



How can a demonstration project trigger the energy retrofitting of social and public housing in Europe?

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Abstract: *The objective of the session is to prove how different expertise developed in a demonstration project can contribute to the massive uptake of the energy renovation in Europe. The session will address the challenge of buildings' energy retrofitting in a social and public housing sector.*

The social housing sector, with 12% share of a total European housing stock – and over 30% in northern European countries – offers the potential for institutionalised, large-scale energy efficient refurbishment programmes. However, actual refurbishment rate at 1.2% indicates substantially low market turnaround.

In the European FP7 project - BEEM-UP – “Building Energy Efficiency for Massive market Uptake”, a total of 21 Partners (building owners, construction companies, universities and technology centres) collaborate to demonstrate successful approaches for deep retrofitting with the potential for large-scale replication. The project identifies and implements cost-effective ‘solution packages’ with the objective to go beyond 75% energy demand reduction in over 340 dwellings located in Sweden, France and the Netherlands.

Based on the experience of BEEM-UP, key areas of major importance for large-scale building renovation have been identified. Each of the presenters will provide insights into one of the complementary fields explaining how it can contribute to the uptake of the energy refurbishment and which obstacles it needs to overcome. Additionally, speakers will have an opportunity to outline the importance of the field they represent, which will provide a ground for a follow up discussion.

- *BEEM-UP success story from a building owner – Swedish pilot site*
- *Integrated methodology – Luwoge Consult will present how integrated methodology for energy refurbishment projects results in more efficient investments in energy retrofitting*
- *Renovation process – Skanska will emphasize the importance of innovations in renovation works both in technology as well as in technical implementations.*



- *Social interaction – SP Technology Research Institute of Sweden will present how an appropriate level of interaction with tenants leads to a higher efficiency in the implementation process and how it improves results in renovation projects.*

Keywords: energy demand reduction, building, retrofitting, social and public housing, massive market uptake, European project



Intervention 1 (Alingsåshem):

A holistic approach in retrofitting, aiming at sustainability, can be worthwhile.

In brief: What we have accomplished

AB Alingsåshem has 300 apartments at the Brogården residential area in Alingsås. There are 400 000 other apartments in Sweden who look exactly like these. They were all built within the ten year period 1965-1974 in the so called “Million Homes Programme”.

All of them have the same problems: poor indoor climate, high energy consumption and low accessibility. They will all need renovation shortly.

We solved our refurbishment by thinking holistically and resolve all three problems at once. By working in a procured partnership together with Skanska we have got an effective approach where we take advantage of the experiences made and constantly improve our process over an extended period of time.

We have stripped down the houses to the frame and rebuilt them using passive house technology. This means that we have reduced the energy demand for heating by 75%.

We have also installed the first solar cells of its kind in Alingsås in order to make some of the houses produce their own energy for laundry rooms, elevators and shared electricity.

We have made the building envelope as energy efficient as possible - now the rest of the energy saving depends on the tenant's behaviour.

Meanwhile, we have also created a socially sustainable area where tenants can remain throughout life.

By thinking holistically it is possible to create ecological, economic and social sustainability for a long time to come. That is valuable both to us and to our environment.

Financial summary - is it possible to recoup?

Brogården represents nine percent of our total rental stock and is therefore of great economic importance to the company.

An external company has performed a property valuation, which shows that the property value after the renovation is equivalent to the total investment costs, both initial costs and renovation costs (including maintenance costs).

Our long-term economic forecasts indicate that the financial statement for Brogården will show a positive result on the bottom line after ten to fifteen years. Rent increases as a result of higher housing standard, significantly reduced energy usage and lower maintenance costs are important factors in this regard.



Upcoming projects – renovations.

We now, as a result of the Brogården project and the participation in BEEM-UP, have a sustainable model that supports our holistic approach, both in terms of planning and execution. We will use this model in our future projects, the next one being the retrofit of the large residential area Noltorp with more than 700 flats. The socio-economic challenges are greater there and we need to work more with integration to include the residents.

Presentation of the company - AB Alingsåshem

- The municipal housing corporation in the city of Alingsås, Sweden.
- 35 employees.
- Owns 3 300 dwellings, and builds approximately 50 new dwellings every year.
- The company's aim is to offer attractive, secure and pleasant housing with focus on individual needs and improved access for disabled and elderly people.
- Alingsåshem strives to contribute to the development of the sustainable society both in an economical and ecological as well as a social point of view. This approach is included in every decision in the building processes.

