# A suitable design methodology for collective-self-organized housing projects to build sustainable districts

***Abstract:*** *Collective building has become more popular movement over the last twenty years particularly within the EU countries. There are different forms and typologies of such movements which have a changing degree of community profile, shared-values and expectations from the program of housing. When the energy-ambition is included in their programs, and embedded into the values of the community; collective housing carries a potential to be as grassroots movement towards building self-organized energy-efficient district via collective behaviour. In this paper, this potential movement is conceptualized as Collective Self Organized Housing (CSO). However, building sustainable districts collectively requires a design methodology which establishes strong and clear relationships among community, design professionals, suppliers, and municipalities. In this paper, firstly CSO design process is defined; secondly participatory design and concurrent design methodologies are reviewed in order to see their suitability to be CSO design process, and finally conclusions and recommendations are drawn to discuss CSO-specific design methodology.*

***Collective housing, energy-efficiency, design***

## Background

A substantial sustainable housing movement has developed over the last 30–40 years with pioneering new ideas and experimenting with new practices (Seyfang 2010). There are fundamentally different discourses, practices, and governance of sustainability between these movements and mainstream housing provision; and these differences result in barriers to transfer the practices which encompasses ideological, cultural, social and ethical factors beyond economic and technical ones (Saffang 2010; Smith, 2007; Shove, 1998; Lovell, 2004). In such movements, there are also innovative design solutions which require behavioural changes (incorporating the behaviours of the end-users and the community), technological change (using and incorporating the technological developments and solutions) and institutional change (regulatory measures, and norms and energy taxes) (Ornetzedera and Rohracher 2006). Nevertheless, experiences of such changes, management interventions, and the innovations are not widely diffused (Seyfang 2010). Little is known about the drivers that are different in movements, the values that attach individuals to join to these movements, and the behaviours of the community governing the sustainability ambition and reflecting all these to their programs of their housing. And there is a need to better understand and therefore harness the creative energies of community-led solutions, and adapt them for wider mainstream settings (ibid). In other words, there is a limited understanding about how different communities lead their projects and incorporate available innovations in the design process. Consequently, there is a need to canvas existing movements, their typologies, driving values and expectations from their housing in order to identify a required design process for community-driven housing projects.

Below the common typologies of such movements are presented.

*Cohousing* is an end-user initiated, developed, and managed residential housing (Fenster 1999; Lietaert 2010). It has mixed programs of private and common dwellings to recreate a sense of community, while preserving a high degree of individual privacy (Lietaert 2010). Cohousing is driven by a modern-communal life style and requires equal degree of participation of end-users (McCamant and Durret 2011) and.

*Common Interest Community* is a community-led private real-estate development (Hyatt 1998; Paik 1998 in Fenster 1999), organized within an association created by either statute or covenants running with the land (Fenster 1999). The community becomes as an institutional client (McKenzie 2003) and is driven by the additional spatial and emotional characteristics (Brouwer and Bektas 2014).

*Collective Housing* is initiated by often municipalities to fulfil modernisation and gender equality such as less house work for women (Vestbro 2000). It is programmed as apartments around central kitchen, with food-lifts providing ordered food to each apartment; driving the collective and communal living.

*Intentional Community* is driven by a shared strong religious, political, environmental or social ideology rather than simply a desire to have a strong sense of community with their neighbours (Guinther 2008). There is no specific program demand by the community as long as the ideological group lives together in their own islands.

*Collectively Commissioned Housing* is driven byadditional functions and values, not represented in standard housing (de Haan & Tummers 2007). The driving force is the potential to be financially and institutionally strong as a collective group. Their programs include such additional spaces next to workspaces, garden, playground or bike stall, might also serve wider neighbourhood functionality.

*Community-led Housing* is formed to stimulate tenants and leaseholders to collectively take on responsibility for managing the homes they live in (NFTMO 2004). The tenants participate to the decision process, excluding major decisions. It is driven by cost-effectiveness, improved maintenance within short-term frame due to the tenancy period.

