Transforming the existing building stock to high performed energy efficient and experienced architecture

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Summary

The project Sustainable Renovation examines the challenge of the current and future architectural renovation of Danish suburbs which were designed in the period from 1945 to 1973. The research project takes its starting point in the perspectives of energy optimization and the fact that the building process over the period changed from craftsmanship to industrialized production of housing. The aim is to present the context in which energy transformation has to be seen as an architectural question. The research field focuses on social housing blocks and expands the discussion of architecture from architectural heritage to energy efficiency and from architectural quality to sustainability. The first, second and third renovations are discussed from financial and sustainable view points. The role of housing related to the public energy supply system and the relation between the levels of renovation of the architectural heritage are examined as possible ideas for seeing the renovation field as an important synergy in society. The recommendation addresses balanced transformation.

Keywords: renovation, energy, industrialized building process, housing, suburb, transformation, architectural heritage

1. Extended abstract

After the Second World War Denmark experienced a deficit in dwellings, and both private and subsidized housing areas were built. During the period from 1945 to 1973, the building sector went from craftsmanship to industrial production and an enormous amount of standardized housing was constructed.

Two interesting building typologies which are examined representing housing for everyday life. The architectural quality of types with different building characteristics and technologies are of different values. The majority of the building mass is not listed as architectural heritage although the period is the most significant building period in Danish history. The ideals of the modern movement asked for a better future and hope for an easier life and through architecture created some of the most interesting and most qualified buildings for everybody in Denmark. The buildings are known as functionalistic and montage buildings, and big suburban schemes were created around the city centres and called the welfare city.

The buildings are either built of masonry or from industrialized concrete elements. In a long-term perspective the building technique and the fast pace of planning and construction resulted in poor building technique; and many buildings have already been renovated once due to technical and aesthetic reasons.

It is now 45 to 65 years since these buildings were built, and the demand for energy efficiency is an interesting question with regards to this segment; because the buildings perform badly and because there are so many of them. The two materials demand different solutions with regards to

building physics, and the way these buildings are conceived and built, require very different designs for architectural renovation.
In Denmark there is a huge focus on the welfare city. A great number of initiatives have been made in recent years and a recent report: `Looking for the preservation values of the welfare city´ has described the building culture of the period and the situation as we see it now: the building mass is worn down and outdated.
So how can we preserve and renew while respecting the interesting period? how do we change these areas, which represent a great resource for society, into adorable living areas?
This is a challenge for architects which concerns cultural, social, political, economical and sustainable interests.
In the beginning of the 90s a wave of the first “montage” renovations of the schemes started. The reason was, first of all, technical problems: elements joined together were not airtight, this resulted in draught problems and water damage and often occurred in combination with the concrete having a very bad patina. These basic problems led to a renovation which also tried to solve the social reputation, sometimes using funny colours.
Now, in the 2000s, we see many renovations, some of them are very ambitious, but for others it seems as if society has not realised the energy question in its entirety. How come the energy question is not obvious to us? Is it too overwhelming to realize the total makeover of these schemes? We can conclude that the second renovation wave seems to have very limited energy ambitions, which will lead to a third renovation with extreme energy ambitions if we are going to meet the goals of the EU commissions in 2020.
If we continue in the direction we have seen so far, the third renovation will demand great investments, it will create much waste and a great waste of manpower, the result will be costly for society and for the environment. In the end, the result will be very bad with regards to sustainability.
For the renovations it is of great importance with regards to sustainability that we take into consideration not only construction expenses. It is necessary to view the total economy seen from a financial perspective, but also from an environmental perspective.
Before we decide to calculate the sustainable effect of the renovation of an ordinary house, we need to take into consideration the public energy grid. The overall idea is both to save energy and completely to change the supply from fossil energy to renewable energy.
Recent research finds this change to have an extreme effect on the way we calculate the energy consumption of our building schemes.
Because if the analyzed tendencies are believable we may not have to aim at zero-energy renovations in all cases – and this would be very significant with regards to our masonry buildings from before 1960.

2. Conclusion and recommendations

It is of great importance to see the complexity of the problem, and furthermore to choose strategies which have a long perspective and which allow us to intervene at different times to fulfill the tasks.
Balanced efforts listed as recommendations:
The process should start by screening the cultural, social, technical, architectural and sustainable values of the buildings and the layout before designing the new architecture. It is important for the success that users, owners and consultants are involved in the process from the very start. Long time perspectives should be taken in consideration. In order to act energy efficient and sustainable a plan for the project should be worked out related to intervention and investment over time in order to save without damaging, the project may have several phases in order to invest with common sense. The relation between the specific site and the public energy supply should be analyzed to realise the best use of energy, related to the specific situation.
The most qualified and sustainable design should always be achieved.
Research projects attempts to emphasize that we should bring all forces together in a common understanding that the renovation should bring the energy performance to the best standard possible and in a balanced way which respects architectural heritage.