Alingsås has 38.700 inhabitants and is situated in the southwestern part of the country, 45 km northeast of Gothenburg.

Long-term renovation strategy

Alingsåshem, like many Swedish municipal housing corporations, has many buildings from the Million Homes Programme from around 1965 to 1974.

We are facing huge renovation needs that we will have to deal with within the next 15-20 years.

Alingsåshem is a small company, financed exclusively by incoming rents and loans. We have to work with technical and economic long-term planning for the company as a whole to ensure that the planned investments are possible to realize – while maintaining profitability for the company “on the bottom line”. Our investments and renovations budget is almost half the size of the annual turnover (€ 12 million / € 27 million).

Caution and sustainability are key factors.

Working methods

- Systematic and long-term
- Anchored with the board, based on dialogue
- Based on the financial statements



- Assumptions regarding annual increases for income and costs are made for several years ahead and are being reviewed annually:

“You must dare to make assumptions”

- Long-term planning provides the ability to deal with adverse events
- Low risk

Main objectives

- Social, Ecological and Economic sustainability
- Attractive, secure and pleasant housing with focus on individual needs, and improved access for disabled and elderly people.

To accomplish this we work with (for example)

Easily resolved obstacles

Technical defects

Flats with high accessibility

Thermal bridges by indented balconies

Larger variation

Crumbling bricks

The need for larger flats

Draughty flats

Installation of lifts

High energy consumption

Improving laundry rooms

Poor sound proofing

Shared premises

Complementary buildings

Other things to consider

Car parks

Cultural historical value

Design issues

Social problems in the area

Planning for passive houses

Tenants

Simplicity, repetition, rationality,

A well-planned area

Effective building

Redress the technical defects



Improving the energy efficiency - The company's energy savings at Brogården

Energy costs for hot water and electricity are lifted from the company's risk and transferred to the tenants' responsibility.

Since individual metering of hot water and household electricity were introduced after the renovation, tenants now have the opportunity to exert influence on their costs to a greater extent than before. This is a “win-win-win” situation: the tenants and the company get lower costs and the environment becomes better through fewer emissions.

Who else benefits from this? The benefit to society

From a socio-economic point of view, the refurbishment at Brogården is beneficial for a number of parties, both locally and nationally.

The government

- VAT
- Jobs (project: a total of 80-100/yr)
- positive for the GNP

The local community

- a positive attitude towards progress
- attention in media
- Alingsås as a modern community contributes to economic growth

The municipality

- tax revenues
- sheltered housing (socially sustainable, lower costs)
- Jobs (project: a total of 80-100/yr)

The tenants

- Radically improved living conditions
- Contribution to sustainability through lower energy usage

Our common environment

- A sustainable part of town
- Economy with resources



In our upcoming project, the retrofit of the large residential area **Noltorp**, we will make a social initiative by giving employment in the rebuilding to unemployed who live in Noltorp.

Lessons learnt from the BEEM-UP project

Dialogue is key

A continuous contact with the tenants has been upheld during the entire project at Brogården. Throughout the project, information to the tenants has been distributed in a planned manner. Alingsåshem, The Swedish Union of Tenants and the tenants at Brogården have in this instance been working together in a continuous process.

Regarding energy usage you have to work a lot with the behaviour of the tenants. It is not enough that the buildings themselves are very energy efficient, if the people who live in them are not motivated or understand how to behave.

Technical development

The development of the pre-fabricated housing wall was a significant step forward for Alingsåshem which enabled a shorter construction time and a better working climate for the builders as well as a shorter evacuation period for the tenants.

In our upcoming project, the retrofit of the large residential area **Noltorp**, we will use the prefabricated wall and further bring down or even eliminate (in many cases) the evacuation period. This will be economically positive for Alingsåshem and socially positive for the tenants.

See the possibilities, not just the limits.

Intervention 2 (Luwoge): Integrated methodology - Analysis of the most optimal technical solutions – BEEM-UP toolkit

Process and Methodology

A specific objective of the BEEM-UP project is the development of a methodology to find and implement the most effective modernization concepts towards deep building renovation.

