Proficient

# End-user’s performance requirements and KPIs

**Deliverable Report: - Proficient D3.2 – End-user’s performance requirements and KPIs -**

**PROFICIENT; SME network business model for collective self-organised processes in the construction and retrofit of energy-efficient residential districts**
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# End-user's performance requirements and KPIs

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## Colophon



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# Publishable executive summary

As diverse the different CSO projects are, so are their specific needs. The CSO market can therefore be seen as a very heterogeneous one. Based on the analysed (new construction) cases in the project, and in line with Proficient approach in general, this deliverable deals mostly with what one could call “ideal” co-housing or “the real co-housing”; the one that tries to internalise most of the decisions among the future owners. Currently, this is very much a niche market, but one with big potential for expansion, especially if the interaction between co-housings’ needs and professional offerings could be transformed into a much more iterative one than current mainstream developments dictate.

Definition of requirements is the starting point of the design stage of any CSO housing project. Within a project requirements can be classified as generic (laws and regulations related) or dynamic (CSO’s and end-users related). Since generic requirements are professionals’ domain, the main focus of this deliverable are dynamic end-users’ performance requirements. The term dynamic is chosen because, apart from being ‘tailored’ for each specific CSO, these requirements are as well largely variable in time within one specific CSO project. The common assumption is that any initial set of requirements can only be seen as a first in a series of interpretations of the end-users’ and clients’ needs. This assumption is based on the nature and complexity of problems and problems contexts faced in the CSO processes, as well as on inexperience of most end-users; and for that matter also of most SMEs involved in CSO process, since most of them are just discovering this new market potential.
The main question is thus how to kick-start this series of interpretations, and steer it towards desirable (in any case as short in time as possible) development direction. Even though any pre-defined classification limits the CSO process development, for the purpose of especially time gains in effectively kick-starting it, a classification structure for requirements is proposed based on general specification types clustering: social, economic, environmental, functional and technical.

The main difficulty regarding requirements is however hidden in the nature of two essential approaches within CSO Housing processes: (1) participation of end-users, and/in relation to (2) professional collaboration between expert disciplines from the building sector. Concurrent approach from professional perspective presupposes definition of requirements as far upstream in the process as possible, in order to enable professional parties to deal in parallel with different tasks. However, the main characteristic of participation regarding non-professional end-users is that these requirements cannot be decided upon and fixed far upstream in the process.
Therefore, it could be stated that the very nature of ‘coming into being’ of design options and engineering alternatives is different in CSO related processes, compared to traditional design and engineering. In a CSO related process, the design options and engineering alternatives are not based upon a set of predefined requirements – but that existing solutions introduced by involved professionals instead represent the needed catalyst for participatory process of defining end-user/CSO requirements.
Even though a CSO process generally consists of well-discernable parts, namely Community Building phase, Development phase, Design phase, Implementation phase and Operation/Maintenance phase, requirements remain an issue in, and during most of them:

- Community Building is often based around exploration of basic common needs,
- which often drive the Development phase,
- are certainly essential during the heavily iterative Design phase,
- and resurface again in the Operation and Maintenance phase.

The Lancaster Cohousing demonstration case shows that it makes sense to agree what standards the end-users choose as a minimum at the start of joint process, and whether they want to achieve higher than minimum standards. These standards can then be regarded as end-user's performance requirements that need to be met within CSO housing process consisting of a number of jointly set deadlines.
Moreover, instead of following a strict process model that describes what should be specifically done and when, it may be more helpful for CSO initiatives to set more general deadlines (or have deadlines set upon them) to help speed up the process as a whole. This way, multiple activities can run in parallel, depending on, and tailored to the specific needs of a CSO project, while the fixed deadlines ensure the progress of the project. In this sense, deadlines can be regarded as CSO process practical KPI's. Within a set of deadlines different sequences of activities related to participatory and concurrent design can then be configured or developed along the way for each different CSO project. As such, deadlines do not prescribe what activity should be done exactly when (of course depending on the choice of modules in the Guidelines), but describe a set of KPI's based on which go-no go decisions can be taken.

Essentially, since CSO Housing design approach merges principles of participatory design (PD) and concurrent design (CD), mainly into an effective management of expectations between end-users and building professionals, the requirements have an intermediate role by which the interplay between collective needs definition, solutions design and selection between alternatives is guided. End-users' requirements, instead as a set of (fixed) criteria, are a subject of collaborative programming activities.

The analysed cases, as well as research work and feedback from different CoP's suggest that the interplay between PD and CD needs to be kicked-off, and that an initial set of solution directions and possibilities is the best way to start this process where community decision making plays such an important role. After catalysing the process through participatory decision making on which direction to take, a collaborative work driven by professionals can take over. Which on its turn provides new decision making possibilities, that can again be addressed through PD.
The demonstration cases clearly indicate that in this interplay a strong role of a core team, which truly drives the process, is indispensable. It can to a certain degree be taken over by a (professional) facilitator, but if it comes from within a CSO community, it enlarges commitment and speeds up the process while at the same time it decreases the risk of stopping the initiative.

Even though the end-user requirements are very different depending on the CSO initiative, they still should remain within the boundary of health and safety codes, environmental codes, energy-sustainability codes (e.g. EPC), etc. Besides, a list of possible generic requirements can be a suitable catalyst to get participatory and decision making process going. This can be further helped by the CSO Housing platform and E-market place within it, which also offer the possibility to SME's to initiate and drive the CSO processes, while further speeding up CSO driven initiatives.

As Proficient key deliverable, the CSO Housing platform, with E-marketplace as a specific part of it, can foremost be seen as a 'negotiating' instrument between the end-users and the suppliers of products and services. The CSO Housing platform uses a process of continuous refinement of end-user's requirements in order to eventually arrive to a match between supply and demand.

## List of acronyms and abbreviations

- CD: concurrent design process
- CEN: European Committee for Standardization
- CoP: Community of Practice
- CPD: Construction Products Directive
- CPR: Construction Products Regulation
- EeB: energy efficient buildings
- IFC: Industry Foundation Classes
- OWL: Web Ontology Language
- PD: participatory design process
- SME: small and medium enterprises
- WP: work package

## Definitions

| Terminology | Definition | Scope |
|---|---|---|
| **CSO Housing** | Collective Self Organized (CSO) housing refers to 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. | Focus on collective actions, excludes the individual (SO) projects.<br>Both new construction and retrofitting projects.<br>Energy Efficiency objective. |
| **End users** | End users of CSO housing projects are the intended inhabitants of the project, and can be owner occupiers or tenants. | Residents, but also open for commercial facilities like child care, cultural events, start ups and ESCO's etc. |
| **Stakeholders** | All the people, businesses and organizations that are directly influenced by, or directly influence the CSO project. | Both in terms of the housing process and the outcomes of the project |
| **Modular Design Approach** | Design approach is based on pre-defined building concepts and solutions, which can be (re)configured by the designer and or end users in order to tailor their housing design. | Design and build professionals from the supply side need to feed in the pre defined concepts and solutions. |
| **Free Design Approach** | Design approach is based on free interpretation of the programme of requirements by design professionals . | Less effort is anticipated beforehand from the professionals |
| **Participatory Design** | PD refers to a design approach which places a premium on the active involvement of end-users in the projects' design and decision making. | The PD principles will be applied to the design phases of CSO housing project |
| **Concurrent Design** | CD refers to a design approach where from start all design professionals are being involved and collaborate in order to tackle fragmentation of a sequential design process. | CD principles require parallel and synchronous design activities. |
| **E-marketplace** | This virtual marketplace facilitates the CSO housing process with tools and support, for example the design configurator. | Functional use of the marketplace is covering the whole life cycle of CSO |

# Contents

# 1. INTRODUCTION

The 'Proficient' Collaborative project is funded under the FP7 programme "Energy efficient Buildings (EeB)" within the theme EeB.NMP.2012-3 [Development and validation of new processes and business models for the next generation of performance based energy-efficient buildings integrating new services].
The subject of the project is Collective Self Organized (CSO) housing, referring to a group of individuals that acts in association to organise and commission the processes from definition and design to implementation and / or maintenance of their own energy-efficient housing project.
As the definition of requirements is the starting point of the design stage of any CSO housing project, the current deliverable suggests how to approach a very delicate process of context-specific programming end users' requirements, especially in what one could call "ideal" co-housing or "the real co-housing", the one that tries to internalise most of the decisions among the future owners. Currently, this is very much a niche market, but one with big potential for expansion, especially if the interaction between co-housings' needs and professional offerings could be transformed into a much more iterative one than current mainstream developments dictate.

## 1.1 Complexity of CSO processes

As diverse the different CSO projects are, as are their specific needs. And even within a project, different members may participate for different reasons. The differences between the projects also mean that it is difficult to place certain activities that take place during the development process in clearly marked boxes, steps or stages.

Instead of following a strict process model that describes what should be done, and when, it may be more helpful for CSO initiatives to set deadlines (or have deadlines set upon them) to help speed up the process. This way, multiple activities can run in parallel, depending on, and tailored to the specific needs of a CSO project, while the deadlines ensure the overall progress. These multiple activities include accommodation of different priorities for individual end-users, and relate them to collective values and visions.

## 1.2 Generic requirements

Recapitulating the findings of D1.2 "Guidelines for Participatory and Concurrent design", the definition of requirements is the starting point of the design stage of any CSO housing project. These requirements can be classified either as generic, when related to laws and regulations, or as dynamic when directly related to CSO specific project and end-users needs.

