Co-housing: pioneers of eco-engineering
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Abstract:
Cooperative self-managed housing is a growing trend in Europe. Renewed housing typologies emerge that raise many expectations for creating vivid social networks and healthy environments. Co-housing is an expression of contemporary citizenship, citizens actively taking the housing and environment situation in their own hand as a concrete response for social cohesion, care for an aging population, local identities under globalization, healthy and child-friendly environments, locally based responsible economy, energy transition, in short: to what in many European cities is the objective of the agenda 2020.

There is an important message in co-housing as innovators of housing provision, co-habitation [social cohesion] and sustainable environmental technology. The notion of ‘participation’ is not only challenged but acquiring new intensity through co-housing practices. Many innovations in renewable energies have been applied by residents groups. Nevertheless, the value and contribution of co-housing initiatives to housing provision and sustainable urban development, both quantitatively and qualitatively, have hardly been assessed. Urgently missing in current research is a realistic understanding of the ecological performance of co-housing projects. Monitoring by residents takes place in some projects, but is rarely brought to a structural level. The explicit ecological orientation of the majority of initiatives is not related to research and planning for energy transition, and other mayor environmental challenges. This paper illustrates how in the briefings and design co-housing initiatives articulate their intentions to build to low-energy consumption, passive house standards. However, aspirations for ecological and healthy buildings suffer from regulations, availability & costs. Another aspect is the complex installations for heating and ventilation systems, such as the passive house model, which poses difficulties for self-management and maintenance. Finally, the orientation on sustainable technology needs to be enhanced to incorporate aspects of culture and use.

1. Introduction:

1.1 What is co-housing
In the 21st century, new forms of ‘community’ lead to new typologies for housing. The present emergence of self-managed co-housing needs to be understood in the light of demographic change, diversification of households and increasingly active citizenship. Through mutualisation collectively managed housing clusters with shared spaces facilitate ‘the
organization of family-life’ (Kläser 2006). The ambition of the initiators is to create green and safe environments in an urban environment: connected to services and public transport (Jarvis 2011, Tummers & Denèfle 2011).

From an urban-architectural point of view, the following indicators characterise collective self-initiated housing (co-housing):

1. Collaborative housing, with a component of organization such as coop, association or other both in the development AND during use and management of the project.
2. Community building and a large degree of participation and self-management
3. The social/organizational unit/community overlaps the spatial unit/community, this distinguishes co-housing from cooperative housing or traditional Genossenschaften [Fedrowitz/Gailing 2003]

Concepts such as sustainable; energy-neutral, shared spaces and alternative forms of property are instrumental to these key-elements.

Yet the realisation of a cluster of houses, with additional shared spaces, is not the final goal of the initiators. The aim is to create living environments that respects and shelters people, planet and profit. Building together is a strategy to form social networks, mix generations and incomes on a small scale, to experiment with sustainable building materials and renewable energies, and to combine living and working environments. This paper explores the practice of self-managed co-housing to investigate if the strategy is effective.

1.2 Why is co-housing relevant for energy transition?

The perseverance and the emerging networks, manuals and studies underline that self-managed co-housing is not an incident of a minority, but a new housing model that is articulated from the grassroots [Lietart 2012, Bunkers et al 2009, Peters and Stengel 2005]. The innovation is real and ongoing, in some countries based on tradition, taking the place of housing associations, in other countries as a new partner in urban development. In the Netherlands, many of the initiatives benefited as pilots from environmental stimulation programmes (subsidies) implemented by the government. These provided useful learning experiments for example to improve solar collectors and wood-construction systems. In Germany the concept of ‘passive house’ was developed in practice to a large extent in self-managed building groups. In France, the first (contemporary) self-managed housing projects quickly formed networks and published guides for the realisation of projects with low energy need and renewable sources such as geo-thermal heating and cooling. However in practice the concepts of the residents have difficulties passing through the budget restrictions and the realisation depends to a large extent on the knowledge and motivation of the architects involved.

A number of case studies provide evidence of the living environments that realised projects provide [Krokfors 2012; Jarvis 2011; Williams 2011; Vestbro 2010]. They have been called ‘urban oases’ to indicate their combination of the benefits of both inner city as well as suburban living, especially for young families [Haquebord 2009]. For most initiatives it is important to optimise their ‘ecological footprint’ through building, use of
renewable energy sources and life-style. However, not all co-housing aspires to Eco-housing, and due to practical obstacles the ambitions are not always realised. On the other hand, experimental technologies of early initiatives have quickly become set standards for ecological performance in the next generation of even general housing production [Tummers 2010]. It is therefore relevant to investigate with more systematic analyses which features of self-managed co-housing are transferable to ‘mainstream housing’. Which lessons that can be learned for collective action for energy reduction, self-management of small-scale renewable energy sources and water-management?