To find the most important applicable indicators for the refurbishment projects, the spectrum of existing Key Performance Indicators (KPI) of the labelling systems DGNB, LEED and BREEAM (ecologic, economic and socio-cultural aspects) are considered within the Project research works. These KPIs are then evaluated by the housing companies and other stakeholders against the background of different professional or national specializations and adapted to the project specific requirements.



The indicators are then included in a BEEM-UP toolkit which is especially developed for holistically assessing and comparing refurbishment projects in different countries and climate zones. It takes following aspects into account:

- Environmental aspects (Energy demand, emissions, grey energy, impact on nature)
- Economic balances (Life cycle costs - including cost for energy, investment, current and future maintenance, etc.)
- Social aspects (summer/winter comfort and tenant involvement feedback)

The first step of the applied procedure is an analysis of the building status quo and clarification of general requirements given by the housing company. In step two, single measures are developed and evaluated with the BEEM-UP toolkit, which gives indications of their impacts in terms of economy, ecology and comfort. The single measures are compiled to complete retrofitting scenarios. Scenario 1 is always the “anyway” or maintenance scenario. The maintenance scenario is important for an economical comparison and feeds in KPIs like cost of saved energy and represents the package of measures with the lowest investment costs. For the single measures compilation, particular attention is paid to the building interdependences: The thermal envelope and the HVAC system request special attention, as the relation between an improved envelope and the HVAC system selection and operation is really close.

The BEEM-UP toolkit evaluates the performance of a large number of possible refurbishment concepts (up to 10,000) by assessing their environmental and economic performance from a lifetime perspective (production, construction, operation and maintenance during 40 years of lifetime). This automated process leads to optimized results.

To visualize a large number of scenarios in order to improve the comprehension of the complexity of the building and the interdependence of different measures on economical, ecological and social sustainability can give the building owner a good basis of decision.

To tackle specific problems in refurbishment projects, the construction sites’ responsables are assessed on innovation techniques (wall, roof and ceiling situations are specially addressed). In different workshops, architects, engineers, site owners, designers and craftsmen develop innovative ideas for the combination of different scenarios. The most promising improvements are afterwards built, tested and evaluated using the BEEM-UP toolkit. Where outperforming the standard practice, detailed construction guidance is developed for the actual building sites.

Depending on technology readiness levels, costs and applicability, some of the situations are then implemented into the pilot sites.

Results for the 3 pilot sites (showing examples of how the methodology is applied)

The methodology developed helps to find the most appropriate solutions for all building sites. By offering multiple optimized variants, the refurbishment concepts go beyond standard



practice. The general goal of reducing the energy demand by 75% was defined using such a threshold for all building sites and lead to eco-efficient refurbishment scenarios. For each building site, six cost-efficient variants are assessed and compared in detail to show a variety of solutions (including maintenance only).

Paris

In Paris six cost-effective variants show a huge potential for energy savings.

As the overall project goals are to save at least 75% of energy, variants 3 to 6 are taken into consideration. To take into account economic aspects, a life cycle study is developed.

From the graphic above, variant 3 is chosen by the housing company. For Paris, several of the innovative solutions are interesting. Particularly, the space saving Aerogel insulation was implemented as well as a grey water heat recovery system and an ICT feedback solution for tenant involvement.

Overall, the best performance can be achieved by assessing all relevant Key Performance Indicators, offering a wide range of possible solutions and setting preferences for this site.



Brogården

Six cost-effective feasible variants show a huge energy demand reduction potential for the refurbishment project, with Var.1 being the maintenance scenario enabling the lowest savings.

A special focus is laid on the social indicators like room comfort, accessibility and dwelling usability as the housing company's main goal is to improve quality of life of their tenants. Therefore, intense tenant involvement activities are organized like active groups or the possibility to use of the showroom apartment as a communal space.

The wide range of possible solutions and their visualisation helps the refurbishment team in Brogården to find the best fitting solutions having in mind also all of their former set KPIs and individual refurbishment goals.

In terms of innovations, prefabricated wall elements with grey EPS cores are developed and implemented to guarantee best Life Cycle Costs and Eco Efficiency as well as room comfort. Amongst others, as well an ultra-thin flooring system and an ICT solution are constructed.



Delft

For Delft, six of the most economic scenarios (Var. 1 is the maintenance scenario) are evaluated in detail and presented to the tenants.