Generic requirements are thus understood as the set of requirements that arise from mandatory constraints in laws, regulations or standards at local, national or even European level. As such, generic requirements are not directly dealt with as part of the CSO participatory design process (PD) but rather they are dealt by the experts. It is expected that these requirements are to be taken into account 'automatically' by the responsible professionals during the concurrent design process (CD). Therefore these requirements demarcate the reasoning framework for the experts during the design process, which in consequence will impose practical boundaries to the definition of end-user requirements. The responsibility for correct handling of these requirements is thereby also placed in the hands of the experts, by which a pitfall of participatory approaches with non-professionals is also avoided: the wrong transfer of responsibility to the end-users / clients, with consequences nobody is accountable for.

Most of these generic requirements are of technical nature and vary depending on the location of a CSO project. To start with, a new construction or retrofitting project will need to deal with specific requirements from land-use and planning regulations, as well as requirements from the respective building authority. From Proficient's perspective another important part of the generic requirements will arise from energy-efficiency regulations. Normally CSO projects would need to meet certain energy-efficiency requirements contained in European or national standards and norms. These building and energy-related topics are widely covered in D5.3 "Design and technical regulations for CSO projects".

### 1.3 Dynamic requirements

As case study research in Proficient clearly indicates (see D7.4 and D7.5), it seems neigh impossible to come up with a set of requirements that is applicable to CSO projects in general. Cases show that CSO requirements realistically cannot be summed up under one common denominator; each CSO has its own focus and specific questions, in all different categories (community, sustainability and/or budget related).

The main conclusion is then that all different types of requirements from different types of CSO's need to be accommodated in Proficient approach. These CSO specific requirements, which are different to the regulations related generic requirements and are changing both across and within projects (including service aspects), are treated as dynamic requirements. The term dynamic is chosen because, apart from being 'tailored' for each specific CSO (which makes them very dynamic for SME's across different projects and/or CSO's), they are as well largely variable in time within one specific CSO project.

### 1.4 Deliverable overview

In chapter 2, initial Proficient "theoretical basis" is taken into account:

- Especially in WP1, WP2 and WP4 a number of models are developed and described for various issues, such as design processes, business models and technology related (business) cases. By following these process models, or initial canvasses, 'rational' or 'theoretical' background is presented. Hence, 'requirements following process models' as the title.

In chapter 3, these theoretical models are confronted with realities of real world cases:

- In the first place based on demonstration cases, but also enriched by other practices. The main source for these realities were Proficient SME's, such as IAA and LLL.

In chapter 4, requirements that set boundaries to the CSO processes are discussed, including lessons learnt from the case studies:

- Essentially, descriptions from chapters 2 and 3 are merged, offering new insights regarding how to deal with flexibility in CSO housing processes.

Finally, in chapter 5, conclusions are given in form of 'final results'.

# 2. REQUIREMENTS FOLLOWING PROCESS MODELS

The initial 'ideal' Proficient process model, presented in this chapter, summarizes and merges (developing) models and 'requirements' from different work packages, based mainly on the "Guidelines for Participatory and Concurrent design" from WP1, and enriched by the work from WP2 and WP4. This 'theoretical Proficient preliminary model', that started to develop directly from the beginning of the project, and in a number of parallel research activities, is then reflected upon from the perspective of user requirements from the known cases (material largely acquired through work in WP7). Following a rational and methodical approach (of the guidelines and research work) results this way in a hypothetical best solution for the end-user requirements definition and use.

The reason for taking this route towards defining end-user requirements was simply because of the tension between the recognized need to have (to make) largely predefined offerings based on general market status-quo, on the one hand, and the need to be able to respond to specific CSO's and building (site) related demands, on the other hand. The former has a direct relation to the 'known' market developments, while the latter is directly related to emerging developments and the ability of SME's to quickly and context specific react to them on the basis of their expertise.

As an illustration, work in WP4 shows that user awareness concerning scientific and business oriented existing contents and integration possibilities are arguably very 'low'. For example, the definition of technologies to be applied in particular solution proposals needs to be looked at from the perspective of total energy consumption and costs, return of investment and life time costs, instead as separate measures and sub-solutions.

At the same time, it is necessary to provide a supply route to the existing (sub)solutions related to particular CSO demands, explicitly based on current market expertise – but not forced upon CSO's by the market. This implies that SME's, as a supply side, probably need to learn new ways of dealing with their (potential) clients, and add new elements to their business models.

## 2.1 What and when is possible?

The common assumption is that any initial set of requirements can only be seen as a first in a series of interpretations of the end-users' and clients' needs. This assumption is based on the nature and complexity of problems and problems contexts faced in the CSO processes, as well as on inexperience of most end-users; and for that matter also of most SMEs involved in CSO process, since most of them are just discovering this new market potential. This description of course applies to any design process involving non-professional clients, but is especially important in processes where they participate significantly and even proactively. The 'openness' of end-user's requirements then necessarily causes (iterative) changes in time, which require additional (re)interpretations and (re)work. These issues, from traditional business perspective often labelled as 'not desirable', are characteristic for evolving product-service solutions.

The niche market of CSO housing should fit perfectly to SMEs, as they have a potential to effectively offer client oriented tailored solutions. Being present physically at the point of sale, SMEs are carrying and developing a

deep understanding of their clients´ needs, necessary for continuous further development of their tailored offers. Because sole application of separate products is not representing an overall solution from client's perspective, the steering strategy is *a service* and not product oriented; which ideally has to be driven by overall covering quality insuring methods. This means that the SMEs have to learn that the marketing and distribution strategy for services is not comparable to regular product marketing and distribution means. The matching of supply and demand cannot in this sense be fully categorized beforehand, as products' sales usually can, but specified along the way by defining the questions via description of possible answers, looked at through the prism of service offerings. This innate process of interaction between clients/end-users and SME's forms the core of a dynamic briefing approach.

Accordingly, a proposed new technology solution does not need to represent the whole development of new technologies, but instead represents the creation of new combinations of products and services that add up to solutions already adapted by the market partners (see D4.5 for more detailed description of technology solutions, also in relation to business cases).

The main difficulty regarding requirements is therefore hidden in the nature of two essential approaches within CSO Housing processes: (1) participation of end-users, and/in relation to (2) professional collaboration between expert disciplines from the building sector; as pointed out and elaborated upon in deliverables from WP1.

Concurrent approach from professional perspective presupposes definition of requirements as far upstream in the process as possible, in order to enable professional parties to deal in parallel with different tasks, whereas the main characteristic of participation regarding non-professional end-users is that these requirements cannot be decided upon and fixed far upstream in the process. Regarding concurrent engineering and more in-depth engineering issues in general, as a specific part of concurrent approach, participation of end-users is usually very limited (or even non-existing). This limitation is traditionally dealt with by offering opportunities to end-users to choose between engineering alternatives and/or design options.

The CSO decision making participation is however only possible after the actual designing and engineering, the very process of creating various alternatives and options that in case of CSO housing is directly related to participation of end-users. Therefore, it could be stated that the very nature of 'coming into being' of design options and engineering alternatives is different in CSO related processes, with regards to traditional design and engineering, in a sense that they are not based upon a set of predefined requirements – but that existing solutions introduced by involved professionals instead represent the needed catalyst for participatory process of defining end-user/CSO requirements.

Even though CSO process generally consists of well-discernable parts, namely Community Building phase, Development phase, Design phase, Implementation phase and Operation/Maintenance phase, the definition of requirements remain an issue in, and during most of them. Business cases linked to different phases will be developed in WP2, in order to show what is possible and feasible from the perspective of SME's offered value. The additional created value comes forth from 'mediation' between the offers and 'special' demands in a certain phase. Based on business propositions, this way a network of SME's can accommodate specific end-users requirements:

- Community Building is often based around exploration of basic common needs,
- which often drive the Development phase,
- are certainly essential during heavily iterative Design phase,
- and resurface again in Operation and Maintenance phase.

Lancaster Cohousing case shows that it makes sense to agree what standards the end-users choose as a minimum at the start, and whether they want to achieve higher than minimum standards. Guiding collective decision making this way can both (and in parallel) help the design of the physical product and process of community building.

Regarding new-construction and retrofit or/either refurbishment CSO processes, the differences are less big than in standard construction projects and processes. The reason for this is because in case of CSO's the end-users are always present and involved, in both new constructions and retrofit/refurbishments, while standard new construction projects typically do not have to take specific end-users into account – in contrast to standard retrofit/refurbishment which however do.

Focus of the CSO housing process is therefore in the first place always on securing a certain degree of self-organization, of participation by end users in the development process and energy efficiency ambition definition, which allows non-professional users to reach their own objectives and the EeB objectives as defined by local, national and EU energy directives and requirements. Because of local housing policies, and social and/or cultural environment that influence forming of communities and their objectives, explicit forms of CSO housing processes will differ per country or region.

### 2.2 Proficient case

From the point of view of the design guidelines, the definition of requirements can be considered 'an activity' whose main outcome, or aim, is a certain balance and trade-off between collective CSO and individual requirements in order to consequently come to consensus based decision making. Once again, the difficulty of the task regarding CSO participation is reflected in the need to not only truly improve the traditional sequential process, but at the same time incorporate involvement of end-users through accommodation of changing requirements. CSO Housing design approach (model) merges principles of participatory and concurrent design, mainly into an effective management of expectations between end-users (as non-professionals) and designers (professionals). Requirements have an intermediate role, by which the interplay between collective needs definition, solutions design and selection between alternatives is guided. A CSO process is generally slowed by the end users participation, which involve a continuous and iterative redefinition of requirements and information. The synchronous and parallel development of different knowledge (including earlier communication of enriched design information towards end-users to ensure their higher satisfaction, but also their involvement) entails less iteration among activities, speeding up the process.