2. Co-housing survey in the Netherlands

In order to assess what reality lies behind the expectations, a field study was performed to eight projects in the Netherlands, realised between 1990 and 2010. The pilot considers projects which are dwellers initiated and continue to be self-managed, although residents are not always the owner of the premises. The projects in the pilot study are representative of different types of collective housing initiatives. Rural self-managed initiatives are usually indicated as ‘eco-villages’. While in terms of ideology the differences are not significant, the spatial setting of housing clusters does make an important difference in decisions for energy-provision and ecology. Therefore the survey selected projects with comparable urban setting.

<table>
<thead>
<tr>
<th>Le Studium &amp; AlterProp Co-housing Research</th>
<th>Project Case-studies Netherlands 2011</th>
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<tbody>
<tr>
<td>NAME</td>
<td>CW Romolenpolder</td>
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<td>city</td>
<td>Haarlem</td>
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Tabel 1: overview of projects in the survey

The research was performed during 2011 through site-visits, interviews with residents and architects, and consulting archives and planning documents. Despite the different definitions the pilot study found similarities in the ‘packages’ of energy- and environmental measures. Over time there are slight modifications with available building or installation components. Solar collectors for example are usually integrated, whereas PV is often individually added afterwards. As experiments, the initiatives make creative combinations of different available items. During building supervision and development the groups build up ‘local knowledge’ which is important for maintenance. The study found that the energy- and
environmental performances depend both on expertise and attitude of the institutional partners and on the will or knowledge of the residents.

Illustration: Buitenkans (Almere-Buiten) in this project the standard was set on passive houses. At the same time, energy content per m² building, surplus space, low density and high car dependency make it’s ‘footprint’ still relatively large.

3. Co-housing and environmental issues

3.1 Ambitions and calculations

Virtually all projects identify with environmental concerns, at least in their initial goals and external profile. In the briefings and design most projects articulate their intentions to build to low-energy consumption, passive house standards. The goals set vary considerably, and are related to the general intensification of interest in ‘sustainable building’ over the last thirty years. Since the first National Policy Document adressing the environment in the Netherlands (NMP1 1989), the context has changed: the understanding and equipment of eco-engineering for example has become more sophisticated and translated into policies, developing calculation methods for energy use that did not exist before. The experiments with renewable energies and energy saving in the first generation co-housing projects have meanwhile become general EP normatives, while new co-housing initiatives continue to be on the forefront. Co-housing initiators can be considered ‘early adapters’ or frontrunners in new models of economy and technology [Parasote 2012; Locatelli et al 2011; Fedrowitz-Gailing 2003].

The ‘green’ criteria are fluid: some initiatives prioritize reduction of CO2 emissions at all aspects of the buildings, while others focus on renewable resources, reducing energy demand or passive house concepts. This implies that for comparison of the environmental performance, harmonization and recalculation is necessary. Rather than a comparison between projects, the environmental performance needs to be related to the general (energy-)standards for housing at the time of building. However, aspirations for ecological and healthy building suffer from regulations, availability & costs. Calculation models to estimate the energy-demand of buildings during its life-span depart from standard patterns of use and distribution of rooms. The technical energy label of a co-housing cluster may therefore not correspond to its performance in practice. Urgently missing in current research is a realistic assessment of
the ecological performance of co-housing projects. Monitoring by residents takes place in some projects, but is rarely brought to a structural level.

For example, a critical evaluation by Enertech of a project in Grenoble (France) revealing that the performance did not live up to expectation, is primarily concerned with the installations and does not look at aspects such as common rooms [ENERTEC 2011]. Kido and Nakajima through a simulation model calculated the energy efficiency of shared spaces in Japanese cohousing. They conclude that Cohousing can be more energy-efficient, but under what conditions requires further research. [Kido and Nakajima 2011]

Illustration: eco-engineering in Groene Dak.

3.2 DIY, expertise and partners
The residential coops are a new partner in the process. Responsibilities and decision-making in the development as well as for future management need to be redefined. The Dutch survey found that the key issue is whether or not the initiative is perceived as a serious partner, with an expertise of its own: that of living together and the spatial arrangements it requires. This was also found by a study into French initiatives [Biau and Baque 2010]. Especially concerning ecological and energy issues, the members often develop a large knowledge which is not always trusted and seen as too risky by investment partners. Eco-engineering seems to depend on how strong a group is for negotiation. Even being located in a ‘green’ development zone (eco-quartier) is no guarantee for becoming an eco-project. Much depends on the quality of the project advisors, a new professional development for which there are no standards yet.