The housing company describes the measures and involved costs comprehensively to their tenants. Then, these decide which measures they want to have for their dwellings. Therefore, except of the maintenance variants, all developed variants for the buildings are performing well in terms of economy as only these variants would be chosen by the tenants.

As the tenants are responsible for the chosen refurbishment concept, a wide range of possible combinations is realized.

In many of the buildings an ICT feedback system is installed to help the tenants save energy. The experience with this is so far very good. Most of the building envelope innovations developed for the Delft buildings' problems are not yet at a technology readiness level to be implemented immediately. However, as a step by step approach is considered, the innovations may be implemented at a later time when they are ready for the market.

How can the methodology be used for other projects

Focussing on the most important indicators helps to find overall environmental friendly and cost-efficient solutions which were also performing well in terms of socio-cultural aspects. It results important to take into account long term implications of different retrofitting alternatives. A practical assessment tool helps to make decisions within three main sustainability dimensions (social, economic and environmental), provides transparency for the decision makers (housing companies, etc.) and helps them to set preferences.

While most refurbishment projects still focus on investment costs only, it becomes clear that Life Cycle Cost considerations should become more important. Therefore, in many countries the legislation needs alternations as it is often not possible for investors to cover additional upfront costs for energy-efficient solutions through the resulting energy savings, which the tenants cash in. Alternative rent concepts (i.e. warm rent models) or Energy Performance Contracting may help to solve this issue as well as absolute transparency of future maintenance and energy costs for tenants (when searching a dwelling).

As considerations to eco-efficiency will probably rise in importance during the years to come, it makes sense to include indicators of grey energy and impacts on the environment into the assessment. For almost all of the refurbishment materials it is proven that energy saved during life time is much higher than energy needed to produce them. EPDs help to compare products and can give first indications about their eco-efficiency.

In relation to the socio-cultural aspects, not all indicators are measurable (i.e. accessibility, construction traditions...). However, including a (simplified operative temperatures) winter comfort calculations into the energy performance calculations is an easy way to find out which measures offer a healthy indoor environment. The temperatures of the surfaces should not differ more than 3-5 K from the indoor temperature. Then, the risks of draft (through



convection) and of condensation is minimised. Also the overheating frequency can be calculated and compared for different variants.



Intervention 3 (Skanska): Construction efficiency - technology and innovation

Introduction

The Brogården passive house retrofitting project is quite unique in Sweden as well as in Europe as a whole. Ambitious sustainability targets have been met in aspects of economy, ecology and social issues. This has been for the benefit of the tenants, the building owner and the contractor, but also for the community as a whole.

The retrofitting of the dwelling area has been ongoing for six years, 2008-2014, in a procured partnership between Skanska Sweden AB and AB Alingsåshem with a shared focus on experience feedback and a commitment to common goals.

This short summary describes how the project organisation and mindset have supported the development of the construction process and technology from the contractor's point of view, resulting in a better building performance, built up knowledge, the gaining of competence and improved efficiency in the process on site.

We are sure that these gains and the way of working could be useful to many other projects and retrofittings, regardless of the level of ambition and size of the project.

Improved efficiency on the construction site

There are three most vital factors behind the technical development and the improved efficiency in the construction process of Brogården. These three factors are described below:

1. **The nature of the dwelling area**, as built in an industrial and highly repetitive manner
2. **The involvement scope** of the retrofitting project, including common goals for all team members and the importance of the contribution from every team member
3. **The regular experience feedback organisation**, through internal and collective meetings and kickoffs, resulting in a number of formal and informal evaluation processes

1. The nature of the dwelling area of Brogården

Brogården was built in the early 1970's, during the peak of what is known in Sweden as the Million Homes Programme. Through granted loans from the government and a new and highly efficient construction methodology – focusing on efficiency through a high rate of standardisation, simplified construction processes, a high level of industrialisation and/or prefabrication, all at a large scale – the Million Homes Programme (MHP) served a growing society with an 8,000,000 population with one million new, modern, high standard dwellings in a period of 10 years. This is by far the biggest construction boom and the most important improvement of living conditions the Swedish population has experienced in modern times.

