

## NOVEL DESIGN PRINCIPLES AND PROCESS MODELS FOR EMERGING CSO HOUSING MARKET

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**Abstract** *After many years of top down organised urban planning and housing provision, the current time frame identifies a reverse trend: a collective bottom-up approach. In this approach, the initiative and directing power comes from individuals and group of individuals now, instead of local municipalities or large real estate developers that have dominated the housing scene for long. Particularly the group of individuals play a key potential role to build energy efficient housing at district scale. We call this collective and energy-efficient approach, Collective Self-Organized (CSO) Housing.*

*In CSO housing, individuals form and organize a collective client-ship and steer their housing process towards their values, wishes, and prerequisites. They take liberty to formulate where and how to live, contact the market suppliers, engage themselves in design process, and move towards their particular social, economic, environmental and spatial ambitions (i.e. sustainability, eco-design, energy efficiency, child friendly etc.). Depending on the profile of the collectives, these ambitions include changing degree of active participation of the individuals to the design process. However, embedding this participation to the conventional design process and being a collective client pursuing particular ambitions requires a different arrangement with market parties (designers, engineers, advisors etc.) and municipalities than the traditional stakeholder relations.*

## 1. INTRODUCTION

For many decades, the housing construction has been dominated by large commercial companies, contractors and real estate developers. In dialog with local authorities, stirred by the large development plans and ideology of the state housing ministries, has housing supply been determined for the consumer, how and where to live [1].

Many reforms have been pursued, ideologies changed from modern high rise housing in the 70s, back to terraced family houses, in child friendly and green urban sprawl areas in the 80s and 90s [2]. Commercial and profit stakes becoming more important for developer and municipalities, working together on new urban plans for flourishing neighbourhoods full of (semi-)detached houses for the nuclear family.

The predominant housing strategy worked out fine as long there was more demand than supply, and real estate prices went up each and every year. But in those areas, and in those times that these pre-conditions were not met, this development model doesn't reflect the diversity and uniqueness of future home owners. These aspects, worsen also by the general housing market crisis, caused the failure/dissolution of more and more real estate developing projects; and the very fast decrease of sales figure. As a result of this global situation, commercial developers are now facing half-finished projects, paid with bank loans they can't pay back, with a strong negative impact to the overall building industry.

It seems obvious from this description that large scale housing projects, initiated by developers and authorities with large commercial stakes are not fulfilling the wishes of current and future demand any more. Contemporary demand is characterized by smaller scale, a local identity, bottom up initiatives and sustainability in both design and construction of buildings [3]. This form of housing requires a different form of client-ship, and type of process organisation to realize the projects too. Firstly, this paper identifies a sample of ways that enable individual, but in most cases a collective of individuals organises, formulates, designs, and constructs their own housing project. Collective Self Organised (CSO) Housing is defined as an umbrella term, overarching many types and characteristics of longer existing collective housing forms like Cohousing, community led housing and self-build housing.

In this paper we elaborate on the further requirements for end users as well as for suppliers, how to cooperate in the design and construction of houses for the future. We primarily focus on the design stages, that entail the interaction between intended end users on the one side, and a wide range of design disciplines, suppliers and experts on the other. Within the context of the EU project PROFICIENT, this paper represents the main findings and lessons on design activities, how to allow for end users to *participate in the design process*, and secondly, have the design disciplines working on their task in a well-informed simultaneous way, called *concurrent design*. Next to the design process, what clearly deviates from conventional housing process, is that CSO Housing groups have a strong role in the initiative, the organisation of the client role, the selection of suppliers, formulation of demands and in financial risk management. How these features of the CSO Housing process model work, interact, and what is required from stakeholders is also explored in this paper.

## 2. TYPES OF CSO HOUSING

CSO Housing is not entirely new, the label is, but is referring to the type of housing provision that goes back much further in time than we can trace. At the same time of mass housing provision programmes were initiated to recover from WWII, there was also a counter movement initiated in Scandinavian countries, where a specific sound was expressed for more community driven housing projects. In this section we will present an overview of collective housing typologies that have emerged over time, and pursued a particular level of self-organisation, community values, and/ or sustainable type of living.

Analysis of the set of collective housing typologies delivered an inventory of the shared values, the community profile, behaviours and program of requirements of the typologies. The table below is representing a more extensive study of typologies [4].