For example, the CWR initiative informed itself about sustainability issues during planning stages and made concrete design proposals. Although it is located in sustainable development area Romolenpolder, the partnering housing association did not want to experiment beyond its maintenance protocol. Other partners of the CWR initiative were not effective in this matter: the architect had little affinity with environmental issues and the plant team advisor was not able to negotiate on technical issues. In CWR a simple watersaving device became the symbol of their environmental ambitions: it took three meetings on the building site before the standard item was taken out of the builders contract and installed by residents themselves on the day of moving in [minutes building process].

For Groene Dak the planning context was not environmental friendly, but the housing association was interested in experimenting. The collective contained a few environmental activists, who were well informed and together with the housing association looked for subsidies. Groene Dak has implemented more or less everything possible on the field of eco-
engineering at that time, sometimes at a small-scale. They continue to monitor and to evaluate which elements work or had to be given up. [de Jong and Born 1995; interviews]

This expertise is not always recognised by the partners in the process. Institutionalised corporations have difficulties deviating from standard procedures, developers find the risk of innovative materials too high and architects or consultants have too little knowledge or motivation. For this reason the potential of co-housing (and self-management) has so far remained under-used. In those examples where the parties involved work together towards clearly established goals of ‘sustainable performance’ demonstrate that the necessary budget for innovations and the flexibility for implementation can be found. Contrary to the perceived risks, self-managed groups are a stable partner. While the individual member may change, there are always candidates to take the vacant place. Problems that occur, for example in the maintenance or malfunctioning of installations, are signalled on the short term and resolved by mutual effort [interviews and planning documents]. The realisation requires a re-orientation of all parties involved, as the traditional roles of ‘producer’ and ‘consumer’ become diffuse. This implies that the responsibilities shift and new instruments and contracts for planning and management of technical networks need to be invented.

3.3 Selfmanagement and (eco-) technology
Self-managed co-housing initiatives depart from integrated approaches, whereas policies are often one-item oriented. One example can illustrate the capability of dealing with closely intertwined design-questions: Most co-housing initiatives are prone to an organic organization of building volumes, rather than geometrical forms. In many cases the (‘triangular’) shape of the site support this, in a minority of cases it was inspired by anthroposophic philosophy avoiding straight angles, for example the Bongerd, Zwolle. As part of the final quality of the urban environment, it re-introduces besides formal arguments the perception of urbanization and density corresponding to human scale and enhancing privacy and identity.

Fromm already in 1991, and later Vestbro and Horelli demonstrated how the ‘intermediate spaces’, small ‘non-functional’ transition zones, in co-housing are essential to the organization of a community [Fromm 1991, Horelli-Vespà 1994, Vestbro 2010]. These intermediate spaces can be found more easily in so-called ‘irregular’ (or organic) forms than in concepts of formal urbanism. In this way cohousing projects are a laboratory for re-thinking the relation between spatial and social dynamic.
Another example is the rainwater collecting systems that have been implemented successfully in early-generation projects. The small-scale water management provides an excellent example of the potential of self-management for. Residents are no longer only consumers but also producers and managers of distribution and maintenance. The investment is done collectively en in some cases the financial benefit feeds back into community funds (Tummers, 2012).

In the same way, the application of new technologies and sources can not be seen separate from the ‘housing (living) culture’ the initiatives subscribe to. For example in Groene Dak dry (compost) WC were given up although the technical functioning was without fault; over time residents were getting more and more busy and decided the system was involving too much domestic work. On the other hand, the reedbed for water purification continues to work without being disturbed although it is located next to the public road.

The complex installations for heating and ventilation systems required to achieve a high standard, for example in the passive house model, pose difficulties for DIY management and maintenance. The orientation on (sustainable) technology has been criticized for ignoring aspects of culture and use [Subremon 2011, Shove 2003].

3.4 Co-housing as environmental educator

Inhabitants of self-managed housing develop a different attitude to their energy household. From passive consumers they become active consumers and often energy-producers, implementing proper standards of living. Many of the projects monitor their energy-consumption, and on the whole a first impression indicates that they are indeed (slightly) more efficient than average housing. A more precise analyses including the use-patterns of common space and their impact on the energy consumption should however be performed.

