Proficient

State-of-the-art of CSO energy-efficient retrofitting

Deliverable 7.5

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PROFICIENT; SME network business model for collective self-organised processes in the construction and retrofit of energy-efficient residential districts
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Colophon

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Publishable executive summary

This report describes 15 state-of-the-art CSO energy-efficient district retrofitting case studies from five countries in the EU. Two of those are demonstration cases, meaning that parties involved in those cases are partners in the Proficient research, while the others are observatory cases, meaning that information is gained from literature study.
The case studies described in this report are reviewed on a generic level: rather than going into detail, the cases are compared to determine what shared factors were relevant to make them a success. This is useful, as it can help determining the viability of new projects that are being developed.

Success factors for projects are dependent on the type of project. A distinction between different projects can be made based on the actor that took first initiative. As a result, the projects can be split into three main driving forces:

1. Government initiated projects
2. SME initiated projects
3. End-user initiated projects

Government initiated projects mostly originate from programs where a (local, national or even European) governments finances EeB projects. Based on the case studies, funds available for EeB retrofitting projects from the government are spent on either:

- Subsidy to reduce cost for technical measures. Usually, the subsidy covers part of the cost.
- Programs to increase innovation and knowledge of EeB in the building industry
- Programs to stimulate the development of new market concepts aimed at building owners
- Creation of a revolving fund to provide cheap loans for EeB projects

SME initiated projects are characterised by a consortium of a number of different businesses, that combined are able to offer process management, technical consultants, installation companies and contractors and sometimes even financial services, thus offering a one-stop-service for clients.
End-user initiated projects are characterised by a home owners association that represents a (large) group of end-users. The board of the association acts as commissioner for the EeB measures, while potential solutions and measures are discussed with home owners at meetings, before a final decisions are made.

Case studies illustrate the great potential of retrofitting projects in the existing built environment. By retrofitting, one is able to increase the energy performance, remain the social network and cohesion in the neighbourhood, the architectural appearance of these projects may improve, and above all, the living quality for residents goes up in service level and comfort.
End-users might be supported better by providing good guidance materials, to inform them upfront of the process flow, some potential difficulties, and experience from other projects. SMEs can organise the best fit solutions for the end-users, mediating between the professional organised authorities on the one side, and the non-professional end-users on the other end.

1.1 List of acronyms and abbreviations

- **CSO** : Collective Self-Organised
- **PSO** : Private Self-Organised
- **SME** : Small and Medium Enterprises
- **ESCO** : Energy Service Company
- **EeB** : Energy-efficient Building
- **DoW** : Description of Work
- **WP** : Work Package
- **HA** : Housing Association

1.2 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. Both new construction and retrofitting projects. 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

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1. Introduction

The Proficient research is about creating new business opportunities for SMEs, directed at CSOs. When developing new products, being process models, technical solutions or otherwise, it is important to know what has already been done and what was successful or not. This report gives insight into CSO projects that have been realised recently or are currently in the process of being realised. The lessons learned from these projects may give valuable input for new initiatives that are being formed.

Within Proficient, the workload is split into eight work packages that focus on different topics. Of these eight work packages, six (WP1-WP6) deal with specific aspects of a CSO project: they deal with the process, or with technological aspects. Two WPs, WP7 and WP8, have a more general approach. WP7 is tasked with the demonstration aspect of Proficient, providing the link between the demonstration projects and the Proficient research projects, while WP8 is tasked with the dissemination and valorisation of the knowledge produced by the different WPs, providing the link between the 'outside world' and the Proficient research.

The more general approach gives WP7 the unique opportunity to look at case and/or demonstration studies as a whole, instead of a collection of separate elements. Through this helicopter view, many cases can be compared side by side, to determine not only what separates them from each other, but also what the commonalities are, and what factors play a role in the success of a case study.

The helicopter view also entitles WP7 to take a more distant look at the case studies. Because there are many cases, and there are many different topics that play a role, it is difficult to take every individual aspect separately, assess it, and weigh it against another individual aspect. WPs 1 through 5 focus on the individual aspects, grouped into the five topics each individual WP focusses on. WP7 takes a different approach by taking a step back and looking beyond the little details. The underlying elements that form the driving forces behind successful CSO projects become visible.