Cohousing	An end-user driven small-scale type of residential housing development (Fenster, 1999; Lietaert 2010); with mix of private and common dwellings to recreate community sense, with a high degree of individual privacy (Lietaert 2010) and equal degree of participation of end-users (McCamant and Durret, 2011).
Common Interest Community	A community-led private real-estate development (Hyatt 1998) with the community as an institutional client (McKenzie 2003) created by statute/ covenants running with the land (Fenster, 1999); programmed to have more characteristics than the housing on the market yet often criticised of being 'hygienic' districts (Brouwer and Bektas 2014).
Collective Housing	A municipality/local government initiated (often) real estate, driven by modernisation of life and gender equality (Vestbro, 2000), seen in Scandinavian countries and programmed as apartments around central spaces,
Intentional Community	Driven by a shared strong religious/political/ environmental/social (Guinther, 2008); not a specific program demand by the community but group living together in isolation.
Collectively Commissioned Housing	Driven by collectives willing to commission their housing project, often due to additional functions/values, not represented in standard housing (de Haan & Tummers, 2007). potential to be financially/institutionally strong as a collective group.
Community-led Housing	Driven by cost-effectiveness, improved maintenance within short-term frame due to the tenancy period, and formed to stimulate tenants to "collectively take on responsibility for managing the homes they live in" (NFTMO, 2004); participative yet excluding major decisions.;
Self-build/provided	Driven by cost-effectiveness and affordability comparing to speculative housing provision; a major element in the expansion of European metropolises and sometimes reaches the heights of 'post-fordist' industrial organisation and product development (Duncan and Rowe 1993).

Table 1. List of existing housing typologies under as examples of community-led housing movements (Source: [4])

CSO Housing is basically a follow up step, on top or better, overarching a larger set of collective housing typologies that became into being over the last decades. In determining the main distinctive features of CSO Housing, the work Tummers [3] and Zandvoort [5] has identified two main characterizations of what is CSO Housing. Referring to collaborative housing projects, the distinctive features are {1} building together, and {2} living together. This surprisingly well corresponds with the features we have identified earlier, as being the participation dimension and the community intentions one (fig. 1).

In defining the scope of CSO Housing, we have identified a market potential for CSO Housing in both new construction and retrofitting of existing houses. This market potential for CSO Housing is primarily based on precisely that type of housing projects that embody a good basis for self-organising capacity. This capacity can be found throughout Europe, in both multi-family type of dwellings, as well as terraced houses, detached houses etc.

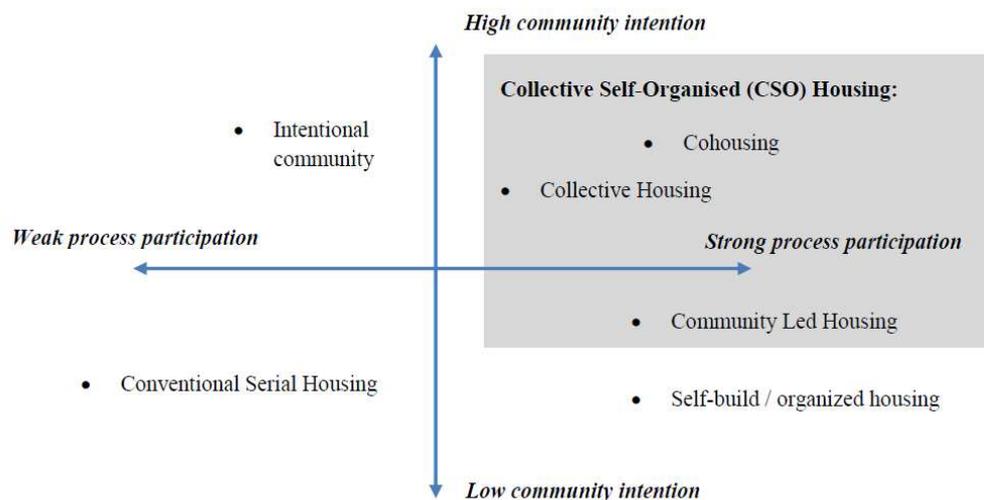


Figure 1. Two dimensional mapping exercise of existing grass roots housing movements (source: [6]).

Within the two dimensional field analysis, which reflects the participation of end-users on the horizontal dimension, and the level of community intention of housing typologies in the vertical dimension, the accented area typecasts the CSO Housing characteristics. A combination of high community intentions and strong process participation. In-here a few existing collective housing typologies are bundled.