*Self-build/provided Housing* is driven by cost-effectiveness and affordability comparing to speculative housing provision. It becomes a major element in the expansion of European metropoles, and sometimes reaches the heights of 'post-fordist' industrial organisation and product development (Duncan and Rowe 1993).

Existing movements exemplified above have either community or program driven values. For example, cohousing, collective housing and intentional communities are on the community-driven side as the program is a tool to create the life-style the community desires. Whereas common interest community, collective-led/commissioned housing are on the program-driven side, as the enhanced program itself is an expected result due to the additional physical features that the community aim to have (i.e. controlled entries, surveillance, similar-income housing, affordability, more public spaces etc.).

None of the examples results in a totally unique programs but *new physical and social entities* in relation with their community profile, shared-values and the degree of their participatory behaviours from the perspective of design process. In other words, even if the categories are not univocal, each typology can differ by basing on some particular characteristics. These characteristics deal with:

- Higher/lower sense of community (the degree of community intention),
- Level of involvement of end-users (the degree of partication),
- Motivations/values which drive a group of individuals to start a collective process.

This can result in ideologically-driven communities or groups-driven by the potential of saving costs and/or having affordable and tailor-made design comparing with the traditional housing market. A major share of them presents shared facilities, as communal kitchen and laundry, or additional services to the neighbourhood. However, no matter how strong the interaction and participation of the community members with the commissioned parties are and how changing motivations they have, there are similar problems such as delays, standard solutions, or not reaching the full potential of aimed energy ambition in the end. Regarding the sustainability values, only few movements incorporated 'sustainability' as a value attached to the movement, except the examples in cohousing, eco-villages which evidently impose a certain ideology of either political or life-style.

The collective movements analyzed as Cohousing, Common Interest Community, Collective Housing, Intentional Community, Collectively Commissioned Housing, Community-led Housing, and Self-build/provided impose a certain typology and categorization to the future collective groups who focus on deliberate sustainable living and building. Thus, there is a need for an umbrella concept that doesn't impose any ideology, typology, life-style explicitly, yet generic enough to associate community members to the potential projects and drive the whole development process towards their requirements at district scale, which incorporate governance of sustainability. Below, this umbrella concept is called as *Collective-Self-Organized Housing*.

**Collective-Self-Organized Housing**

The term Collective-Self-Organized Housing (CSO) refers to a housing model characterized by a high level of self-organization and participation of the end-users in the processes of formation, requirements definition, planning, design, implementation and maintaining their own housing project at district level. CSO is used as an umbrella term that encompasses multiple housing typologies, incorporates energy efficiency, and the movement driven by a group of individuals who organizes community forming, pre-design, design, construction and operational phases with changing degree of participation. CSO housing can be either new construction or retrofitting of existing buildings at district scale. In other words, community in CSO housing obtains a high degree of customization of the private and common spaces at the district scale and involves in a tailor-made design process, which incorporates their values.