This reports (Deliverable 7.5) describes the state-of-the-art of CSO energy-efficient district retrofitting. Together with Deliverable 7.4 (energy-efficient new districts), it describes a number of CSO projects. The difference between new construction and retrofitting is that in case of new construction, there is no pre-existing condition that dictates the direction of development. There is more freedom to cater to specific needs and to custom create according to wishes and desires. The decision making process however can take very long.
In case of retrofitting, there is an existing structure, existing end-users and sometimes existing connections between SME and building owners, e.g. in the form of a maintenance contract. The pre-existing conditions may limit the freedom of decision making. Individual home owners or tenants may have different opinions about what needs or need not to be done, while the existing structure may steer the retrofitting solutions in a certain direction.

The case studies are split into demonstration case studies and observatory case studies. The demonstration case studies are connected closely to Proficient as some of the participants in those projects are partners in Proficient. For this reason, more detailed information is available, and a certain amount of feedback can exist between the demonstration case studies and the results from Proficient work packages. Not all demonstration cases are able to provide the same amount of feedback, as not all projects are in the same developing stage. Some are close to being finished, others are ongoing or still in the start-up phase at the time of writing.

The observatory case studies are similar to literature studies. Relevant information is gathered from available sources, and used to give a general description of the specific projects. Although important to determine the current state-of-the-art of CSO energy efficient building projects, they have a lower status than demonstration projects, in the sense that they do not provide the feedback and validation of results that the demonstration case studies give.

This report describes the result of the first 18 months of the Proficient research, focussing on CSO case studies. The cases described are collected in collaboration with the different Proficient partners. They describe the state-of-the-art and serves as a reference point for the results of the Proficient research.

2. Demonstration and observation case study characteristics

The cases described in this chapter can be divided into three categories:

1. Demonstration case studies
2. Observatory case studies as described in the Description of Work (DoW) of Proficient
3. Additional observatory case studies, provided by Proficient partners

Two of the four demonstration case studies can be classified as district retrofitting, the other two consist new construction projects.
The observatory case studies listed in the DoW are not all equally relevant to the Proficient research: not all fit the criteria of CSO housing. Despite the lesser relevance of some, all are listed with information about the specific project, as they might be helpful by giving a frame of reference or provide a link to other interesting information.

2.1 Description demonstration cases

Two demonstration cases listed in the DoW are classified as district retrofitting: Zelená úsporám in Prague, Czech Republic, and Raab-Sol in Györ, Hungary.

2.1.1 Zelená úsporám, Košíře, Czech Republic

In the Košíře district of Prague, a block containing 23 apartment dwellings has been renovated to improve the energy performance. Apartments are owned by private persons associated in SVJ (Association of dwelling owners). One of the members is a housing cooperative (Housing cooperative of underground builders). This cooperative used to be 100% owner and still owns couple of apartments. The housing cooperative acts as an appointed owner and at the same time is responsible for management of housing stock to SVJ.

Development process

In 2008 a number of dwelling owners took initiative to add insulation to the external envelope of the building through SVJ. End 2009, information on the state programme “Zelená úsporám” (Green savings) became available. This meant that they had to comply with certain requirements to be eligible for the subsidy. SVJ commissioned a professional consultancy to design the EeB measures to match these requirements and to apply for the subsidy.
The proposed measures were explained to the apartment owners in a number of meetings, and no objections were raised and in 2010 the building permit was issued. At the same time, the subsidy process was delayed, but SVJ decided to proceed with the instalment of insulation nonetheless. A contractor was commissioned, and in November 2012, after completion of the EeB measures, the subsidy was awarded.

EeB measures

The EeB measures consisted of replacing the glass in windows with energy efficient double glazing, in case this had not already been done, and insulating the façade, ceilings on the top floor and floors of the bottom apartments.

Additional thermal insulation ETICS

- external walls 120 mm EPS
- floor slabs above unheated 1st underground storey – mineral wool 80 mm
- roof – mineral wool 180 mm

Funding

The final investment costs were below the budgeted limit of € 8.000,00 per flat.

The EeB measures were financed by the SVJ owners association, using a fund that is filled by the apartment owners through a monthly contribution. In addition, a credit was provided by the CSOB bank. After completion, the awarded subsidy was used to pay back the credit.

2.1.2 Raab-Sol, Györ, Hungary

The Raab-Sol project consists of 63 buildings, containing 1683 apartments, located in three different districts of Györ. Depending on the district, 10-11 storey or 4-5 storey buildings are common; dwellings are between 50-70 m^2 floor area. All of the buildings belong to the same housing association called XXX. Lakásfenntartó Szövetkezet (30. Housing Management Association). The 63 buildings have a separated cost accounting and a representative. They are responsible for arranging common matters and for decisions in financial issues.