The Brogården area is a typical representative for this era:



- The 16 buildings are low, 2-4 stories high, multifamily houses – applicable to about one third of the MHP dwellings in Sweden
- The layout of flats is heavily depending on the casted concrete "bookshelf" structure with load-bearing transverse walls, creating quite large rooms including a kitchen, 1-2 bathrooms and a balcony or a patio in every flat.
- The blueprints of Brogården were part of a highly standardised system established by one of the larger actors on the market at the time, HSB. There are among today's 2.5 million Swedish flats about 400,000 made from the very same system of blueprints
- The buildings were erected in a very rational way on reasonably flat grounds, where the builders moved from house to house to cast the concrete structures, before supplemental wooden works and masonry façade walls were erected.

Conditions for an iterative approach are good as the rationality and systematic thinking of the original designers and contractors are very visible today. The same structures, the same details, layouts and components repeat themselves through the 16 buildings of the area. The structures are simplified with no excessive decorations or detailing, using materials and design that enable an "assembly line"-approach focusing on maximum rationality and efficiency in the sequence of elements in the construction process.

Today, this construction approach results in a spacious layout of the area with large yards and connection between the buildings, enabling retrofit works to be made in the same rational way, with machines and teams moving easily from one building to the next.

In our deep renovation of the area, the buildings are stripped down completely and new building service systems, a new passive house building envelope and new surfaces and fittings at a very high rate of accessibility are introduced to the flats. The rational concrete structure is the skeleton of the buildings that is kept for the future, to which all new measures are adapted.

For every building, the contractors can expect the same type of layout, structures and conditions. The repetition of rooms and walls is the same. If irregularities or problems are found in the old structures, they can also be expected to repeat themselves in the next building.

Altogether, this enabled an iterative and continuously improving approach for the retrofitting of Brogården. Challenges met and solved in earlier buildings result in measures that are incorporated in the standard procedure of the following buildings. Measures, routines and tools are continuously evaluated and if needed improved by the different teams, also in discussions with each other.

The layout of the area and the repetitiveness of the structure also support the planning and enable more rational logistics and transports, where trucks and cranes can get close to the buildings and access almost every room in the opened structure. This has been made very convenient for the material logistics of internal works and the reconstruction of works, and last but not



least for the erection of the prefabricated retrofitting wall that was used for the three last buildings to retrofit.

Hence, one can say that an MHP area itself in many ways support a reconstruction process focusing on effectivity, through the rationality, simplification and repetitivity of buildings, structures and flats.

2. The involvement scope of the retrofitting project

AB Alingsåshem introduced the procured partnership model of the project in order to enable a better experience feedback than in traditional tenders, within and beyond the project. There are a few more vital aspects of the procured partnerships that are important to consider:

- Shared goals and common agreements
- Split incentives and fully open books
- Full and early cooperation
- Involvement and contribution of every project member

In addition to the procured partnership, there has been an ambitious and successful involvement of the tenants. However this is not penetrated here.

Shared goals and common agreements – the project started with a kickoff meeting where everyone designated to be involved in the project – building owner representatives, designers and experts, contractors and subcontractors including skilled workers – had a one day workshop where they got introduced to Alingsåshem's vision of the final result, the idea of defects to improve while keeping and developing the soul and benefits of the area, and the sustainability scope with the passive house technology and accessibility approach. By the end of this day, all members of the just formed retrofitting team of Brogården officially agreed on what should be the objectives of the project. Ever since then, each new stage of the project has started with an experience feedback and goal defining workshop of everyone involved in the project at the time: from Alingsåshem's CEO sharing her ideas of the retrofit, to the scaffolding worker evaluating the influence of his work on the logistics and the weather protection of the buildings.

This is important, as the agreement on common goals based on earlier experiences embrace every actor on the site in their specific role. Every worker knows by heart the key priorities of the project and building owner, and can thus understand and value how this applies on the work and see the importance of his/her own performance. Everyone has agreed on the goals in relation to their own job and knows that their skills and achievements mean a difference to the final result.

Split incentives and fully open books the Brogården tender is based on full transparency and open books between the building owner and contractor. The tender is split in a fixed and a variable part, where basic costs and the profit of the contractor is a fixed amount, not related to the other results. Regarding material costs and alike, a prognosis is set and the end result of these costs will be shared between the building owner and contractor, thus having the same



incentive in finding better supplier agreements and improvements of the process. The main subcontractors – electricians, plumbers, ventilation workers, painters and demolition teams – have the same kind of agreement with the main contractor. Thus, the results of the contractor and subcontractors are fully transparent to the building owner, and regularly reviewed by the building owner and contractor in cooperation.