CSO Housing is further defined as a group of individuals that acts in association to organise and commission the processes of formation, requirement definition, planning, design, implementation and/or maintaining their own housing project. Although linearly listed these processes largely run in parallel, are intertwined and/or (partly) iteratively repeated. A CSO housing project is typically characterized by a mutual dependency between the individuals participating [6]. Considering the further typologies listed in the table and two dimensional field here, it becomes evident that most housing typologies are focussing on new construction. We like to stress that CSO Housing is very much open for retrofitting projects. Unfortunately, practice doesn't present us nice typologies on retrofitting housing projects, but they can fit the definition of CSO Housing very well. Even in the current light of weak construction activities, and shifting focus to sustainable retrofitting of existing housing estates (from multi-family blocks, to detached family houses), opens a whole new market segment for CSO Housing. Furthermore, retrofitting represents more than ever one of the most potential market sector for building industries, mainly due to the general urban sprawl and the resulting politics addressed to reduce land consumption.

### 3. DESIGN PROCESS FOR 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 [6] are from the perspective of the community, and it does not include the perspective of design professionals. Below in Figure 2, we enhance this interplay through including design professionals, which also have changing values, driving forces, disciplinary behaviours and program expectations.

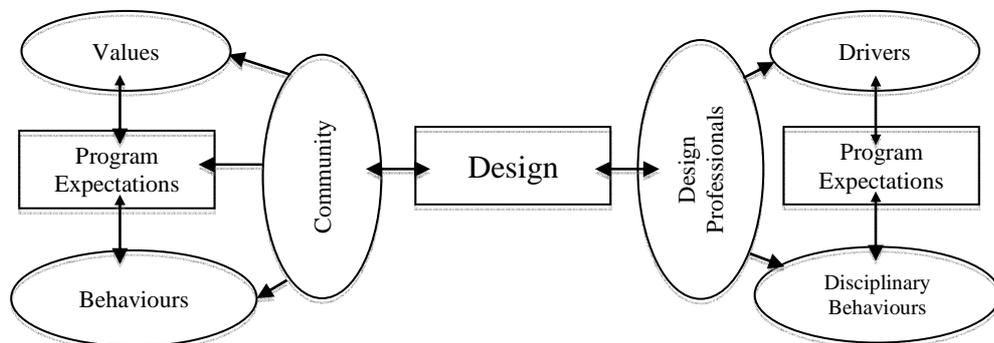


Figure 2. Focus of CSO Housing design, illustrates the participatory design feature to the left, and the concurrent design to the right, adopted from Bektas [4]

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, the need for review of current design approaches from perspective of this interaction (and mutual influences) is evident as well.

#### 3.1. Conventional design process

Conventional design processes, certainly from perspective of engineering disciplines' involvement based on largely concurrent type of activities, are often characterised by sequential design stages and steps. The following stage is depending and waiting for the previous to be ready. And if a mistake of improvement has been identified later in the process, sometimes many steps need to be redone. Of course, if resources allow for them to be repeated.

Furthermore, design in itself should not be considered decoupled sequentially from the formulation of end user requirements. Or in other words, CSO Housing allows for a change in requirements definition first-then (inventive) solution definition steps, as usually performed in traditional type of development. Furthermore, where this type of development suited

efficiency based work flows of professional developers, it is just not the mode of action for non-professional clients, such as collective of homeowners (that often assume this client role only once or twice in their lifetime). Non-professional clients encounter a daunting and very tough task if they're required to define their 'problems' correctly on the first try. Where professional clients, largely based on their experience, can analytically list their requirements, non-professional clients go through a more trial-and-error process based on synthesis first-then analysis of the synthesised solution; resulting in an iteratively improved requirements definition. This synthesis-analysis-synthesis iteration cycle is even more important for a group of non-professional end-users that need to form one client voice. It's found that after a first set of requirements from the end users, a visual representation of possible solutions (directions) helps the end users to further shape and detail their requirements. One should consider the process of designing (interpretation and visualisation) and formulation of requirements as two interacting, parallel – not concurrent – process stages, that allow for dynamic and fluid determination of a situational fitting design.