The housing association owns the building structure and envelope, the interior is owned by the individual home owners. Services (heating, hot water, electricity) are provided by the housing association.

Development process

The housing association was interested in, and had a positive attitude towards the projects the ESCO Energosys Inc. was doing. A collaboration between the association and the ESCO, with the help of a technical consultant company (Lagross Ltd.), resulted in a financial and technical concept to retrofit residential apartment buildings. The Municipality of Győr showed an interest in the project and Energosys Inc. developed a financial supporting scheme considering the interests and possibilities of the 3 main stakeholders. After 9 months preparation and development of technical and financial contents the Raab-Sol project started at the end of 2011.

The buildings can be grouped into 6 types of prefab buildings. For each of the building types, a forum is established where home owners are invited to join and be informed about their building specifics, and what EeB measures are proposed. One forum can contain approximately 100 people.

For each of the buildings, scenarios are developed that focus on technical measures, investment cost or operating cost. These different scenarios are presented to dwelling owners, who have to agree on a per-

building percentage of 67% on once scenario, before retrofitting measures were being undertaken. This involves personal visits by the ESCO with each individual home owner.
The ESCO is responsible for the implementation, funding and operation of the EeB measures.

EeB measures

- Installation of PV panels and solar collectors.
- Façade insulation
- Roof insulation
- Cellar slap insulation
- Ventilation retrofitting
- Window replacement
- Heating and hot water system modernisation

The amount of measures undertaken differ per building, dependent on the state of each building. In some cases, decisions are made to improve the building in phases: first, improve to energy class B, and after a number of years, further improve to class A with additional measures.

Funding

The housing association takes on a loan of 100% of the project's cost for 10 years. The housing association, municipality, ESCO and the government contribute to the redemption of the loan.
Energy savings guaranteed by the ESCO provide 20-30% of the investment costs (in a ten years perspective). The saved money is used for the redemption of the loan in order to lower the owners' direct costs.
The housing association collects service fees from the home owners. These fees are transferred to the ESCO. The ESCO has a contract with the bank to redeem the loan over a 5 to 10 year period. How long is dependent on the specific building and the specific EeB measures applied: bigger measures cost more money and take longer to redeem. The fees collected from the housing association are used to cover the loan and cost of running the ESCO service.
The financial support provided by the municipality and the government is lower than 25% of the investment costs and the financial scheme allows them to pay over 10 years. In addition, the EU provides 15% subsidy, making the total percentage of subsidy 40%.
The expected cost for the total project is 20.7 M EUR, which comes down to approximately 8880 EUR per flat on average.

2.2 Description observatory cases

The cases described in this paragraph are listed in the Description of Work. They vary in size and type, and the information given is adjusted accordingly, based on the information available and the relevance of the case.

2.2.1 Zagreb project, Budapest, Hungary

The project covered 4 blockhouses in the 10th district of Budapest, with 768 flats in total. The buildings originate from 1976, and each building forms its own housing association. The housing association (HA) owns the main structures of the buildings (except the windows) and the common building services (except radiators) and equipment. Flat owners own the indoor space of their unit, separation walls, windows and inside equipment.

All members of the HA pay a monthly fee, covering maintenance costs, lighting and heating of common areas, wages of representatives and payments for the retrofitting funds. The use of the funds is regulated by the HA rules, which also determine the minimum amount of payment, which is compulsory.

The HA can decide to increase common costs with a 2/3 vote, which will be included in the HA statutes. In the case that the HA takes a loan to finance a major retrofitting investment, both the investment and the loan must be approved by the assembly with 2/3. After the approval members pay their shared part as part of the accordingly increased common cost.

HA is represented by a common representative, who is supervised by a supervision and accounting committee. In Hungary there are two types of HAs:

1. Cooperative ownership (with legal body)
2. Condominium (without legal body)

In the case of the Zagreb project all involved buildings function as condominiums, which decision making processes are very complicated.

The retrofit measures took place over the following period:

- Preparation and decision: October 2004 - September 2005
- Grant application: September 2005 – February 2006
- Procurement, contracting and financing: February 2006 – July 2006
- Implementation: July 2006 – March 2007

Development process

Communities agreed to join a government tender (see funding) and each of them contracted with a consultancy (in this case: Lagross Ltd) . A coordination committee (CC) had been formalized according to the proposal of the consultancy, in which on the behalf of the municipality the Municipal Real Estate Management Company, the consultancy and 2 representatives of each of the four HAs participated. As a result of the activity of this committee, participants decided that there would be a joint procurement for the four buildings.