CSO Housing design approach goes further than regular problem-solving approaches, where after analysis of a problem a solution is synthesized, or regular matching of question and answers, and involves redefinition of requirements and criteria, often even meanings. CSO Housing design approach deals therefore with definition of requirements through an existing set of possible solutions (seen broadly as product-service combinations, existing examples and/or modules), and/or drives solution development through initial set of requirements. In both cases the integration activities require a "functional and spatial-relation entity", corresponding to a level of building system breakdown, which can be described by a 'macromodule' (as explained in detail in D1.2).

One of the most important outcomes of the WP1, certainly regarding end-users' requirements, is the description of CSO Housing design model that states that the starting point of the design stage is the activity of the definition

of requirements. The programming of end-users' requirements definition needs therefore to be fully integrated in the CSO process. This happens through a series of interpretations, starting from initial definition of end-users requirements and needs, their interpretation / translation by designers, feedback towards end-users, which might lead to their redefinition, reinterpretation and finally agreement. This means that the definition of requirements could be pursued theoretically until the implementation phase. However, initial requirements as a prerequisite for the whole process can also be posed in the form of a low-level configuration of existing products through a digital 'CSO housing platform'. This configuration setting can firstly catalyse, and secondly help further develop the process of coupling (re)defining 'dynamic' part to professionals' 'generic' part of requirements (regulations and restrictions related constraints), which eventually leads to a coherent solution proposal by experts including a service component.

An equilibrium between existing pre-defined standard (modular) offerings in/from the market, and specific (changing) CSO requirements can be provided and facilitated by the E-marketplace, through tooling that supports the CSO Housing process for both professional as well as the non-professional users in a number of ways:

- the content within the E-marketplace will be able to interact with various libraries, and
- each individual configuration can be exported to various applications (a.o. for calculation of heat/loss, performance, quantity take-off etc.) via open standards,
- the issue for non-professional users is to start such an E-marketplace and fill it with content; wizards make it possible even for such users to start the E-marketplace for foreseen and implemented process steps.

The E-marketplace is foreseen to cover important parts of the requirements arising. This is done by enabling access to state-of-the-art tooling in areas that are very active and relevant like:

- interaction between stakeholders through user forums, wiki-a-like systems,
- communication and group forming via systems like Facebook, Skype,
- relevant upcoming and state-of-the-art tools at the moment the E-marketplace is delivered.

This way it is possible to facilitate participatory design, even in cases of concurrent/modular approach with fixed pre-defined (sub)solutions. Deliverables from WP2 and WP4 provide further and additional explanations for achievement of this equilibrium (facilitation).

Next to making use of existing systems, E-marketplace will also make use of the growing and already wide adaption of open standards like IFC as well as the Semantic Web technology. A semantic system is created to store, use and configure digital content in a flexible way enabling import and export to commercially used systems by SMEs via open standards like IFC and OWL. Reuse of knowledge in standards and existing components, and being able to combine knowledge from different sources together with limited, configurable but user friendly interfaces is expected to fill the requirement for bringing SMEs and end-users closer together and improving the understanding of each other's language and knowledge.

# 3. DEMONSTRATION CASES FINDINGS AND DISCOVERIES

## 3.1 Lancaster Cohousing in detail

http://www.lancastercohousing.org.uk/Project

Lancaster Cohousing project has been set-up by five people, the core team, two of whom had experience in the building construction sector. The pioneers of the core team very early on proposed two key aspects that were later agreed on by the membership, and which essentially *did not change* during the project:

- Passive House standard
- Level 6 of the UK national standard 'code for sustainable homes' (CSH) (https://www.gov.uk/government/policies/improving-the-energy-efficiency-of-buildings-and-using-planning-to-protect-the-environment/supporting-pages/code-for-sustainable-homes). This includes long term issues as waste management.
    - AECB Gold standard was the first standard considered in the early days, but CSH was chosen instead as being a 'higher' standard.

Within a few months more members (were persuaded and) applied to join the starting community. There were two main reasons why people were interested in joining the project – the community aspect and the eco home. Prospective members were encouraged to consider their commitment to both aspects through its vision to be an environmental cohousing project. The vision was also to be 'at the cutting edge'. The standards of CSH have changed since the original decision, however Lancaster Cohousing requirement to meet the highest standard did not.

Community engaged early-on an architect, even before there was a site chosen. They engaged in learning from existing co-housing processes; the core principle being 'socialising'. Together with architect a number of workshops using for example "pattern language" (Alexander 1977) principles were conducted.

The user based requirements (in the first place site lay-out, then house design) were always dynamic. However, the aim was to fix the site and house design as soon as possible. The issues that were left open for debating were mainly cost, regulation and materialisation related. For example, costs needed to be comparable to other houses, since community was not meant to be exclusive. Cost was a factor that related to both the site layout and house and was a consideration in the number of houses to be included within the development – as there is ideally a limit to the number of units within a cohousing community. This obviously has an impact on the cost of individual units.

An important issue for members was to try to make the price that they would pay for the completed houses reflect the cost of other, similar local homes. The anticipated price for properties on an earlier site was lower than the final price members paid for the built properties. This was due to a range of factors: the final site cost; the difficulties associated with building the site; and rising building costs. The cost of the homes remained an issue that was tightly controlled throughout the project to keep the final price affordable for residents. It was therefore decided to have as few house designs as possible and to limit individualisation as key cost control measures. Limits and boundaries are important to make CSO housing operable and are essential. There were three different lay-outs for houses at the start, however at the end there were six. The residents who wanted living upstairs were prepared to pay significantly more for this different design and construction. Generally, the footprint of the houses is smaller than traditional houses, since there are no guestrooms, an open plan living space and there is space in the communal areas that is shared space. All of these decisions were reached by consensus.

The way that site and house lay-outs were discussed was: architect would come up with design proposal, and all residents would react to it, leading to iteratively improvement of the first proposal.
Other disciplines were involved after the site was bought, based on specific issues:

- Building on rock.
- Site contamination.
- Existing buildings, some of which were (to be) kept.

The whole process was actually a stage-gate process. The example of Common House shows this clearly: after its location decision was made – it (the location) was fixed. The decision about its location did relate to where houses would go, as a principle of cohousing is that the Common House should be the centre of the community. Residents should be encouraged to come to the Common House, for example to collect post as well as for communal meals. The site design and location of the houses was influenced by the sloping site conditions, cohousing principles, cost implications and getting the right mix of property types on the site. Jan, one of the owners / end-users: "stages helped… whether they were right it's another question".

A key process that was both community building and vital to the cost of the project was the value engineering workshops held by the members. The purpose of these was to reduce the budgeted costs to within the limits of the contractor's costs. The chosen contractors had put in a price that was higher than the budget so the residents had to agree, via consensus, what aspects of the design they were prepared to compromise on and which they

were not. This resulted in things like cheaper flooring and doors being chosen. There were several members who were insistent that they wanted ‘upside down’ houses with the living area on the first floor and the bedrooms on the ground floor. The final decision here was that, as this constituted a considerable variation from the basic design, they would only be able to have this if they were prepared to pay the premium for it. If this had not been accommodated, several members could have left the project.

Community formation is essentially on-going process and generally “the community is dynamic as the group will always be changing”. Regarding ‘small issues’ as interior and finishing details there were more changes and more overlap between stages. These changes during the build phase are made on trial and error basis, as they always are since these issues tend to emerge only during construction.
Similar stage-gate process applied also to community forming: the five core members almost immediately decided to form a separate legal entity for the community, after which public meetings followed, and the development of a membership application process. This process included social and financial aspects. Prospective members were expected to attend several meetings and social events and to get to know, and be known by, the other members. They had to agree to the vision and values of the project, several policies and be able to put in a 30% deposit for their prospective purchase. Members who joined early were entitled to a discount with a sliding scale depending on when members joined.
Very late in the process (October 2012) a user guide for future owners was produced. This was done in order to meet the requirements of the Code for Sustainable Homes.

The community led process at LCH can be largely characterised as traditional, in a sense that once the client was defined (legal entity formed by the core team), an architect was appointed to lead design process in which end-users had decision making role (based on ‘reacting mode’ to the proposals), and builder was contracted to construct the final design. The original intention had been to involve the contractor with the design, however this

did not happen in practice. Other disciplines (specialists) were involved on a need-to-know basis, as required, for example to resolve ground work issues related to building on rock. As such, they had no input in initial definition of requirements, but were exclusively asked to perform problem-solving activities based on their expertise and usually only after the problems were defined.

Summarizing, if we follow the premise that 'the definition of requirements is the starting point of the design stage', two key technical aspects were agreed quite early on in the process. Namely Passive House standard and Level 6 of the UK national standard code for sustainable homes (CSH), which proved to be starting and lasting points for both development and design phases. The other important aspect that influenced the design is that this is a cohousing project and therefore followed many of the principles of such a design: shared facilities including the common house; designing opportunities for informal social interaction through, for example, the kitchens facing the pedestrianized street and 'nodes' to encourage interaction; cars kept to the edge of the development; and a smaller footprint for the properties due to sharing  This initiative was taken by the highly motivated community members, who further-on remained in the (joint) lead of the process. Important to emphasize is the fact that the core team members were experienced with regard to building construction.