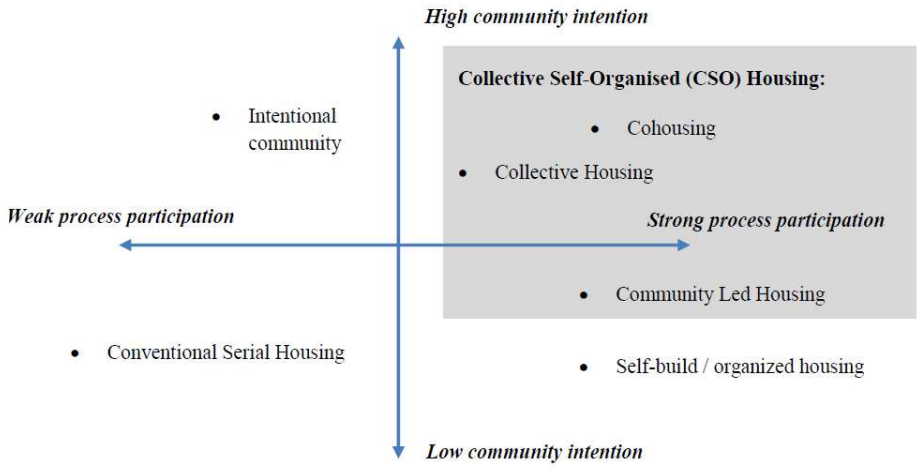


*Figure 1 representation of mapping grassroots housing movements with explicit defining area of CSO Housing (Brouwer and Bektas 2014).*

Brouwer and Bektas (2014) identified four dynamics that provides interplay in each CSO housing projects; 1) values, 2) behaviours, 3) community, and 4) program as illustrated in *Figure 2*. These four aspects are reflected in design process either being tangible (i.e. program of the community) or intangible characters (values, behaviours) of projects.

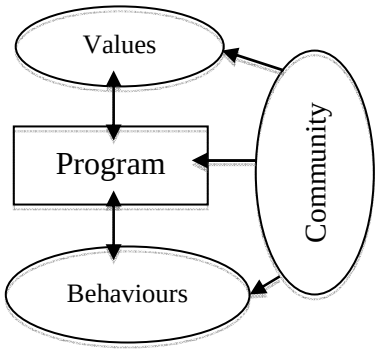


*Figure 2 Four typical dynamics influencing the design process of collective housing movements*

Regardless of the political, ecological or social ideology, CSO housing becomes a tool to build and/or transform existing districts to sustainable districts. However, there are two critical predictions in CSO Housing conceptualized here:

1. As CSO housing is a conceptual term that embraces existing grassroots movements, the current problems of existing movements remain the same, unless they are addressed particularly. (i.e. being a once-a-life time project in which the lessons are learnt yet not transferred anywhere; facing with excessively long and costly projects; ending up with mismatches between expectations of community and design solutions provided by the design professionals when the values and behaviours are not well-understood and reflected to the design; difficulty to have realistic energy ambition in their programs.

2. As currently the community (the non-professional end-users) has limited access (and insights) to the businesses and suppliers that are innovative and skilful to apply novel total solutions, CSO housing has a danger to end up very standardized design solutions than being innovative.

These predictions highlight the importance of finding a suitable design methodology that bridges community expectations and practice of design professionals (including architects, engineers, suppliers, ESCO's etc.); and that provides the intended degree of participation and concurrency between these actors in CSO projects.

**Design Process of CSO Housing**

The design process of CSO Housing requires a high -yet changing- degree of participation of end users, and intensive interaction among design-disciplines due to their program embedding innovative technologies for sustainability. It also embraces a high degree of iteration in design activities. Depending on the profile of the community, their values, and expectations from their programs, the degree of participation is required. This degree influences their behaviours to the design process.

The interplay of CSO housing (among values, behaviours, community and program) of Brouwer and Bektas (2014) are from the perspective of the community, and it does not include the perspective of design professionals. Below in *Figure 3*, we enhance this interplay through including design professionals, which also have changing values, driving forces, disciplinary behaviours and program expectations.

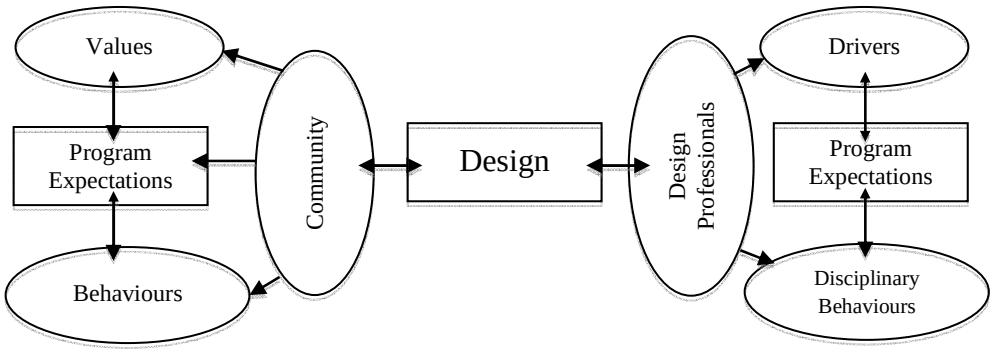


*Figure 3 the focus of concurrent design in CSO housing projects, adopted from Brouwer and Bektas (2014)*