Full and early cooperation – in comparison to a traditional tender, the contractor was involved from the very beginning of the design process, enabling a transfer of knowledge. This was important to the efficiency from the very beginning, as choices that relate to construction planning and progress on site were made on a wider knowledge base. E.g., the sectioning of the air tightness layer was made room-wise instead of building-wise to enable a better process flat by flat, where weaknesses could be detected and seen to directly. The weather protection was designed (and the right costs were set aside) to fully support logistics and quality aspects as to moisture safety and end results. Among this, the contractor could suggest cheaper or more effective choice of design and measures –before the construction process had even started.

The design process also started with a pilot house retrofitted using the best known alternative to fulfil the targets of the project. The pilot building was then thoroughly evaluated and measured in terms of quality; performance and indoor environment before the next buildings were designed, resulting in several important changes. Among these, the ventilation system was changed from a decentralised to a centralised system, and the design of the exterior wall and the insulation of bottom floors were also thoroughly changed. For the oncoming stages of the project, the design process was also reorganised to treat the buildings in groups. Buildings of similar layout were considered as one type, resulting in a more effective design process.

Involvement and contribution of every project member – As stated above, every individual professionally involved in the retrofit has contributed to the common goals and experience feedback. To a single person, this often means the very difference. If you know that you are a vital part of the team and that your experiences count, you are more likely to suggest improvements and report problems that you see and supply advice on how they can be avoided. This also opens for the cooperation between different trades, as the final result is depending on the cooperation and quality of all different actors. For example, the first design of the exterior wall from the pilot house was redesigned on a suggestion from the carpenters in the assembly phase. Based on their evaluation of the "constructability" of the structures, an interdisciplinary team of skilled workers, structural designers, site management and material suppliers could redesign the wall. The result was a wall with the same quality as to moisture performance and air tightness, 10% better thermal performance and 6% thinner dimensions at a slightly lower price. Above all, in terms of time efficiency, logistics and ergonomics, the new design meant less unique and less different kinds of steel details and insulation materials, less heavy boards to handle, less complicated hidden screwing fastenings, 8000 fewer screws per house, 2 km of knife cuts that were no longer needed to be made on site, and a simplified assembling process.



3. The regular experience feedback organisation

Weekly meetings are held with the building owner visiting the site.

Every fortnight planning meetings are held, involving the foremen of all trades making the detailed time plan for the oncoming weeks. These are great occasions to raise and discuss important issues and experiences.

The focus of formal evaluation processes with experience feedback on project kickoffs and interdisciplinary meetings also encourage a more spontaneous evaluation and discussion of experiences. Every worker and foreman on site knows that the site management and building owner are interested in their experiences and opinions on different materials and routines for a continuous improvement. The routines are therefore often revised, and new suggestions are often raised to the management, both through formal meetings and through informal conversation.

If problems of some kind are spotted, they are rapidly reported to the organisation in order to ensure quality, not hidden away to avoid delays or complaints. E.g., as the foremen of the main contractor do the air tightness pressurising test themselves on site with support of the skilled workers, these tests function not just as a quality test but also as a process check where the routines and detailing are evaluated and new aspects of improvement can be discovered.

The exterior wall example

The exterior wall can exemplify in terms of efficiency from the application of the process measures and organisation of experience feedback to the repetitive layout of the area. The prefabricated wall was used in the last three buildings.

The experience of the original structures from the previous buildings was used as a base and refined within this innovation, design and pilot application project within the project. Being the most influential part of the construction process, the assembly of the exterior wall has been a key moment in terms of efficiency all through the project.

From the evaluation of the pilot process of the last generation of the wall, we have also seen the need for an even deeper involvement and experience feedback from the skilled workers in the bridging phase from design to production and assembly. Thus, the process is still not perfect even after six years of continuous improvement.

With this example, we want to conclude that an involvement approach and efficiency focus goes very well together with retrofitting of buildings from a rational and industrial construction era as the MHP. Even for projects not going this far in terms of energy efficiency, range of retrofitting or accessibility focus, a deeper involvement of knowledge on site in organisational measures and a focus set to improvement and efficiency, will pay off well in the retrofitting.