### 3.2 Prague Na Stárce project in detail (retrofitting)

The "Na Stárce" retrofitting project in Prague consisted in applying energy-efficiency improvements to a 23-dwelling, 3 to 5-storeys, 3-building multifamily residential complex.  The construction system is a mix of masonry walls with prefabricated concrete slabs and timber roof truss, built in the 1990s and due to their poor energy performance the buildings were in need of refurbishment of its external envelope. All individual dwelling units are equipped with local gas boilers for space heating. It is up to each flat owner to decide whether to replace them for more efficient ones.

The flats are owned by private persons associated into a SVJ (Společenství vlastníků jednotek - Association of dwelling owners). One of the members is a housing cooperative. This co-operative used to be 100% owner of the building before the privatization process, and currently it still owns a few of the flats. The housing co-operative acts as the appointed owner, and at the same time, it is responsible for management of the property, for which it has a professional team at its disposal.

Decisions regarding the management of the buildings are taken during the regular association meetings. Every owner has vote power proportional to the area in square meters of owned units, according to the law and the own regulations of the SVJ. According to the regulations a 75% majority is required to approve renovation projects.

In 2008 the dwelling owners took the initiative to reduce the energy consumption of the buildings. At that time both the increasing heating costs and the thermal discomfort were the main concerns.  The dwellers felt that these improvements would not only save money spent in energy in the long term, but also improve the value of their property. Leadership from some of the most energy-conscious dwellers was the catalyst to bring the topic to the attention of the association, and to convince some of the members who were initially hesitant.

The idea of undertaking such project had been informally discussed between few members for some time before the idea officially was presented to the association during a regular meeting of its members. In late 2009 the SVJ members voted to approve the project, with more than 75% of support.  It was decided that a group of three members would be assigned as project coordinators, responsible for linking the SVJ and the contractors.

Although the SVJ had in place a maintenance fund fed by monthly fees from the owners, this fund was not large enough to undertake such project. Therefore it was foreseen that a bank loan would be needed to finance about 80% of the estimated cost of the project. The SVJ in its legal form would be the creditor of the loan and the members with their contributions would repay the loan. Banks usually offer special loans to SVJs for projects like this. Provided that some requirements are met by the association the loan can be granted without collaterals. Some of the main requirements of the banks are that there is a sufficient level of contribution to the maintenance fund and that there is good management of the SVJ finances, which were met by the association.

While the SVJ was in the early process of considering the project, it became available a state-sponsored programme called “Zelená úsporám” (Green savings). This programme supported the investment in energy savings in reconstructions and new buildings. The potential financial contribution from the state programme gave an additional momentum to the decision to start the project. However, some technical requirements would need to be met in order to apply to the grant.

The definition of the project scope was agreed since the beginning. The project would consist only in applying an insulation layer to the external envelope of the building (also known as “external thermal insulation composite systems” - ETICS) and replacing the original single-glazed wooden windows. This energy-efficient measure is quite common and its use is widespread in retrofitting projects in the Czech Republic.
Due to lack of interest of the SVJ to commit funds to include further retrofitting measures, other typical improvements were out of the scope of the project. The members of the association specifically requested not to include the retrofitting of the loggias floor and balconies railings, and to not include insulation of the ground floor walls where there are no apartments.

In order to be able to apply for a contribution from the state programme, certain technical requirements needed to be met. A minimum calculated energy consumption for heating had to be achieved (<= 55 kWh/m$^2$a) and at least a 40% decrease of energy consumption compared to the original state of the building. This was the main criterion used to choose the energy-efficient solution for the retrofit of the external envelope of the building. Other minor requirements came from the building permit process. To comply with the fire code, it was necessary to use canopies above the main entrances and add insulation from the rock wool on the ceiling in corridors. The building authority recommended using the colour of plaster to be more less the same as the original one.

In autumn 2009 the association voted for the possible reconditioning of the building and decided to co-operate with a designer. This consultant was commissioned with designing the energy-efficient measures to match the requirements of the state programme, and to apply for the subsidy and building permit.
Overall, the execution of the project was successful. In 2010 the building permit was authorized and the application to the subsidy was submitted. Even though there were unusual delays and uncertainties regarding the results of the subsidy application, the SVJ decided in spring 2011 to go ahead with process and select a contractor. The retrofitting works took place between September and December 2011 financed by the bank loan. Only later in spring 2012 the grant was officially awarded and it took few more months until the loan was paid back to the bank with the subsidy received from the state programme.

The process of dealing with authorities is documented in further detail in D5.3 “Design and technical regulations for CSO projects” while in D3.3 “Performance-based procurement and contract model” there is a description of the procurement and contracting process.

One of the hardest parts of the process was the early stage of convincing people of the need of such improvements. Although most of the members immediately recognized the importance of improving the energy efficiency of their building, some members were reluctant to make such investment and even to support the bank loan.

Installation of external insulation to the “Na Stárce” building

View of the finished project “Na Stárce”

The main argument to convince members was the unique opportunity to obtain a significant state subsidy. It was correctly assumed that a subsidy in this amount would not be available in the future. Further arguments were the increasing gas prices and the planned increase of VAT. Finally these discussions and the preparation of the project concept helped to convince the hesitant members.
Another remarkable lesson was the decision of executing the project even if the state support was not for sure granted. This decision, albeit risky, allowed the project to be built on time. Furthermore it proved the determination of the SVJ to improve the energy efficiency of the building regardless the grant from the state programme.

From the execution point of view, it was a simple project but quite a successful one. In fact, the revitalized building now has lower energy consumption which resulted in lower energy heating costs. The project also left a better organized association, now more knowledgeable of how to undertake such projects in the future. The success of the project encouraged members to plan other necessary repairs, such as the repair of chimneys and ventilation system, also to plan aesthetic improvements like the replacement of exterior doors and the renovation of the interior common areas.

### 3.2.1 Typical refurbishment of residential buildings in the Czech Republic

Typical projects aimed at improving the energy-efficiency of residential buildings are usually complex projects that include other types of improvements. A typical comprehensive retrofitting project in the Czech Republic includes adding external thermal insulation to the building envelope, exchanging doors and windows for ones with better thermal performance, improving the thermal conditions of roof and floors, improving ventilation of the flats (e.g. mechanical ventilation), improving the efficiency of the heating systems (e.g. replacing the boiler, regulation of heating system), and even improving the water heating (e.g. installation of solar panels).

Given the scale of these retrofitting works, it is usual to include improvements not only to the thermal envelope of the building, but also include other aspects such as improving common interior areas. Common areas can be given better accessibility (e.g. adding ramps for disabled people, replace old elevators, in some cases even building new elevators), improve lighting, building security, fire safety, etc.

The main motivation of the dwellers to uptake such projects are usually related to the need of improving living comfort and health, improving the building energy consumption and increasing the market value of their property. The scope of the projects is usually decided by the owners associations in terms of the requests of their members and the financial possibilities of each association. The scope is limited to the willingness of the owners associations to take bank loans or their eligibility to receive state support from special programmes.

Technical requirements to be met by the projects often come from the different state subsidies that might be available and from the requirements of the building authorities. Usually state subsidies require achieving certain level energy performance to grant financial support.

### 3.3 The Hague Erasmushove in detail (new construction)

The municipality of The Hague is actively promoting Self Organised building processes, collective or not. End users are encouraged to form communities by organizing meetings where prospective builders can meet and exchange ideas, but further steps are left to the individuals themselves.

The Erasmushove is unique in The Hague for the added requirement by the municipality that the new homes be energy neutral.

Situation in the Erasmushove on 29 July 2014

The municipality has converted a piece of land from sports fields into 25 plots for individual houses, and one larger plot originally intended for a CSO. The municipality has a forefront (Kavelwinkel or plot shop) that acts as a store and information point for the prospective plot buyers. The plots are sold on a first come first serve basis, a method that does not stimulate cooperation between potential buyers.

When offering out the plots, every plot is accompanied with a 'plot passport' that contains information about the plot specific conditions. These conditions concern building specific regulations such as building height and buildable area, but also owner specific regulations, such as the requirement that the prospective buyer has to go and live in the building him/herself, and that it is not allowed to sell the building within three years of moving in. These last rules are designed to discourage speculation, by either individuals or developers.

When the plots in Erasmushove were offered for sale for the first time in 2012, there was a bit of initial action, in the sense that an option was taken on a number of plots, but slowly, each of those options expired and only one plot was sold. The reason why is uncertain. Perhaps location, perhaps the requirement from the municipality that the houses should be energy neutral deterred people.

The year following the release of the plots, very little happened at the Erasmushove, while other locations in The Hague with free plots experienced no lack of interest. The municipality then decided to release more plots for self-organised builders, accompanied by a lot of media attention. Apparently a bit nervous for a lack of interest in the plots at Erasmushove, the Kavelwinkel unofficially slacked the rules regarding no developers a bit, and allowed two developers to take options on plots: one developer used straw men to pose as interested buyers and collected 10 options on plots to develop homes to sell directly to interested clients. Six of those were eventually sold. The other developer took an option on the larger plot originally purposed for a CSO, and made plans to build an apartment building containing 73 apartments. Many of the other future inhabitants of the Erasmushove objected to these plans and opposed the request for a building permit.