Marckmann, Gram-Hanssen and Christensen point to the necessary change of environmental attitude as collective process, and explore the potential of co-housing as a ‘reservoir of responsible citizens’ [Marckmann Gram-Hansen and Christensen 2012]. Like Melzer did in 2000, they argue that housing communities offers better chances for changing energy-consumption, through its clustered building, social interaction and environmental orientation of its residents. While the social profile and interaction of the communities may be very similar whether urban or rural, the spatial embedding does have considerable impact on its environmental performance. For example energy needed for transport and mobility, and the choice of renewable sources are to a large extend depending on the insertion (or distance) to networks.

While self-management, attitude, collective learning and group dynamic should not be ignored as a specific quality of co-housing, the relation between co-housing and energy transition does also exists in the urban and technical aspects of the projects. The development towards decentralization of energy production and the potential that clustered housing and direct management of the facilities provide examples for maintaining local energy necessary to reducing transport and mobility, and the choice of renewable sources are to a large extend depending on the insertion (or distance) to networks.
innovation that could be further explored. Decentralized networks, with 
short circuits, allow for management of peaks in production or demand on 
a small scale, for example using shared cars or washing facilities as 
storage for solar power.

Illustration: solar roof 
grown over time (Utrecht 
2011)

4. Conclusions
The pilot study made clear that in many aspects self-managed initiatives 
are ahead of policy-development, and considering them ‘pioneers’ rather 
than as idealist minority would not only help to solve bottlenecks for the 
projects but also advance the instruments for ‘planning with citizens’. 
The explicit ecological orientation of the majority of initiatives, in research 
is not related to the planning for energy transition, reduce heat islands 
and other mayor environmental challenges.

4.1 Obstacles and opportunities
In the briefings and design most projects initiatives articulate their 
tentions to build to low-energy consumption, passive house standards. 
The average investment of costs of an apartment in self-management is 
not significantly lower than turn-key property or rental. But the ‘value per 
Euro’ is significantly higher. Not only do self-managed projects create 
more m2 for the same price, but also more quality and lower energy 
costs. Value is understood comprehensively, wider than only financial. The 
financial arrangements that are needed are not amongst the current 
products offered by banks, excepting the cooperative banks. Costs of 
equipment that ensures for example reduction of water- and energy-
consumption are often seen as un-necessary during the creation of the 
project, whereas on the long term they provide better guarantees for 
independence and continuity of energy- and water supply. The need of 
investments is the most frequent reason to force initiatives to collaborate 
with institutional partners. As mentioned earlier, this may put the 
ecological ambitions under pressure. Involuntary, it also puts restrictions 
on another ambition: the mix of incomes in the project and the 
accessibility for low-income groups. Formal housing distribution 
regulations for example do not allow institutional participation for middle-
and high-income households.
4.2 De-centralized energy & co-housing

While self-management, attitude, collective learning and group dynamic should not be ignored as a specific quality of co-housing, the relation between co-housing and energy transition does also exists in the urban and technical aspects of the projects. The development towards decentralization of energy production and the potential that clustered housing and direct management of the facilities provide examples for innovation that could be further explored. Decentralized networks, with short circuits, allow for management of peaks in production or demand on a small scale, for example using shared cars or washing facilities as storage for solar power.

A parallel development of citizen’s initiatives is emerging in many fields; for example small entrepreneurs insurance; health care or ‘renewable energy cooperatives’ [Schwenke 2012]. Local residents create energy coops to mobilize DIY producing. The reasoning behind such initiatives is similar to co-housing but these initiatives concern dispersed building volumes: the participants do not live under one roof.

Housing unites the three pillars, people - planet - profit, of environmental sustainability. The ‘green urban oases’ have proven to be micro-laboratories for social dynamic, organisation- and property models, self-management and self-budgeting (the mutualisation of resources). Until now, self-managed co-housing initiatives are the pioneers for low-impact high quality housing. They developed much knowledge about sustainable building, renewable energies and efficient installations.

Initial analyses of case-studies in Germany, the Netherlands, Japan and France reveal that the mutualisation of resources and the direct involvement in maintenance and management leads to better sustainable performances. There is lower consumption of water and energy per household, and a larger share of the consumption is from renewable sources.

However the realisation of these environmental qualities requires much perseverance of the residents. The building and housing sectors as a whole are slow to adapt to transition to non-fossil energy and often do so only when forced by governmental regulations following European agreements. The lack of available housing with small environmental footprint is one of the incentives for collaborative housing initiatives.

Even if proportionally self-managed co-housing is to remain a small share of the housing stock, the recognition of its essential qualities is of wider importance. Until now, the evaluation of the environmental performances has remained mostly inside the initiatives. The learning experience of self-managed co-housing projects needs to be structurally made available, in order to understand the innovations that are relevant for up-scaling in fair share housing models.
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