In CSO projects, *design* itself becomes a mean to communicate, externalize both sides' expectations and reflect their values. As participation becomes crucial from the perspective of community, participatory design methodology becomes evident to be reviewed. As interdependency between design disciplines (i.e. building, installation, materialization) and the iteration managed with end users become crucial for the design professionals' perspective, concurrent design methodology becomes evident to be reviewed.

**Participatory design methodology for CSO housing**

*Participatory Design* (PD) is an end-user-oriented design methodology that places a premium on the active involvement of end-users in design and decision-making (Sanoff 2008). Kensing and Blomberg (1998) claim that PD is one of the preconditions for good design and increases the likelihood that buildings will be designed and built useful and well integrated into the daily practice of residents. CSO housing is conceptualized as an emerging sector due to the freedom the end-users experience in expressing their demands and wishes into formulating the ideal housing process, housing design and forming of a community. This freedom becomes the participation space of end-users. PD promises a profound involvement of the end-users in the design, accordingly to the rules of participation established between the end-users and design professionals, and provides tailor-made solutions.

PD in CSO housing would be interpreted as a method that end users participate actively to the design process accordingly to the rules of participation established between the end-users and design professionals. PD in CSO housing at least involves the design disciplines (architect, structural engineer, technician, building physics) and the envisioned end-users (owner occupants, services). Thus, the participation deals with the integration of the perspectives, knowledge and insights of the supply and demand side. The aspects of PD in CSO housing in this sense become reality by agreeing upon 1) definition of the extent of participation rules between actors, 2) agreement on the form and degree of participation 3) selection and the use of the tools and methodologies in participatory design, by both supply and demand side. PD in any CSO housing project is a tailor made solution, depending on the requests of the demand side, and a certain pre-fixing of solutions and design freedom from the supply side.

In terms of requirements to facilitate the principles of PD in CSO housing, the community (as CSO client) is free to choose which degree of participation they wish to have in their CSO projects. This degree in the design process depends on the willing of the community and the rules of participation they set up. The participation in CSO housing deals with the whole collaborative design process, not only focus on the collective decision-making process. But even in collective decision-making process, there are preparation requirements. Any collective decision-making process requires having a choice, between a set of alternative solutions, and/or in defining the problems (articulation) as in the program of requirements. The interplay between problem definition, solutions design and selection between alternatives (on various abstraction levels) is the key for a successful design process. This brings a crucial treatment to the program of requirements in CSO housing, as it is a collective outcome of end-user requirements. Therefore, PD requires accepting that the program of requirements in CSO housing changes over time and managed with dynamic briefing principles.