People chose to build their home in the Erasmushove for a variety of reasons. Although the municipality specifically designed the area to be energy neutral, and advertised it to be one of the most sustainable areas in The Hague, for many people this was not the main reason to choose this location. This was demonstrated by the apparent lack of interest during the first year that the plots were on the market. Only when the Kavelwinkel changed their 'angle' for promoting the Erasmushove, the plots began to sell. Rather than specifically mentioning sustainability or the requirement of energy neutrality, the plots are now being sold as the opportunity to build your own, free standing house in a green neighbourhood. The requirement that the building be energy neutral still stands, but is downplayed a bit by arguing that an energy efficient home is usually a comfortable home with low energy bills, and that in in The Netherlands in 2020 new houses have to be energy neutral anyway.

The prospective inhabitants come from different (cultural and social) backgrounds. The following list displays some of the reasons people choose to build their own home in the Erasmushove:

- Build your own house
- Garden (with ability to grow vegetables)
- No rules regarding look or appearance
- Able to build at lower cost
- Custom (interior) design and layout possible
- Energy neutral neighbourhood
- Location
- Attracted by the architecture (in case of the developer sold houses)
- Low density neighbourhood

As the Kavelwinkel let some of its initial rules slide a bit to stimulate the selling of plots through developers, backlash was created with some of the other prospective buyers who felt they had been given false promises. Not only was the Kavelwinkel being dishonest about (not) allowing developers to build homes, allowing a developer to build an apartment building containing 73 apartments was felt to be a significant departure from the original plan to assign the large plot specifically to a CSO. Although strictly, the plan by the developer adhered to the building regulations from the plot passport regarding maximum dimensions and volume, the size of the proposed project was very different from what the Kavelwinkel originally communicated the plot was intended for: a small to moderately scaled CSO development containing 15 to 20 dwellings. The people that bought the other plots felt that the plans presented by the developer were such a departure from the original plans by the municipality that the whole neighbourhood would be affected negatively. For this reason, they opposed the building plans by the developer.

### 3.4 Experiences from other Dutch cases (new construction)

Based on conversations with members from a number of Dutch CSO cases:

- VAON
- De Groene Mient
- Het Kwarteel
- De Schrijver
- De Kersentuin

The wishes, or requirements, that prospective CSO builders have regarding the houses they intend to build (in case of new construction) are not set in stone, but rather change in time under the influence of progressing insight, financial issues and input from fellow CSO members.

However, generally it could be stated that the more efficient processes emerge from a smaller group of initiators (end-users) and their 'pre-defined' and fixed small set of 'leading' ideas or concepts. When these concepts are set and backed by basic financial (emergency) rules, including subsidies schemes, the whole development gets a direction and acceleration. Although this is not always a permanent type of acceleration, because there can often occur various hick-ups and struggles, the process keeps going on because one can always fall back on the clear starting principles. This is actually the case for most of analysed CSO initiatives, also outside the Netherlands.

Upon entering a CSO process, different members have different starting points that persuaded them to participate. Every CSO project starts with one or a limited number of persons that take initiative. They bring their own set of values or requirements that forms the starting position of the whole project. Every subsequent member that joins the project does so for his/her own reasons that may differ from the intentions of the initiative takers. The differences in view or reason however are small enough for the new member to be either adjusted or disregarded, as long as the bigger picture overlaps enough. Once a valid member of the CSO, this new person is then entitled to express his/her opinion, wishes and desires. Most CSOs have some kind of sociocratic or democratic structure, meaning that every member is entitled to influence the (design and other) process to some extent, as they all become (partial) owners of the end result.

The result of process that defines a CSO – a group of individuals coming together to co-create a housing project – is that it is nearly impossible to define a group of requirements at the beginning of the project, as is customary in traditional building projects. In a traditional building process led by a developer, a set of requirements is laid out at the start of the project, and the project is moulded around these requirements. In case of a CSO, the starting point is a group of people, each with their own vision and desires. Before the building process, or even designing process can start, these people have to decide on common values and requirements.
CSOs typically contain people that have no or limited knowledge about the different aspects that are involved when building a house (or other type of building). As such, they cannot be expected to be able to formulate a conclusive set of requirements that enables the design of a building. They lack the required knowledge. The result is that CSO members may change their requirements during the group formation and design process, based on progressing insights, decisions made by the whole CSO and/or insight into financial consequences of certain choices.

The extent to which the user requirements change is very difficult to describe, as they are inherent to the CSO process, but rarely (if ever) documented. In order to make this process visible, the initial set of values or requirements would have to be written down at the very beginning of the CSO process, of each member. Every subsequent conversation, and the influence it has on the original set of requirements would have to be documented. Something not only impractical, but also neigh impossible as many decisions are made on a subconscious level.

This process of deciding upon the design (and other) requirements is part of the group formation process and is one of the reasons why CSO processes tend to take much longer than traditional building processes. Based on

the experiences of a number of CSO projects in The Netherlands, the process can be accelerated by setting a number of deadlines before which certain decisions have to be made. The driving force behind these deadlines can vary (e.g. the municipality, the architect, workgroups from the own organisation), but they can be a motivation to speed up the decision making process.

Even though CSO initiatives derive and are dependent on non-professional end-users, it is often the case that the involved professionals need to 'pull hard' on the group in order to move it, and the decision making process, forward. This happens usually by introducing and visualizing different possibilities, which lead to (new) discussions, based on which new insights arise and/or further crystallise that allows CSO's to take further steps in decision making process.

## 3.5 Other cases

**German CSO housing practice by Klaus Th. Luig, 3L architects, Germany**

**An overview focusing on end-user requirements and their involvement**

Germany has a tradition of CSO housing developments since 1990 when the movement started in Freiburg. Until today there are about 800 projects of any scale realized in Germany and it is quite fashionable at the time being to go for CSO housing as the municipalities that are offering almost 100 % of the sites to interested privately organized building societies like to have a better urban design and building design quality. This is ensured following the experience of the involved municipality if the end-user is involved as the responsible client from the start of the project and not just buying a condominium or a row house developed by a general contractor. Furthermore the clients learned in the past years that the responsibility for the quality in terms of good cost value relationship cannot be transferred to a third party e.g, a general contractor without losing values and having additional costs. In that case clients today in Germany are willing to take extra risks compared to traditional general contracting while knowing that they receive quantifiable and qualifiable profit.

The well introduced process of CSO housing is following the participatory design workflow. First the clients look for a fitting group of familiar clients in terms of expected results or a fitting developed project following a top-down or a bottom-up way of approach i.e. the clients are looking for a site or a site is looking for a suitable project. Then the kernel group of the building society is initializing the project with the support of experts in order to find a suitable site and to compile the information created by internal brainstorming into relevant data for a program describing the projects demands related to applicable and affordable site seeking. After the site is bought or ensured by placing a buyer´s option the design phase starts followed up by the building phase and last but not least by the using period.

Talking about the definition of the end-user requirements the first question is why are the people going for CSO housing projects as the motivation is the mirroring of the expected results and giving a feeling for one's requirements. All scientific surveys available in Germany conclude that there are lot of motivations that move different groups but there is no key performance indicator covering the common needs e.g. clients like to live in a socially protected group, they look for careless multi-generational housing, they have economical pressure that forces them to compromise, they are looking for emancipation issues, they want to build green, they are driven by social aspects, they are following a certain religion or philosophy etc.. Unfortunately the motivations are multiple and there is not a common basis for the creation of special general demands instead of basic housing needs.

Within a scientific survey promoted by the German Bundesamt für Bauwesen und Raumordnung the key factors for successful CSO housing projects after analyzing lots of cases are:

1. Social competence of the group members
2. Public relations activities (good communication on projects and hard contents to win members)
3. Participatory design in the development and design phase
4. Framework conditions (funding opportunities, site availability)
5. Overall Architectural mentoring.

The end user requirements and their treatment are of course included in all 5 key factors but the most they are involved in key factors 3, 4 and 5. While the participatory design is obviously dealing with end user requirements, factor 4 is most important without any influence of the client on this. Without any available sites or financing and funding it is not possible to realize buildings following any requirements. Especially regarding key factor 5 it is unconditionally necessary to collect the fragmented individual user requirements and compile them on an expert level in order to prepare the compromise on the decision making process effectively and efficiently. It seems that the development of the process how the definition of the end user requirements is generated is providing the most demanding complexity and therefore successfully realized projects are following a good approach in terms of information flow treatment.

Nevertheless the expectance of the end users in terms of Energy efficient Building solutions and Energy efficient Design methodology are quite high and the green building demands are in the focus of the end users if the total budget i.e. low cost housing is not the driving force of the CSO hosing group.

**Italian CSO Housing practice by IAA**

Starting from the 70s, Italian housing sector has been characterized by collective initiatives as Housing Cooperatives, and nowadays it still represents an affordable way to build your own home reducing time and costs, and to meet the end-users requirements. This kind of initiatives are mainly characterized by a top-down approach, where a cooperative, which the future inhabitants are associated to, initiate, develop and manage the housing intervention all along the process phases and often owns the properties (i.e. cooperatives with *undivided property*). The organisational structure is hierarchical, as it presents a president and an administrative committee, but at the same time it is democratic, as the associates have the right and the power of decisions.

In the past cooperatives of inhabitants were strongly linked to political parties, and nowadays they still maintain a sort of political background. Thus these initiatives hold a strong social value, and can have privileged connections with municipalities that operate offering lands in change of urban refurbishment and social facilities.