Intervention 4 (SP): Tenant interactions in the deep retrofit and strategies for the large-scale implementation

In the BEEM-UP project, consideration is taken to the three corner stones of sustainability, i.e. economic, environmental and social sustainability. The overall goal with the tenant involvement of the Swedish, French and Dutch pilot sites is to ensure that retrofitting projects are successful not only from a technical but also from a social point of view.

The main findings from BEEM-UP regarding reasons for and key factors of tenant involvement are given during this presentation, as well as general approaches in renovation programmes. Generally, the perspective is that of housing owners, and especially housing owners of rental apartments. The information is also valuable for technical and social consultants, renovation architects as well as municipalities.

THREE reasons why tenant involvement is important

There are different perspectives and reasons for which the involvement of tenants in a renewal/renovation process of a housing area is important. Three main reasons from a housing owner perspective are given here, based on the BEEM-UP experience:

1. Better facts - better decisions

It is about considering the houses from the tenants' perspective. Tenants are a resource and it is to the building owner's advantage to use their specific knowledge about the area. What is it like to actually live in your property? The residents know about qualities and defects. There may be flaws and problems that you, as a property owner, do not know about, and there may be values only tenants perceive. With wider knowledge, you can make better decisions.

2. Satisfied tenants - Promotion of well-being and safety

It is of great importance that the residents have an opportunity to express their opinions and that they can feel respected and listened to. For most people, their home is their security. During a renovation, it is easy to feel that you are losing control over your home, resulting in a feeling of unease and insecurity. If the tenants are given opportunities to influence what happens, it might be easier to handle the situation. The feeling of being involved can reduce stress and anxiety associated with the renovation.

Participation and commitment from tenants can help increase the safety and comfort in the house or in the residential area, which in turn increases the attractiveness of the houses. Through the process, you as the housing owner have the opportunity to strengthen the relationships with those who live in your property.

3. Saving time, money and energy

It may take time to collect the residents' views, but it is well invested time. You will get the pay-back at a later stage because the decisions are well established/anchored and the residents



already know what will happen. Different countries have got different laws, but the tenants' approval usually helps to create a smoother process and reduce the risk of failure of the renovation altogether. In Sweden, dissatisfied tenants can block the renovation process by applying to the rent tribunal permission; in the Netherlands you need to reach 70 percent support amongst the tenants in order to carry out a change that will affect the rent. With approved plans you will avoid months of delays.

By creating involvement and commitment tenant interaction can also, over time, lead to less property damage, less relocation, fewer vacant apartments, less rental losses and increased attractiveness of the housing area (a good reputation leads to increased property value). All of these factors save money for the housing owner.

Tenant interaction in sustainable renovation projects can also provide a good opportunity to discuss energy issues with the tenants. The property owner is in an ideal position to raise energy awareness and facilitate energy-efficient behaviour.

Approaches and experiences of the BEEM-UP pilot projects

The scope of the renewal process in the Swedish pilot project meant that all the tenants had to be evacuated from their apartments. This meant that there was a huge potential for a lot of problems and stress. But as a matter of fact there have been no complaints to the rent tribunal and the tenant satisfaction index is higher after the renovation. A good communication with the tenants is believed to be a contributing factor to these results.

The benefits of tenant involvement experienced in the French pilot project, was that the tenants were quicker to accept the renovation works since it was more adapted to their needs. They also knew what to expect. People's preferences were taken into account to a certain extent in the program phase. Nevertheless, it was not a personalized retrofit - all the apartments were retrofitted the same way. In addition, energy issues were discussed with the tenants.

The Dutch pilot was actually initiated by the tenants' need to have the window frames renewed. They were willing to cooperate on a complete renovation under the condition that the windows were replaced before the coming winter. A group of persons that represented this interest was connected to the planning team, taking part in negotiations and discussions.



THREE key factors to tenant involvement

There are numerous important factors for a successful tenant dialogue – the three main ones obtained within the BEEM-UP works are presented here.

1. Dedicated person for tenant interaction

A dedicated person who is good at communicating with people is probably the most important factor for a successful tenant involvement. The tenants need to know who to contact and who they can form a trustful relation with. This requires special competence and the skill to see different people's needs. The communication should be honest and clear, especially regarding what the purposes with the renovation and dialogue are, as well as what can be influenced and what cannot.

At (initial) meetings this person needs to be backed-up with other technical and non-technical information from the renovation process, with other areas of knowledge, since many different kinds of questions are usually raised by the tenants.