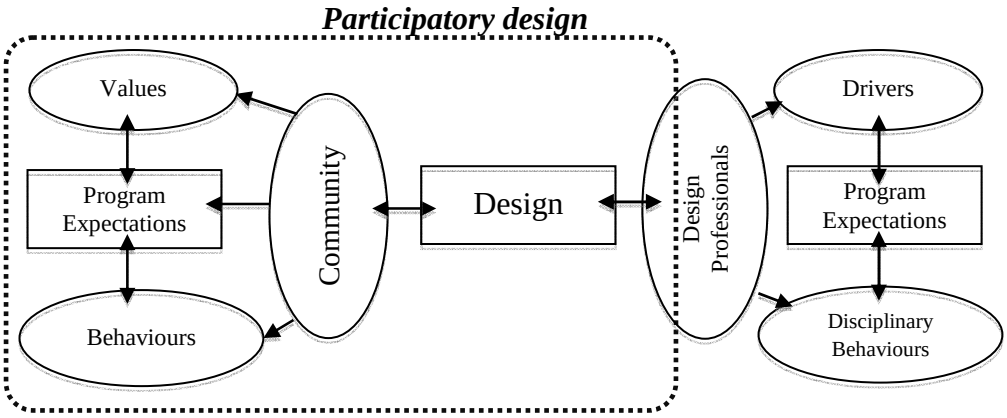


*Figure 4 the focus of participatory design in CSO housing*

**Concurrent Design methodology for CSO housing**

Concurrent Design (CD) is a multidisciplinary integrated approach to embed technology constraints, cost, risk and planning to the design for complex projects (Matthyssen and Gerené 2011). In product development context, CD is defined to incorporate the considerations in the downstream product development phases (i.e. manufacturing, assembly, maintenance, etc.) into the design phase for producing a design with the best overall product life-cycle performance (Xue et al. 1999). Thus, it deals with enrichment of the design information earlier rather than convention manner as it occurs over time across the phases. Matthyssen and Gerené (2011) emphasize it on management perspective and the need for CD in complex projects due to their notoriousity in management performances (See: Flyvberg 2002, Flyvberg et al. 2003), whereas Xue et al. (1999) deal with the early integration of the information that normally produced (or made explicit) through the elaboration of the design solutions.

As Finger et al. (1995) identify, CD consists of two views: 1) organizational and 2) technical. From the organizational point of view (1), CD creates and organizes team of professionals, which develop parallel and synchronous activities. From the technical point of view (2), the team is expected to organize itself creating and integrating computer-based tools to share a common ground for knowledge. Contrary to the traditional design method, it involves the opportunity of overlapping the activities, thus the removal of information dependency between different activities, allowing the collaboration among different field of expertise (Bogus et al. 2005). This leads us to the two levels that CD is related to: 1) project management and 2) design management and evolvement. Depending on which view the project team looks through, the implementations and the expected benefits can vary. Below, we try to understand what CD's benefits are in projects.

The benefits listed above deal with different actors (i.e. client, design team, contractor) in different levels in projects (i.e. organizational –'corporate'). It deals with firstly the client (as referred to 'customer') with higher satisfaction and quality, reduced risk; secondly the design team with managing re-design and iteration ('reduction'), evaluation of more design options

and thirdly the contractor with standardization of methods and the design model that integrates multi-disciplinary knowledge. Besides, the employee efficiency and involvement cross-fertilizes the benefits that differed to each actor.

However, this essential aspect, and promising potential of concurrent design, is not fully utilized, often due to time and organizational constraints in projects. CD requires an attentive calibration between benefits and risks as the incorrect organizational structure could instead bring to waste in terms of money and time, not guaranteeing the results. These connect us to the requirements of CD in relation with the view of CD.

The key issue in CD is to integrate design information in early stage. This information deals with the assembling, maintenance and operation and indicates the projects actors (client, design team and the contractor) about the management performance indicators such as cost, time, quality, etc. In order to do that CD identifies activities to be synchronized and/or parallel run. Two things are required for this; 1) identification of activities and 2) management plan.

Thus, CD requires a decision-making structure definition to support collaboration. Through tools, plans and identified activities, decomposition of assignments (task and activity) and the synthesis of different solutions are done. These concurrent activities allow for a faster and shorter-cyclic iteration, through which more synchronous and coherent effort can be achieved.

Besides the collaboration with the design professionals, the collaboration with suppliers entails the integration of process and products speeding up the timing and fixing the cost of the investment. The synchronous and parallel development of different knowledge entails less iteration among activities, speeding up the process. All the different disciplines work concurrently to the definition of the project achieving also a better fulfilment of the requirements of the end-users and the response to their expectations. Moreover, the “cost” factor is prevailing in a CSO project as late changes in cost could achieve the failure of a project.