All proposals of the CC had been discussed with the assemblies of the involved communities and had been approved by each assembly. The consultancy prepared information for the discussion and

decision-making. Concerning the financial solutions this company ensured two days weekly when owners and tenants could contact personally and discuss the technological details of their flats and financial issues. During the preparation phase of the application the municipality and the consultancy offered different technological options and explained their technological and financial details in special consideration of functional and comfort impact, savings and payments.
These options had been introduced in forums in which all stakeholders could participate (maximum of 200 persons per forum). At the end of this discussion procedure assembly of each community decided about technological content of the retrofitting, expected maximum amount of investment, conditions of loan, amount of common costs, and not at least conditions of tendering and contracting an ESCO and the main contractor.

The four HAs decided to develop a cooperation relationship with each other in order to

1. develop a common unique project,
2. lower investment costs,
3. stimulate the renovation of the whole primer energy distribution system. It is the responsibility of the Budapest District Heating Company. This action could result that there will be a possibility for each building to have its own heating centre. This is essential for each building to be able to optimize its heating energy consumption.
   (Comment: before the retrofitting, only one “shared heating centre” regulated and controlled the heating service in 7 buildings in the area. These 7 buildings had a very different level of energy-efficiency: the result was that the building with the lowest efficiency determined the performance of the system.)

After formalizing the idea of a possible investment, the HAs contacted with the consultancy in order to:

1. establish the technological and energy-efficiency base of the project,
2. assess the building,
3. develop the investment proposal for a deep retrofitting*,
4. develop a favourable financing scheme,
5. support the decision making process of communities,
6. prepare and submit the application after the decision.

*: Until 2005, in Hungary communities preferred partial solutions for retrofitting, with a maximum of 2000 EUR/flat investment cost. Deep or semi-deep retrofitting implicates a minimum of 5-7000 EUR/flat, depending on technological condition.

<u>EeB measures</u>

Requirements in terms of technology and energy efficiency:

- meet the requirements of energy efficiency specified in national regulations of energy-efficient buildings
- certificated quality of used products and equipment according to EU or Hungarian national standards and regulations

- quality guarantee for services of contractors and site works
- 5 years warranty for equipment and products and 10 years warranty for construction works and windows
- meet the requirements of fire and lightning protection regulations
- professional liability insurance
- guaranteed energy saving

Funding

Between 2002 and 2006 the Hungarian government launched a very favourable tender for getting grants for retrofitting projects of prefabricated blockhouses. The tender offered to housing associations grant of 2/3 of all retrofitting costs, from which 1/3 is ensured by the government and the other 1/3 by the municipality. The remained 1/3 could have been financed by the HAs. and by an ESCO. The grant could not be applied to some of the necessary technological content, e.g. new radiators, green energy sources, drainage and plumbing.

As the municipality and communities had scarce financial sources for a complex project, they demanded the consultancy to develop a suitable financing construction. The base of the proposed financial solution, as the involved parties decided, was the following:

1. All parties shall submit a loan with 8 years payback time.
2. Participation of an ESCO, which guarantees the energy savings as a source of loan payments.

The investment costs cannot exceed 7000 Euros/largest flat. This was calculated for elaborating the application.
The increased amount of common costs cannot exceed 30 Euros/month/flat. At the end of the investment owners' cost was 26 EUR/month/flat. Considering that the common costs will be paid monthly for the period of 96 months, this amount is equivalent to 2496 Euros/flat. This is the owners' part. Total investments cost is 6730 EUR/flat. After getting state grants this means 4921 EUR/flat cost and 6358 EUR total loan payment/flat, which is paid by owners, municipality and ESCO jointly.

2.2.2 Sustainable refurbishment project in Livorno, Italy

In the Shangai District in Livorno, Italy, two separate housing blocks have been retrofitted by demolishing and re-constructing part of an existing residential district. As the retrofitting process consisted of demolishing and re-constructing, this project is described as a new-construction in D7.4 State-of-the-art of CSO energy-efficient new districts.

2.2.3 Energy leap ('Energiesprong'), The Netherlands

Energy leap is a program commissioned by the Dutch government, with a duration from 2010 to 2014. Energy jump aims to motivate all parties in the building industry to take an innovative approach towards energy consumption. This should lead to large scale deployment of renewable energy technology and a major reduction in the consumption of fossil fuels.