2. Planning and timing of information

The first step of tenant involvement is that the housing owner draws up a plan for how to take care of and maintain the commitment mobilized during the renewal process, especially on how to handle comments from tenants.

Early involvement in the process can be significant for how the tenants perceive the participation process as a whole. Too often the dialogue starts “at the very last minute”. Similarly, the timing of information during the execution phase is important. During this phase, information on exact planning and detailed information about for example nuisance periods are of particular importance. Repetition of information and many different communication channels might be needed to reach as many tenants as possible.

3. Feedback and practical results

It is of great value that the housing owner gives continuous feedback on incoming proposals and remarks from the tenants, whether they could be met or not. It is important to clearly state what the tenants actually can influence. Information on how the rent will be affected is of course also very important for the tenants.

The renewal should, on the one hand, be characterised by a long-term perspective and endurance, but on the other hand it is important to provide fast results to the tenants. To show practical examples - which can be done e.g. in a show apartment - can make the renovation easier to understand.

In a renovation project, many unforeseen problems will probably occur. Experiences show that tenants usually have an understanding for problems in the renovation project, but little understanding for problems concerning the information to the tenants.



Approaches and experiences of the BEEM-UP pilot projects

One experience of the pilot project in Sweden was that information has to be repeated for each affected house, for each affected tenant, because people tend to process information only when it concerns them directly - not when it is available. This could be a challenge for the housing owner when renovating large areas over a prolonged period of time.

In both the French and Swedish pilot projects, a specific person at the housing company was assigned to be the tenants' contact person. This person was supported by other important stakeholders also having a close relation with the tenants, such as a housekeeper living in the building (French case) or the local union of tenants (Swedish case).

Besides the energy measures paid for by the housing owner in the Dutch pilot project, the tenants could choose to invest in a selection of measures such as a solar hot water system, and an efficient heater. This decision was completely up to the tenants. To promote awareness of these measures, activities to stimulate community development were set up. The involvement was perceived as positive by the tenants.

The show apartments have proven very useful and have been used for many different purposes in the pilot projects. These apartments became a meeting place where open houses and meetings were held. Social, practical and technical issues were raised and discussed during both formal as well as more informal activities.

General approach in renovation programmes (massive market uptake)

The kinds of renovation or measures that are planned affect the selection of tenant involvement strategy. A very comprehensive renewal of the building and building area obviously differs compared to a scenario where single measures are carried out. Normally, the tenants have the biggest influence over their own apartments, less influence over the building as a whole and even less over the building area and the town district/neighbourhood. The role and the responsibility of the tenants shift with these boundaries, from an individual perspective to a shared or communal perspective with the whole neighbourhood's interests at heart. If the tenants have to move out of their apartments during the renovation is also an issue to consider for the housing owner: which consequences this has for the tenants and for the communication process.

The table below describes a number of different important parameters related to tenant involvement for different kinds of renovation or measures, based on the BEEM-UP experience.

The Swedish pilot project is a *total renewal of the housing area*. The French pilot project has elements of both *collective measures in building* as well as *total renewal of housing area*, while the Dutch project has more of *measures in individual dwellings* together with components of *collective measures in building*.



Final remarks

It is not easy to follow up and evaluate a dialogue process. One can form an opinion of the outcome of the redevelopment but how do you know if it was a successful dialogue? How can you evaluate if it "was worth" having a dialogue with the residents? A number of aspects could be considered in this context: Are expectations of the renovation met? How is the general satisfaction? Experience from tenant involvement in retrofitting projects. Experiences of housing owners (changes for next time). How will the dialogue continue?

This presentation includes the findings and experiences of the pilot projects of BEEM-UP, together with lessons learnt from other renovation projects. It has been especially fruitful that the three pilots have had different situations and different needs, and still some common important reasons for and key factors of tenant involvement have been identified that can be valuable to other renovation projects having an interest in tenant involvement.

Sources-references

Boverket (2014). *Vägledning i boendeinflytande vid ombyggnad*

<http://www.boverket.se/Bygga--forvalta/Boendeinflytande-vid-ombyggnad/>

Kronvall, J. (2010). *Miljonprogrammet och makten över det förestående förnyelsearbetet*, in *Makten över rummet. Tankar om den hållbara staden*, G. Graninger and C. Knuthammar (Eds.)