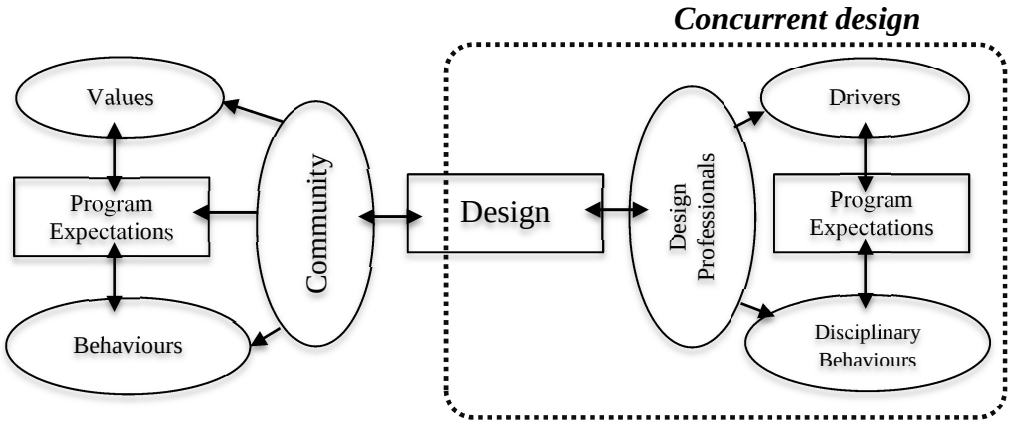


*Figure 5 the focus of concurrent design in CSO housing*

So far, CD in CSO housing seems promising for collaboration among design professionals from the early beginning of the design phase. Moving from promising to be a suitable

approach, definition of roles and responsibility of each actor become crucial for the coordination and activities development mechanism. Thus, CD in CSO housing requires 1) initial definition of upfront requirements, 2) a flexible set-based design and 3) an organizational and technical tool to develop the design activities. The proper definition of these upfront conditions (project constraints and potentials, requirements) (1) entails less design changes in case of downstream information/requirements changes which could be better fulfilled within a (2) flexible system.

**Discussion & Conclusions & Recommendations**

Both methodologies have a different focus in CSO housing projects, as PD focuses on participation of end-users, whereas CD deals with collaboration of all the disciplines in the different project phases. On the one hand, PD reflects a key role of the end-users, ensuring their involvement in the design process, from the early beginning, up to the construction phase. On the other hand, CD provides a suitable basis for the integration of social, economic, and technical knowledge in the design process establishing a parallel work-setting instead of a traditional hierarchical, sequential order of steps and incorporating the knowhow of disciplines from the end of the design and building process (materials, details, management and maintenance) as far as possible to the beginning. Subsequently, neither participatory nor concurrent design methodologies fully fit to the interplay of CSO housing projects.. Neither one supports the facilitation between CSO housing clients (communities attached to their values and behaviours to the design process) nor design professionals, which also have disciplinary behaviours, program expectations and own drivers, together.

The main difficulty in combining PD and CD is that collaboration essentially presupposes definition of requirements as far upstream in the process to enable professional parties to deal in parallel with tasks; whereas the main characteristic of PD regarding non-professionals end-users is that these requirements cannot be decided and fixed far upstream in the process. Thus, these operate on two different levels. In these two level operations, a specific methodology and innovative tools would be necessary to provide concurrency among parties, participation of the community and programming which makes the values explicit.