In the housing sector the law constraints are manifolds and give no wide freedom to design dwellings and buildings. Therefore – especially in the *undivided-property* cooperatives – the participation of the end-users is mainly concentrated in the last phases of the design process (finishing, furniture, …). In *divided-property* cooperatives, indeed, the future inhabitants will become the real owner of the house/dwelling and so they will follow the whole process closely. But these kinds of coops are less spread than the others.

Besides this, there is a growing sector formed by groups of individuals that decide to build their home, form a community – basing on certain common values – and proceed in acquiring a land/building in order to reach their goals. So far, we can count around 20 existing cases in Italy. CSOs in Italy tend to develop themselves

autonomously without the respect of a precise process flow or a proper interaction with the local administration. Despite this, in Italy we talk about CSOs in terms of “cohousing”, being the result a settlement characterized by the presence of common facilities or services and by an high involvement of inhabitants in decision-making, tracing in part the former North European model.

Therefore, in Italy the cohousing market is generally driven by associations of different kinds. On one hand, some associations work as service providers. They offer land opportunities, foster the community building, provide professionals and facilitate support. In many case, their role becomes so essential that they mostly develop projects autonomously to then being “sold” as cohousing to a group of interest. On the other hand, other associations work as “promoter”, encouraging and supporting the development of CSOs project, mostly “spreading the words” after having developed a cohousing project for themselves. The social and environmental values are generally strongly promoted.

The result is a variety of typology models that entail many declinations of CSO and difficulties in replicating the model.

If we want to identify the main typologies of CSO we can classify them like this:

1. totally self-organized settlement with specific characteristics according to the aim of the specific group
2. already designed/realized settlement with common facilities on selling
3. already set-up programmes based on opportunities to be developed by a group of interest

Being each case a distinguishing one, it is quite difficult to trace a framework related to the end-user requirements issue. Generally the motivation for choosing CSO in Italy is sustainable values (social, environmental) and economic reason.

The motivation changes a lot depending on the typology of CSO we are dealing with.

In the case of totally self-organized settlement, the social and environmental goals are predominant and the main aim of the community is to change the life-style and improving the quality of their living in terms of sustainability. The main requirements are, thus: social integration (favouring neighbourhood relationship), green values (sustainable common services such as car sharing, ethical purchasing group, etc.), and energy savings for sustainable reasons.

In the case of CSOs already set-up, the motivation is generally the cost savings, which could be reached, on one hand, by the absence of an investor, and, on the other hand, on the presence of common facilities. Of course, the energy efficiency could be set as a project requirements as it entails a cost savings during the life-cycle of the settlement.

Moreover, in the cases where the participation of end-users in the design phase is foreseen, the fulfilment of a “tailor-made” solution is a main goal for the future inhabitants. This factor is though quite tricky in Italy, as the living standard are set high and the law constraints are enough strict to allow freedom to the end-users in designing their dwellings.

From the requirements perspective, it’s not so easy to find a prevalent methodology, as it is chosen from time to time based on the group composition and the level of involvement of end-users in the process. Based on this aspect some cases were identified as existing interpretations of the issues presented above. The list of cases is not exhaustive about the possible typologies, as we already mentioned that each case is more or less a distinguishing one, but they represents some of the most specific cases we found in Italy. In fact they show

different approaches to the process and to the different actors' role in the different steps of the process, generally higher in the community-led housing typologies and lower in the others.
It is also worth noticing that the different typologies deal with different targets of people. It is possible to identify the willingness to reduce costs, but cooperatives offer more traditional way-of-life and dwelling typologies, whereas the cohousing groups push for more responsible and collective approaches to building and living.

A short description of the selected cases:
Consabit

- A cooperative settled in Tuscany operating in the field of Collective Housing and applying to a certain level to the mechanism of participatory process. The process is highly top-down and the participation is limited to some individual design choice at the dwelling level. It could be interesting to gather information on how these choices could be made by the end-users and on which aspects of their dwelling they can take decisions.
- They generally allow end-users to choose their finishing (i.e. tiles, floors, colours, etc.). The cooperative staff arranges a sort of finishing products exposition, displaying the range of possible choices (and related different prices) coherent with the design specifications. End-users can there select the solution that fits the most with both their wishes and their budget.

Cohousing Numero Zero

- A cohousing community that built-up its projects and now is offering its experience in helping other groups in the first phases of process (building community) in order to allow them to develop the internal competences to drive the process autonomously. The community itself had its starts in a cohousing association, CoAbitare. CoAbitare is addressed to promote a more ecological and less consumerist way-of-life, as well as collaborative neighbourhood intervening in socially problematic urban areas. Cohousing Numero Zero defines itself an *intentional-community*, and it perfectly reflects the ideology of the core association. In facts the specific intervention regarded an abandoned building located in a multi-ethnic and socially depressed area of the city of Turin, near to the city centre. Eight households (the initiating group was formed by four ones) with different ages and professions form the community, which is characterized by a democratic and non-hierarchical structure and focused on creating a very cohesive and socially-active community. The participation system is very democratic and is essentially based on the consensus decision-making method. The architects are 'co-housers' themselves, and that made them play a double-role of end-users and professionals at the same time.

Newcoh

- A service-provider company settled in Milan and active in the field of Cohousing. It is actually responsible for the main cohousing project realizations in Italy. Newcoh develops both top-down and bottom-up kind of processes. It works as a platform where, on the one side, an individual could find opportunities, set-up programs and available lands for cohousing or, on the other hand, an already formed community of interest could find "help" for the development of its own process, providing professionals, facilitators, etc. At the moment the top-down processes are major in number than the bottom-up ones.

  In general, Newcoh starts with formulating opportunities for cohousing interventions. These interventions are conceived as urban refurbishment actions, as brownfield areas, or socially depressed

neighborhoods, or sites outside the urban center to be recovered through “green” and “social-favorable” actions.

Newcoh acts as a General Contractor, hiring local professionals and contractors, and directing closely all the design and procedural phases. They generally drive co-housers through a highly participatory process, where the main decision-making method is the *consensus* one. During the process, they also train the group of co-housers to drive autonomously the community and to manage the intervention once it is accomplished. Finally, they assume that the groups they assisted achieved a strong sense of community and a high agreement on the project.

Maisonbook

- Maisonbook is the label of an initiative that still has no concrete examples of collective housing. Nevertheless, their objectives seem promising. Maisonbook operates as a web platform on which professionals/SMEs, end-users and municipality could interact and set up a CSO Housing project. On the municipality side, they are uploading data sheets on available lands, which interested people could apply to. On the end-users’ side, they could sign up filling in a questionnaire based on individual info and housing requirements. On the professionals’/SMEs side, the platform operates as a network for collaboration. It is important to pinpoint that the project they propose is based on the modular design approach, meaning that the SMEs could participate only if they provide products that apply to the module defined, and that end-users are allowed to make choices limited to design aspects not interfering with the module. They firstly gather information through the Maisonbook application for smart-devices, where people can subscribe to and enter some data - like personal details - and ideally formulate their ideas on the house and neighbours they would like to have. These requirements operate on the community level, allowing Maisonbook to put together the group and to start with the community building process, assisted by sociologists, psychologists and facilitators. Indeed, the requirements on the dwelling level, building envelope and finishing, etc., have to fit with the modular system of the dwellings/buildings, and the energy efficiency philosophy proposed by Maisonbook approach.

  The output of Maisonbook approach is not necessarily cohousing, even if they deal with groups of people. That is mainly to achieve the proper scale of intervention (i.e. minimum 30 units to start the investment), even if members of the group are not interested in sharing facilities.

  Finally, we can assume that end-users would not have a wide range of choices on the design level, as we stated that the project is conceived as a modular system, i.e. the combination of the same module in order to realize different size of dwellings and different building shape/typology, depending on the general and dynamic requirements related to the specific context, etc.

  They currently established themselves in the legal form of cooperative. This is to allow them to realize the interventions. In the future, when the initiative will gain some consistency, they would turn the cooperative in an Investment Services Company (in Italian it stands for S.G.R. – literally Savings Management Company).

EPOurban

- EPOurban is a research project funded by EU under the Central Europe program, which is aimed to activate private households in the retrofitting process of the existing building stock.

The project has been accomplished in November 2014, and it is based on the wider field of urban regeneration, intended as the only way of producing an actual and immediate result for the ongoing environmental and economic crisis of Europe.

The Municipality of Bozen, a city in the North of Italy, was involved in the project. The process started with the selection (through a spontaneous application of owners or administrators of buildings) of 20 case studies (private-owned multi-storey residential buildings) characterized by multi-properties and different features in order to illustrate different options of the existing residential building stock in the urban area. In the meantime, the municipality announced a public application in order to create a group of professionals in different fields of application (designer, economist, sociologist, etc.) as a task for the buildings assessment and the definition of possible retrofitting strategies. Once the selection procedure has been accomplished, the task of specialists worked to the definition of different scenarios (from a minimum of 1 to a maximum of 3 represented in a technical sheet to be delivered to building administrators as a starting point for the actual interventions), basing on the minimum/medium/maximum level of operation and investment required. In order to give a proper answer, professionals evaluated the payback period of investments and benefits in a 25-years term, as well as the sustainability of the different interventions cost (envelope, plants, roof, …).

The main actors of the process, along with the team of professionals, were the owners and the building administrators: the former as the direct stakeholders of the interventions; the latter as the ownership representatives. In particular, administrators were asked to refer to private owners about the initiative offered by EPOurban; to follow them along the process; and to communicate with the Municipality and the team of professionals about the owners response to the process.

