thomas - tenant in Stenløse Syd)

It probably comes down to a question of personal priorities, expectations and tolerance level, and it should be noticed that Karen has moved into the apartment from a single family dwelling. Still it raises quite a few questions that the attitudes towards the dwellings are that different.

Conclusions

The project in Stenløse Syd has been path breaking for Danish low energy building projects. Though hampered by the financial crisis, the project has shown that it is possible for a municipality to promote low energy building on market terms. The project has importance as a showcase of low energy buildings in more ways. Firstly, it is an example of proactive municipal involvement in environmental issues; secondly, it is an example of how low energy dwellings do not have to compromise when it comes to comfort; and thirdly, it has given important experiences with user preferences and the role of the building industry. Finally, it has contributed to develop the competences of the building industry.

The project is to be viewed as a success as it has proven it possible to promote low energy dwellings for ordinary people on market terms.

The newcomers, clients as well as tenants, seems to be perfectly ordinary inhabitants in those types of dwellings. Their main motivations for moving to the area, was the price and location and the possibility to live in a newly built home. It is also worth to mention that a great deal of the newcomers have moved primarily because they were forced, for example by divorce, or because of dissatisfaction of some kind with their former dwelling.

It is evident that environmental standards by themselves will hardly work as a motivating factor for the main part of clients or tenants outside the deep green segment. Even though it is generally viewed as a positive asset of a dwelling, the low energy aspect does not seem to have been the main priority for any significant part of the population in Stenløse Syd. From other research in moving habits and dwelling preferences we see that moving mainly has to do with changes in the life of the individual or family, which makes the current dwelling inadequate. The choice of a new dwelling is also dependent on several factors, such as economy, location and transportation, before people consider the environmental profile.

Though not the main driver, it is worth mentioning that a big majority of the respondents in this survey seems to like the idea of municipal environmental requirements. Generally, low energy dwellings and environmentally sound projects are viewed as positive.

Legislative measures seems to be an effective way to ensure a more environmentally sound building industry as the client/industry relation seems to create deadlocks where neither part is willing to take the initiative to innovate voluntarily when it does not seem economically rentable. As new possibilities have opened themselves up, because it is now possible to include environmental demands in local planning, it is much easier for municipalities to set low energy requirements through legislation though it still requires quite a lot of work to manage the developmental processes as neither clients nor industry have much experience with low energy requirements.

Information about the consequences of building and living in low energy dwellings might be a central issue. Constructed budgets of 5 to 10 years might help visualize the benefits of energy efficient housing. Also, specific guidance in the choices of technology might be a good idea, as long as the building industry does not have sufficient experience to give competent advice. In the case of single family houses it

might be a good idea to involve the clients in the new residential area in the early stages of the process, as collective solutions might mean even less energy consumption than in individual low energy dwellings. This kind of project might also mean that the impact on society through “ambassadors” might increase, as the clients (or tenants for that sake) have more ownership of the project. This is of course conditional on the process and the dwellings running smoothly

On one hand, it is problematic that the newcomers to Stenløse Syd did not choose the area because of the environmental profile, as it makes it difficult to sell new building projects with energy efficiency as an argument. On the other hand it seems that the newcomers to Stenløse Syd are perfectly ordinary people and the project thus proves that it is possible to work with low energy building projects on market terms.

Thus, the main factors promoting low energy dwellings are:

- That people are generally positive towards low energy projects.
- That people living in low energy dwellings would generally choose low energy again; that the actual low energy dwellings do not compromise when it comes to comfort.
- That inhabitants in low energy dwellings might work as ambassadors for low energy.

Also, the fact that it is now possible to legislate about low energy dwellings through local planning might become a central factor in future low energy projects. The main factors hampering low energy dwellings are that people generally do not prioritize low energy when choosing a new dwelling, but rather factors such as price and location. Also the Danish building industry has been hampering the process as it has been unwilling to innovate in the area of low energy dwellings.

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About this report and the class 1 project

This report studies the preferences of house owners and tenants in Stenløse Syd. The aim of the study is to create more knowledge about aspects that may promote or hamper low energy dwellings in order to develop this market. The report is a delivery in the European Concerto project 'Class 1'.

The idea of the project CLASS 1 is to use the strengthening of the energy requirements to boost and drive the technological developments and to prove the economical and environmental benefits of ultra-low energy buildings integrated with biomass- and solar heating based renewable energy supply. In this context the Scientific & Technical objectives are to:

1. Optimise the integration of low-energy building technologies with supply (renewable and conventional) and distribution (heating and electricity) technologies.
2. Advance selected technologies within the 3 areas: low-energy building, renewable energy supply and distribution
3. Improve the design, checking and verification procedures (this relates directly to the implementation of the building energy performance directive -EPBD).
4. Integrate the European ecolabel in the building projects (houses and components)
5. Demonstrate large scale implementation at close to market technical and economical conditions.

The Class 1 project is focused on the optimisation of sustainable energy systems in local communities, through an innovative integration of RE technologies with ultra low-energy buildings.

The bio-mass CHP system produces electricity and heat that are distributed directly to the use for heating in an innovative local district heating system for the dense, low-rise houses, and through the electricity network to heat the single family houses by heat pumps. Solar heating systems integrated in the network – and individual systems on the single family houses supplement the CHP and take over the in summer months when it is shut down. An advanced Building Energy Management System will control the energy supply, the thermal storages (for solar and for heating energy pulses from the CHP plant).

The Class 1 project has been designed to demonstrate that sustainable energy solutions in which integrated energy efficiency and renewable energy sources are economically viable, and technically and aesthetically acceptable.

The project also has special focus on the Indoor Environmental Quality (IEQ) to make sure that the energy savings are met without reducing the IEQ standards set out in the design specification phase. The IEQ focus is one of the areas in which the Class 1 project involves partners from other EU countries who are experts in respectively lighting and thermal comfort issues. Also trans-national cooperation is introduced for the socio-economic research part of the project, which deals with the user point of view (priorities, etc.) in the participating countries.

The Class 1 project demonstrates improvements to 6 individual technologies (windows, slab and foundation insulation systems, bio-mass gasification, local district heating distribution networks, ventilation heat recovery combined with heat-pumps and BEMS) and an innovative integration of these technologies (with solar heating) which lead to improved cost effectiveness.