Development process

Energy leap is characterised by Learning by Doing. Energy leap encourages innovation, primarily by supporting projects, financially or process-specific. The support is not so much for technical aspects, but more for the innovation process. It can be residential, commercial construction and land development, both new construction and renovation.

Energy leap aims at housing projects with ambitions to cut energy consumption by at least 45%, new construction or (preferably) renovation, initiated by housing associations, owners or home-owners associations. In addition Energy leap provides support to a selection of commercial projects and a number of land development projects. The choice of which is ultimately determined by the largest potential for energy reduction.

Apart from the requirement that they make a substantial contribution to energy goals, the projects must meet the following criteria:

- They have a high impact when thinking about energy in specific building types.
- They are innovative and scalable.
- After the experimentation phase, they can independently find their way to market.

In exchange for the support, knowledge and experience from a project becomes public and is shared nationwide. Energy leap brings together people with knowledge, experience and ideas, sometimes virtually, sometimes physically. To share successes, mistakes, failures and new insights.
Additionally, Energy leap does research and develops tools that parties can use to realise their energy ambitions. And Energy leap tries to break down organisational barriers in the market by negotiation, consultation or agreements.

2.2.4 More with Less (MMM or 'Meer met Minder'), The Netherlands

MMM is the national approach towards energy saving in existing homes and other buildings in The Netherlands. The MMM approach is a joint initiative from the government, housing corporations, the construction and installation sectors and energy companies.

MMM aims to tempt, relieve and assist various groups: owner occupants, homeowners associations, corporations, private landlords and collective projects, by making market concepts available per customer group. Ingredients of market concepts are:

- marketing and acquisition,
- advice,
- basic concept with additional options,
- financing,
- quality assurance,
- after care and

- cooperation in the construction industry.

Realisation of the MMM action plan is aimed through:

- improving marketing and acquisition through
  - market-wide introduction of the energy label
  - training
  - workshops and similar
- improving consultancy through:
  - training consultancy skills
  - developing tools
- developing basic concepts + additional options through:
  - research
  - workshops and similar
- developing financing options through:
  - available financing facilities
  - developing financing options by market concept
- developing quality assurance through:
  - training
  - guaranteeing workmanship
  - measuring customer satisfaction
  - make quality assurance visible to the market
- develop aftercare by, among others:
  - research
- cooperation in the construction industry through:
  - workshops and similar.

One of the most visible results of the program is the website www.meermetminder.nl which is aimed at consumers, businesses and the government. It contains a lot of information, suited to the target groups.

2.2.5 Choose Green Light (KGL or 'Kies Groen Licht'), The Netherlands

KGL develops, installs and maintains integral solutions for sustainable energy and energy saving for the existing building stock. KGL consists of a collaboration between seven SMEs, containing technical consultancy, software development, installation companies, energy consultancy and financial services.

2.2.6 'E.nu', The Netherlands

Housing stock in the Netherlands needs to become more energy efficient. That is at least the ambition of many stakeholders that are partner of the e.nu program, like municipality, housing association, end-users and contractors. Ambitions are often lost over the execution of plans, in actually organizing and financing the project.

E.nu is dedicated to cross this hurdle. It offers a one stop shop for end-users in order to provide the full picture of possibilities, costs, benefits, organization and planning.
E.nu is initiated by InstalNova, founded by the association of installing companies (UNETO-VNI) and knowledge providers like Syntens and TNO. It offers a legal and organizational model, including process support for individual e.nu cooperatives to be established to serve a specific region.
In every e.nu cooperative, 18 have started since the introduction in 2009, Energy Performance advisors, installers, contractors, insulation and glass suppliers etc. are working together in co-creation. The partners acquire projects through the legal entity of the cooperative, and working together as equals, not in hierarchical structure.

Development process

The cooperatives offer customers an integral, customized solution, which combines the construction and installation components optimally, besides taking care of technical and financial feasibility. Via this way end-users are being relieved from organizational stress and uncertainty with regard to performance and interrelatedness issues of intermitting building components.

In a traditional construction or renovation process, the installation (and installing partners) is only considered in the end of design and planning. Cost of the installation is often considered as the closure of the final financial picture, and is preferred to be low in initial costs.
Main benefit of the e.nu cooperative is that installation, insulation and other building components are considered at the same time, and in relation to the others. By ensuring the knowhow of all vital building components is sitting together from the beginning of the design of a project, one can offer an inclusive advise to the client, looking at interdependency, considering the whole life cycle of the project and its components, including the costs.