The aim of the project was primarily to promote actions in order to overcome the building sector crisis. The idea was, in facts, to define a strategy through the European process in order to come up with an ‘Agency’, self-financed and in coordination with the major housing market sector stakeholders.

In facts, stakeholders have been constantly involved in the process through the creation of a communication platform, “the EPOurban construction site”, where to elaborate interdisciplinary methodologies shared among private citizens, the Bozen municipality and stakeholders.

The idea of the EPOurban project was indeed to define an exportable tool for assessing the housing building stock. This tool essentially consists in a consulting system focused on technical, economic and financial aspects as well as the legal ones, in a multidisciplinary approach aimed to maximize the odds of intervention realization. Nevertheless, the municipality applied a multilevel approach, undertaking also actions addressed to achieve a general awareness/consciousness of owners, as the key actor of the process/task.

Participation system: The building owners have been involved - directly or represented by building administrators - through meetings organized by both the Municipality and the professionals. During these meetings people were informed about pros and cons of each intervention typology related to the specific building. During the process, owners and administrator were involved mainly in discussing scenarios defined by the experts. They did not actively participate in the decision-making process, mainly due to the technical knowledge required by the task. Nevertheless, they could react on scenarios, and they were asked to define initial wishes and performance requirements they would like to achieve (in terms of savings, of discomfort, etc.), necessary to formulate strategies.

# 4. REQUIREMENTS DEFINING PROCESS MODELS

As highlighted in chapter 2, the main difficulty regarding requirements is hidden in the nature of two essential approaches within CSO Housing processes: (1) participation of end-users, and/in relation to (2) professional collaboration between expert disciplines from the building sector. Concurrent approach from professional perspective presupposes the definition of requirements as far upstream in the process as possible, in order to enable professional parties to deal in parallel with different tasks, whereas the main characteristic of participation regarding non-professional end-users is that these requirements cannot be decided upon and fixed far upstream in the process.

## 4.1 General framework of requirements

In the end, requirements can be considered partly generic as they come from regulations and restrictions (constraints), and partly dynamic as they are directly related to CSO specific project and end-users needs. In D1.2 “Guidelines for Participatory and Concurrent design” a programme of requirements was identified. This programme lists the following activities during the participatory design process (PD):

- Social requirements assessment/identification
- Economic requirements assessment/identification
- Environmental requirements assessment/identification
- Functional requirements assessment/identification
- Technical requirements assessment/identification

Individual performance requirements can be developed for all above listed categories. Technical issues translated or falling under ‘functional factors’ are subject of national laws and regulations. As such, minimum performance quality demands can be handled pretty straightforward with different product and product-service combinations (as shown in WP4). Based on that process of assessment of requirements, a classification structure for requirements is proposed:

| Type | Scope | Generic requirements | Dynamic requirements |
|---|---|---|---|
| **Social requirements** | Requirements which indicate the typology of CSO Housing project in terms of social value to be reached | • Demographic composition<br>• Density restrictions<br>• Availability of affordable housing | • Ethical trading throughout the supply chain<br>• Community interaction – need of common spaces |
| | **Source of requirements:** | • Local ordinances<br>• Planning regulations | • CSO participatory design (PD) |
| **Economic requirements** | Requirements which indicate the parameters inherent to the cost of intervention | • Allowed development density<br>• Mixed use requirements | • Target budget<br>• Contracting strategies<br>• Financial prerequisites |
| | **Source of requirements:** | • Planning regulations | • CSO participatory design (PD)<br>• Financial schemes, grants |
| **Environmental requirements** | Requirements which indicate the parameter inherent to the environmental expectation from the project, the position and characteristics of the site/building of intervention, in addition to the EeB requirements | • Energy consumption requirements<br>• Efficient use of resources (water, electricity)<br>• Use of renewable energy sources<br>• Protection of the surroundings | • Choice of [renewable] materials<br>• Elective norms (e.g. Passivehaus standards, nZEB performance levels, BREEAM certification, LEED certification, etc. |
| | **Source of requirements:** | • Laws, norms, regulations | • CSO participatory design (PD)<br>• Opt-in certification schemes |
| **Functional requirements** | Requirements which indicate the parameter inherent to the typology of intervention, the typology of building, the facilities to include, the dimension of intervention and of the dwellings | • Min. aesthetic characteristics<br>• Min. thermal comfort<br>• Min. acoustic comfort<br>• Min. indoor air quality<br>• Min. accessibility to the disabled<br>• Basic building services | • Desired aesthetic characteristics<br>• Desired thermal comfort<br>• Desired acoustic comfort<br>• Desired indoor air quality<br>• Desired accessibility to the disabled<br>• Additional building services |
| | **Source of requirements:** | • Local ordinances, norms, regulation | • CSO participatory design (PD) |
| **Technical requirements** | Requirements which indicate the parameters inherent to the building system, defining some technical choices due to materials or spatial or construction requests | • Mechanical resistance and stability<br>• Safety in the case of fire<br>• Hygiene, health and the environment<br>• Safety in use<br>• Protection against noise<br>• Energy economy and heat retention | • Construction system and materials<br>• Building materials and finishing<br>• Construction time limits |
| | **Source of requirements:** | • Building codes<br>• Construction standards | • CSO participatory design (PD) |

These generic requirements could be further classified according to the hierarchical nature of the source of such requirements, as shown below. European Directives or other legislative instruments set objectives to be achieved by Member States without prescribing exact means of achieving those results. Therefore Member States adapt their national regulations taking into account their legal, social and economic context. For example at national level these requirements are present in building codes or specific energy-related standards.

| | |
|---|---|
| **HIGHEST LEVEL – OBLIGATORY** | The highest level of requirements obligatory for all kinds of projects are set by EU regulation called Construction Products Regulation - CPR (305/2011/EU) that repeals Construction Products Directive – CPD (89/106/EEC). **See Annex I.** |
| **NATIONAL REGULATIONS AND DIRECTIVES** | National governments are responsible for safety measures of constructions. Requirements might differ from country to country and are obligatory within the country. |
| **EUROPEAN STANDARDS (EN, TS, TR)** | Generally speaking European standards issued by CEN and voted by all CEN members are not obligatory but their level is classified as "VALID". However, national standards shall not be in contradiction with ENs. So called harmonized product standards hENs become basis for CE marking and free export of products to other EU countries. |
| **NATIONAL STANDARDS** | National standards are either European standards (often translated) provided by National Annexes (for instance in case of Dutch National Standards marked NEN) or amended old or new National Standards with regards to EU rules. They are considered to be "VALID". They might became compulsory when they are listed in contracts |

In practice these requirements will be taken into account by the corresponding professional expert. However, CSO's should be aware of the existence of these requirements as they will definitely affect the outcome of their project. This is the case of retrofitting projects. For instance, the Energy Performance of Buildings Directive (Directive 2002/91/EC, EPBD) and its 2010 recast (Directive 2010/31/EU, EPBD recast) sets out certain requirements for refurbishment projects in terms of minimum performance requirements for building elements and technical systems. Furthermore, by 2020 all new buildings will require Nearly Zero Energy Building (nZEB) level including requirement to use renewable energy sources. Thus is of utmost importance that CSO's are familiar with these constraints during the CSO's participatory design (PD) with the help of professional facilitators in parallel to the concurrent design process (CD).

### 4.2 Lessons learnt

The Lancaster Cohousing case demonstrates that the user based requirements (in the first place site lay-out, then house design) were always dynamic. However, the aim was to fix the site and house design as soon as possible. The project was driven by the core team members, and was guided by iterative sessions with the early in the process chosen architect. The need to keep the cost of homes at acceptable levels could only be met by setting limits and boundaries to individual choices. This means that active participation of end-users was from the very beginning clearly channelled by very early on proposed and accepted key aspects of the project. Although no clear deadlines were set, the whole process was essentially stage-gate. And even though the whole process was largely traditional, including the decision-making type of end-users participation, the professionals did not follow the collaborative approach since most of them were asked to perform problem-solving activities.

The "Na Stárce" retrofitting project in Prague shows a similar leadership of the project by a small core team as was the case in Lancaster Cohousing. Based on the consensus reached, a professional was commissioned with designing the appropriate measures, in order to also meet the requirements of a state program that started during

the development of the initiative. In case of “Na Stárce” a ‘quite common energy-efficiency measure’ was implemented, which shows that initial solutions offerings to the end-users are crucial if the community is about to move towards decision making. The participation did not really go any further than this initial technical choice, however the joint process regarding financial decisions did reflect a form of interplay between professional consultants and end-users. In the end the decision was made to go ahead with the project even though the risk of not getting the desired grant was a real one. The project effectively showed that EeB improvements can aid and improve community building, since one of the main results was a better organised association of owners. This is one of the most important issues for CSO initiatives, since community forming is mainly assumed to be something outside of the technical development scope. In this sense, the Czech case demonstrates that this indeed is possible, certainly when living comfort in general is improved, and even though community forming was not explicitly the aim of the used approach.

The Erasmushove demonstration case in The Hague seems to support the claim that (Collective) Self Organised housing needs to have more than a plot as a catalyst in order to get the process going. Probably the possible existing solutions could have helped form a CSO, in a sense that a certain initial direction would allow end-users to group themselves around it, which would provide a basis for further participative development and decision making. Instead, professional developers partly took over the initiative, together with individual ‘self-builders’. As such, the case only partially provides input for end-users requirements development. Maybe that eventual deadlines for forming a CSO and starting a process does show that it indeed can be treated as a CSO process KPI; the deadline was not met and process moved forward in a different direction.