If we can elaborate, from demand perspective, this common level needs to correspond to the quality of site, buildings and dwellings; and focus of programing which consists of functionality (i.e. lay-outs, common spaces, accessibility, etc.), sustainability (the energy-ambition of the community) and deals with the dynamic definition of programs of community. From supply perspective, this common needs to correspond to design quality, the construction process, technological solutions, characteristics and specifications of materials and components, energy performances of building systems, and deals with iteration of program driven by the community not only the design itself. One of the solutions would be focusing on building systems within districts and how to make more familiar concepts to boost the interaction and understanding between both. One example would be to perceive a building system and its neighbourhood as a technological (e.g. structural framework, external envelope, etc.), functional (homogeneous areas and single spaces/rooms), and social (values

tangibly presented in building systems and neighbourhoods) subsystems. When the activities with supply and demand side explicitly focus on these three subsystems, actors of both sides can communicate via “functional, spatial, and social-relation entity” in the design process. This three-relation entity becomes a bridge which externalizes both the expectations of non-professional actors and the knowledge of design professionals.

**References**


Brouwer, J., and Bektas, E. Exploring existing grassroots housing movements for energy efficient districts. Paper accepted to proceedings, AESOP from control to co-evolution conference conference, 3-12 July 2014, Utrecht/ Delft

Duncan, S. S., and A. Rowe. "Self-provided housing: the first world's hidden housing arm." *Urban Studies* 30.8 (1993): 1331-1354.

Fenster, M., 1999. Community by Convenant, Process, and Design: Cohousing and the contemporary common interest community, Journal of Land Use and Environmental Law.

Guinther, L. L., Cohousing: Its Characteristics, Evolution and Emerging Typologies, dissertation (2008) University of Cincinnati, 2008

Haan, H.P. de, and Tummers, L.C., 2007. De C van Collectief Particulier Opdrachtgeverschap. In L.C. Tummers (Ed.), Over(al)tijd: de achtergronden, Delft: TU Delft; Urbanism pp. 20-24

Hyatt, W., 1998. Condominium and Homeowners Association Practice: Community Associaton Law (2nd ed. 1985) $ 1.05 (a)

Kensing, F. and J. Blomberg, PD meets CSCW – Issues and Concerns. Computer Supported Cooperative Work, 7, 167–185, 1998

Lietaert, 2010 Lietaert, M., Cohousing’s Relevance to Degrowth Theories, Journal of Cleaner Technologies 18 (2010) 576-580

Lovell, H., Framing sustainable housing as a solution to climate change. Journal of Environmental Policy and Planning, 6 (1) (2004), pp. 35‑55

Matthyssen A., & Gerené S., Introduction to concurrent design and engineering, Space center EPFL, Lausanne, Switzerland, 2011

McCamant, Kathryn and Durrett, Charles, Creating Cohousing, Building Sustainable Communities, Canada, 2011

McKenzie E., 1994. Privatopia: Homeowner Associations and the Rise of Residential Private Government. Yale U. Press, New Haven, CT

NFTMO – National Federation of Tenants Management Organisations, Guidance and Good Practise for TMOs – 2004 (www.nftmo.com)

Ornetzeder, M., & Rohracher, H. (2006). User-led innovations and participation processes: lessons from sustainable energy technologies. Energy Policy, 34(2), 138-150.

Sanoff, Henry, Community Participation Methods in Design and Planning, John Wiley & Sons, 2000Seyfang, Gill. "Community action for sustainable housing: Building a low-carbon future." Energy Policy 38.12 (2010): 7624-7633.

Shove, E., Gaps, barriers and conceptual chasms: theories of technology transfer and energy in buildings. Energy Policy, 26 (15) (1998), pp. 1105‑1112

Smith, A., Translating sustainabilities between green niches and socio-technical regimes. Technology Analysis & Strategic Management, 19 (4) (2007), pp. 427‑450

Vestbro, D.U., 2000. From collective housing to cohousing. A summary of research. Journal of Architectural and Planning Research. Vol. 17, No. 2, pp. 164-178.

Xue, D., Yadav, S., & Norrie, D. H. (1999). Knowledge base and database representation for intelligent concurrent design. Computer-Aided Design, 31(2), 131-145