### **3.2. New phases for CSO Housing design**

By incorporating the participatory and concurrent design features into a CSO Housing design approach, there are a few additional steps to consider, and new phases to be welcomed in the CSO Housing project. It starts with the anticipation by design disciplines to prepare the design work in such a way that they can work in parallel, and have a well-structured information channel (to inform the other disciplines about particular design decisions). Besides, they have to make allowances for adjustments and create flexibility in proposals to accommodate CSO process driven changes. End users are expected to have a range of basic requirements and conditions checked. Ideally, from perspective of professionals, but also for purposes of an effective time management, these range from the preconditions that come from the building site, to the financial limitations of the CSO group, and the basic requirements with regard to the housing project (nr of dwellings, common house, energy ambition, etc.). As stated before, the building and development process is not linear nor sequential. It involves a series of steps which could be undertaken in a different chronological order and which relate to the design phase through exchange of information crucial to the completion of the process. In fact, the Design phase acquires a relevant role as it begins at a very early stage of the process and relates to all the other phases, and, at the same time, being the phase that materialize CSO Housing interventions. In the Proficient scope, the design stage is developed through the application of Participatory Design (PD) and Concurrent Design (CD) methods. Launching the Design phase at an early stage of the process is beneficial as nearly every step in the whole process generates information, which directly affects the design phase. Therefore, the requirements should start to be defined as soon as possible in the process. The exchange of information could define both procedures, economic factors and contents of the design activities. For instance, design procedures are affected by the definition of the rules of participation, the economic factors by the financial resources of the end-users, while the design content is affected by the definition of requirements to be translated in, and parallel tested by design [7].

#### 4. DESIGN ACTIVITIES AND ACTIONS

In order to cope with a design process that requires the elements and procedures of Participatory Design to be merged with the ones of Concurrent Design, the design process has been considered as a flexible system of activities, in which the necessity and requirements of the specific CSO Housing project is allowed to be developed. From the participation perspective, it is crucial to define which are the activities the end-users participate to, the timing of participation and the tools necessary to apply to participation. From the concurrency perspective instead it is necessary to define the information dependency among activities in order to enable the design team to develop a proper team organization, in order to define the times, roles and responsibility of each professional involved, and in order to keep at a sustainable degree the iterative characteristic of the process. At the same time, it is essential to define the tools to allow communication and technical collaboration among professionals. The necessity to consider the design process as a set of activities rather than a fixed sequence of phases/events also allows each process to find the appropriate path to follow for the specific project and context. The result is the generation of a flexible system in which different paths could be undertaken accordingly to the kind of intervention (either new construction or refurbishment), the rules and constraints of the country of operation, the specific needs and requirements set by the end-users, the level of participation defined, as well as the specific aims of the project itself.

The activities are the design tasks explained according to what has to be done, who does that, and how (which are the tools). The activities here defined for the realization of a CSO Housing interventions have been clustered according to different typologies of design activities. The activities described could belong to the domain of the PD or of the CD methods, involving thus different stakeholders to be in charge of developing a single activity. The clusters are here defined as follows:

- “Needs and goals” activities within the PD domain: including the definition of end users needs and aims;
- “Programme of requirements” activities within the PD domain: including the definition and assessment of social, economic, environmental, functional, technical and generic requirements;
- “Analysis” activities within the CD domain: including assessment of site, community profile, energetic features, key performance indicators, etc.;
- “Exploration and elaboration” activities within the CD domain: including exploration and elaboration of building systems, energy system, materials, etc.;
- “Creation and synthesis” activities within the CD domain: including the elaboration of concept and the configuration of variations;
- “Communication” activity within both the PD and CD domain: including feedback and refinement, KPIs assessment, design visualisation, information of end-users;
- “Selection and decision-making” activities within the PD domain: including the possibility for the end-users to operate choices among alternatives.

Naturally, the activities relate one to another according to a mechanism, which define the dependency relationship among them in terms of information exchange required between two of them. Indeed, this dependency system establishes which activities could be pursued independently from the others and which require complete or partial information exchange with the others to be developed, systematizing the logic of succession of activities within the design process. Two dependent activities require one of them to provide complete exchange of information to enable the other one to be developed. Two semi-dependent activities require one of them to provide partial exchange of information to enable the other to be developed. Two inter-dependent activities allow a parallel development of them, as they require a continuous exchange of information between each other to be completed. Two independent activities, instead, could be developed autonomously as they do not require an exchange of information between each other to be started or completed. The analysis of the dependency among activities is crucial to define the roles and responsibilities of the stakeholders involved in each activity.

Finally, the system of activities is completed with outcomes and milestone, in order to enable a well-structured and effective development of the design process. The outcomes are being defined by the results of an activity, and strongly depending on the rules and procedures of each country of intervention. The possible generic outcomes are: Feasibility Study, Project Programming, Concept Design drawings and reports, Preliminary Design drawings and reports, Developed Design drawings and reports, Energy report, Financial/cost report, Updated building documentation, etc. The milestones are the fixed points of the design process, and they display themselves on a “temporal” system to help in the definition of the sequential understanding of factual iterative and non-linear development of the activities. The milestones are strictly connected to the CSO Housing process, which involves a series of (parallel) steps to be undertaken in order to achieve the realization of a CSO Housing intervention. Considering this, it is necessary to provide a brief overview on the CSO Housing process as defined within the Proficient research project.