Other Dutch cases show that, just as was the case in Lancaster and Prague, (deadlines for) forming a small core team as a nucleus of a CSO could be seen as a more specific KPI. Coupled with subsequently defining a narrow set of guiding principles, on which one can always fall back to during the process, marks a clear set of starting CSO process KPI’s. This forms the basis for making decisions, and allows both participatory and concurrent processes to develop from and keep going.

The German cases show a similar process of CSO housing that follows this participatory design workflow. At the same time all surveys show that no key performance indicator covers the common needs. It is the development of the process itself, how the definition of the end user requirements is generated, that can be seen as a KPI. Several analyses show that end user requirements and their treatment are included in all ‘key’ factors, or CSO (forming) process phases. It is the true interplay of participatory design and concurrent design that drives this process; PD kicks off on basis of known solution possibilities, after which CD allows professionals to tailor the CSO needs.

Italian cases show that even though the initiatives are mainly characterized by a top-down approach, and that most cooperatives have an ‘undivided-property’ characterization, the CSO’s do develop themselves autonomously. This means that a participatory CSO ‘design’ process is a catalyst for the later to follow technical solution development of a settlement. In cases where participation of end-users is foreseen, the fulfilment of a ‘tailor-made’ solution forms a main goal.

Even though the end-user requirements are very different depending on a CSO initiative, they still should remain within the boundary of health and safety codes, environmental codes, energy-sustainability codes (e.g. the Dutch EPC), etc. Besides, a list of possible generic requirements can be a suitable catalyst to get participatory and decision making process going. Further depending on the different initiatives, the roles/responsibilities of parties can than change in time within a CSO project:

| Initiated by / Driven by | **CSO** | **SME** |
|---|---|---|
| **CSO** | free planning<br>(very flexible) | flexible-modular<br>(E-market place) |
| **SME** | flexible-modular<br>(E-market place) | modular approach –<br>restricted choice |

# 5. CONCLUSIONS

The process of deciding upon the design (and other) requirements is part of the group formation process, and as such one of the reasons why CSO processes tend to take much longer than traditional building processes. It could even be said that a well introduced process of CSO housing is following the participatory design workflow. And even though there is no key performance indicator covering the common needs, content wise, the difficult subject of end-user requirements within CSO's processes can be best understood and approached by the following conclusions:

1. End-user requirements are defined and developed through participatory design (PD) – concurrent design (CD) interplay.

2. PD is a kick-starter, in a sense of collective decision making on basis of initial set of solutions (directions). Initiating and forming of a CSO is an autonomous participative process as well.

3. CD and professionals take over and further drive the development (see WP1 guidelines and WP2 business models for more detailed directions). Professionals / SMEs can however also provide the initial input for the PD kick-start, for example in form of various supply offers.

4. The CSO core team is crucial in speeding up this interplay between PD and CD processes, using deadlines as main KPIs for dynamic and CSO specific end-users requirements. A professional facilitator can be an additional catalyst, but it cannot fully replace the role of the CSO 'champion(s)'.

5. This process can be further helped by the CSO Housing platform and E-market place within it, especially because it also offers the possibility for SMEs to initiate and drive (mainly in a sense of self-facilitating) the CSO processes.

The CSO Housing platform, with the E-marketplace as a specific part of it, can from the perspective of end-user requirements in a broader sense foremost be seen as a 'negotiating instrument' between the end-users and the suppliers of products and services. End-users are CSOs, while SMEs, municipalities and financial loans and schemes sources are suppliers of products and services. The CSO Housing platform as the key Proficient deliverable informs (potential) end-users, (indirectly) helps them to join and/or form a CSO, (repeatedly) express their wishes and organise the decision making process, while all the time providing perspective of realising their objectives through links to existing products and services (providers). Ultimately, the CSO Housing platform helps this way in defining, developing and realising end-users requirements.

# References

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Filocca L.M. (2012); Maisonbook - Architettura e sociologia si contaminano per formare 'gruppi di amici'; Lissone: Edizioni Mariani

Verones S., Rinaldi A., Rebecchi S. (2014); Retrofit e rigenerazione urbana; Rome; EdicomEdizioni

Proficient CoP meetings:

- Lancaster
- The Hague
- Prague

Workshop 'Perspectives', 9 december 2014, Haags Duurzaamheid Centrum, Den Haag (14 participants)

Interviews with various market parties, such as Ter Steege construction company in the Netherlands (http://www.tsbouwvastgoed.nl/referentieprojecten/cpo/).

http://www.aannemervak.nl/ondernemen/geld-verdienen-aan-cpo-een-kunst-apart/

http://www.cpo-twente.nl/

http://www.cpoz.nl/

http://iceb.nl/

http://www.tsbouwvastgoed.nl/wp-content/themes/tersteegebouwvastgoed/images/Succesfactoren-van-Collectief-Particulier-Opdrachtgeverschap.pdf

For the Italian cases description, interviews have been taken with representatives of the associations, companies, municipalities that initiated, managed or participated to the interventions, as listed here following.

- Consabit: interview with Stefano Salvadorini, President of Consabit; and arch. Franco Landini, designer of the Consabit intervention in Shangai district, in Livorno (http://www.consabit.it/)
- Cohousing Numero Zero: interview with Chiara Mossetti, cohouser, project manager and designer of Cohousing Numero Zero (http://www.cohousingnumerozero.org/)
- Newcoh: interview with Giano Donati, project manager of Newcoh (http://www.cohousing.it)
- Maisonbook: interview with Luigi Mario Filocca, architect, entrepreneur and inventor of Maisonbook (http://www.maisonbook.it/)
- EPOurban: interviews with Sara Verones, PhD, Engineer, project manager for EU projects for the Municipality of Bozen (BZ); and Andrea Rinaldi, aggregated professor to the Architectural Department of Ferrara and selected expert of the professional team of EPOurban (http://www.epourban.eu/index.php/it/; http://www.comune.bolzano.it/urb_context02.jsp?ID_LINK=4020&page=1&area=75&id_context=21186)

# ANNEX I

BASIC REQUIREMENTS FOR CONSTRUCTION WORKS
(Construction Products Regulation (EU) No 305/2011)

Construction works as a whole and in their separate parts must be fit for their intended use, taking into account in particular the health and safety of persons involved throughout the life cycle of the works. Subject to normal maintenance, construction works must satisfy these basic requirements for construction works for an economically reasonable working life.

**1. Mechanical resistance and stability**

The construction works must be designed and built in such a way that the loadings that are liable to act on them during their constructions and use will not lead to any of the following:

(a) collapse of the whole or part of the work;

(b) major deformations to an inadmissible degree;

(c) damage to other parts of the construction works or to fittings or installed equipment as a result of major deformation of the load-bearing construction;

(d) damage by an event to an extent disproportionate to the original cause.

**2. Safety in case of fire**

The construction works must be designed and built in such a way that in the event of an outbreak of fire:

(a) the load-bearing capacity of the construction can be assumed for a specific period of time;

(b) the generation and spread of fire and smoke within the construction works are limited;

(c) the spread of fire to neighbouring construction works is limited;

(d) occupants can leave the construction works or be rescued by other means;

(e) the safety of rescue teams is taken into consideration.

**3. Hygiene, health and the environment**

The construction works must be designed and built in such a way that they will, throughout their life cycle, not be a threat to the hygiene or health and safety of workers, occupants or neighbours, nor have an exceedingly high impact, over their entire life cycle, on the environmental quality or on the climate during their construction, use and demolition, in particular as a result of any of the following:

(a) the giving-off of toxic gas;

(b) the emissions of dangerous substances, volatile organic compounds (VOC), greenhouse gases or dangerous particles into indoor or outdoor air;

(c) the emission of dangerous radiation;

(d) the release of dangerous substances into ground water, marine waters, surface waters or soil;

(e) the release of dangerous substances into drinking water or substances which have an otherwise negative impact on drinking water;

(f) faulty discharge of waste water, emission of flue gases or faulty disposal of solid or liquid waste;

(g) dampness in parts of the construction works or on surfaces within the construction works.

4.4.2011 Official Journal of the European Union L 88/33 EN.

**4. Safety and accessibility in use**

The construction works must be designed and built in such a way that they do not present unacceptable risks of accidents or damage in service or in operation such as slipping, falling, collision, burns, electrocution, injury from explosion and burglaries. In particular, construction works must be designed and built taking into consideration accessibility and use for disabled persons.

**5. Protection against noise**

The construction works must be designed and built in such a way that noise perceived by the occupants or people nearby is kept to a level that will not threaten their health and will allow them to sleep, rest and work in satisfactory conditions.

**6. Energy economy and heat retention**

The construction works and their heating, cooling, lighting and ventilation installations must be designed and built in such a way that the amount of energy they require in use shall be low, when account is taken of the occupants and of the climatic conditions of the location. Construction works must also be energy-efficient, using as little energy as possible during their construction and dismantling.

**7. Sustainable use of natural resources**

The construction works must be designed, built and demolished in such a way that the use of natural resources is sustainable and in particular ensure the following:

(a) reuse or recyclability of the construction works, their materials and parts after demolition;

(b) durability of the construction works;

(c) use of environmentally compatible raw and secondary materials in the construction works.