## **5. CSO HOUSING PROCESS MODEL**

As defined within Proficient research project and previously stated in this paper, CSO Housing is characterized by the principle of self-organization, and a strong participatory nature in the development process. Indeed, a CSO Housing intervention differs from an ordinary housing project primarily because of the main role the non-professional client, who is also the end-user. These inherent characteristics entail an high level of variability, which bring to assert that a CSO Housing process could change from country to country, according to the local housing policies and the social and cultural environment, and, at the same time, each case is a specific one depending on the level of participation of the end-users in the process and their objectives. However, each process always undergoes some common general phases, which represent the (often retrospective) constants of the system: Community building, Development, Design, Implementation and the Operation/Maintenance phase (as shown in Figure 3).

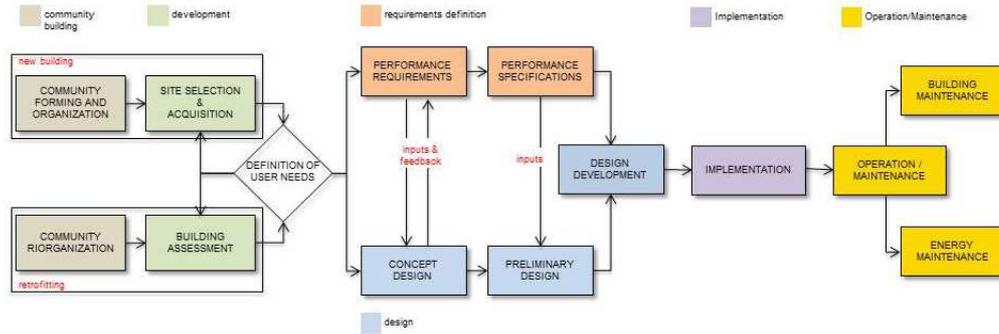


Figure 3. Illustration of the CSO process flowchart [7]

Alongside of the Design process previously described, another step strongly affecting the process is the Community Building one, as it defines the modality of formation of the group, the set of goals to be translated in inputs for the design activities, and conditions like the low/high level of community intention as well as the low/high level of participation. Finally, this is the phase where the group define a legal form, establish the participation procedure and the decision-making structure, essential for the development of the process itself. This is highlighted in the assumption that states that new construction processes differs from the retrofitting ones in the Community Building phase, as it is assumed that in the first case there is a new-forming community, whilst in the retrofitting case is an existing-one, which is going just to reorganize itself. As a result of the new form of demand organisation (CSO Housing) and the coalition forming (cooperation between end users, the suppliers and the municipality), recent studies have identified a number of risks. Potentially the largest risk for a successful CSO Housing project is the time factor. Due to the characteristics of a non-professional CSO housing group, and the nature of self-organisation in group formation, articulation of end user requirements, decision making procedures etc., make that many CSO housing projects suffer from a very long initial stage. Resulting in people leaving the group because things take too long, procedures change (outside), decisions are needed to be done over and over, and so are the end users requirements that need reformulation. Furthermore have we found risks in terms of financial restrictions (financing the pre-development stage), information asymmetry and procedural barriers encountered in correspondence with the local authorities.

The CSO Housing process model described here, is offering support and guidance to the CSO group of non-professional end users, as well as for those stakeholders that are becoming involved in the project from a different perspective (think of contractor, architect, technical suppliers and municipality).

## 6. DISCUSSION AND CONCLUSION

In this paper we have succeeded in combining the forces of Participatory and Concurrent Design characteristics. We prevent us from getting trapped in prescribing, as a blue print (panache) of how the design process should look like, and what steps should be chronologically be taken. It's been our utmost intention to keep as open as possible interpretation of a wide set of design activities, to allow for the specific selection and order to be decided upon one projects own individual iterative and dynamic order.

We furthermore have identified a novel process model, dedicated to guide the non-professional end users and corresponding stakeholders in the development process. From the moment of acquiring information on how to erect a CSO Housing community up to the actual construction and final delivery of the project, this model helps to structure and organise the process of CSO Housing development.

In the rich diversity of authorship, with a combination of practitioners and scientist, we believe in having offered by the above means a set of practical suggestions for guidance of CSO Housing projects in the future. We continue working on a common platform for securing the access to the in-depth details and insights of listed design activities, and process steps to come to a successful CSO Housing Project.

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