By the integrated solution, relevant information on technologies applied as well as their performance is matched from the beginning of the project and can be relied upon. This enables the route to agree upon certain guarantee of performances, in terms of end results. It further more takes the complete coordination of activities and planning away over from the client, which is shifted to the cooperative.

As a result of the cooperative form with a fixed group of suppliers and contractors united, makes that client and end-users have only one contractual partner as supplier. Agreement on general energy performance and direct interaction with all essential disciplines contribute to clear expectations, responsibility and communication between client and suppliers.
Due to the fact the cooperative exists of a fixed number of partners, and these partners are used to work together in realizing targets, adds to the quality of the product and improves the interdependency between suppliers (as is often not the case in traditional construction projects). In the end, less failure and miscommunication will be reported and extra costs for repair are unnecessary.

EeB measures

Most e.nu cooperatives combining the specific knowledge and experience of energy advise (engineering, design, planning), with the concrete components to provide for better energy performance like sustainable energy generation suppliers, insulation measures, HVAC components, glass products and general contracting company. In many cases, specific information on financial, legal or subsidy regulations and measures is added to finalize the integration of solutions offered, and to provide clients with a realistic performance simulation of the future situation.

Finance

At the beginning of each cooperative, individual partner organisations put in some money as start budget, covering costs for communication and supplies. In most cases, the labour of partners in terms of acquisition and managing the cooperative are not covered by cooperative means, but shared by the partners individually.

Costs of the constriction or renovations work are clear from the beginning, as all actors are involved from the beginning in planning and design, and a total solution is offered. Failure costs because of miscommunication between partners; or a mismatch between interacting building or installation components is prevented due to the early stage involvement of all relevant disciplines.

But probably more interesting and relevant for clients is the fact that even the benefits of the reconstruction work can be ascertained. How does the building operate after reconstruction, how is the energy performance, and what is the benefits in the end for the client in terms of energy expenditure can and will be simulated by the e.nu cooperative, for now and in the future.

(http://www.energiebesparingnu.nl/), Min. ELI/ TNO, Samenwerking en duurzame innovatie in de bouw, 2012, Delft.

2.2.7 ZEB, Trondheim, Norway

ZEB is the Research Centre on Zero Emission Buildings, established in 2009 in Trondheim, Norway. The vision of the ZEB is to concur by research development in the abatement of the greenhouse gas emissions caused by buildings. The main objective is to develop products and solutions for existing and new buildings that will be carbon-neutral with regard to their production process, use, and demolition.

2.3 Additional observatory case studies

In addition to the demonstration and observatory case studies described in the DoW, information about a number of CSO projects in Europe has been collected by the Proficient partners, based on their own judgement and availability of information, and is described in the following paragraphs. Not every case has the same amount of information available, which is reflected in the descriptions.

2.3.1 Hook Norton, Oxfordshire, United Kingdom

Development

Hook Norton is a Co-operative and Community Benefit Society, set up by Low Carbon Hook Norton members to help the community reduce its energy consumption, carbon emissions and save money, with a range of community-based schemes and individual household projects based on interest-free loans.

EeB

Hook Norton Low Carbon's (HNLC) main activity is to provide low cost funding for energy saving measures in the home. Money is lent at competitive interest rates for any form of energy saving idea, with priority given to the more basic measures, e.g. they are unlikely to fund solar PV on a house that has poor insulation and incandescent lighting throughout.

Hook Norton Low Carbon members can also benefit from:

- Community purchasing power for energy efficiency measures, which will bring lower prices. Renewable 'green' electricity is available at prices comparable to standard 'brown' electricity through an affiliation scheme set up with Green Energy UK. 5% of any money spent is given back to HNLC to fund other projects.
- Access to reputable installers of loft, cavity wall and solid wall insulation and renewable energy systems — for example, solar panels for electricity generation or hot water, air / ground-source heat pumps or wood pellet and log boilers/stoves for sustainable heating.

They are also proposing to set up a Community Land Trust which will allow them to provide housing at permanently affordable levels for long-term community benefit. Hook Norton Community Land Trust (HNCLT) will do this by separating the value of the low energy building from the land that it stands on. So for example HNCLT is likely to retain the freehold of the development and then sell the houses on the basis of a 999 year lease based on the construction cost for the house. The future resale of the house could then be index linked to the Retail or Consumer Price Index (RPI or CPI).

They will build on the success of the social enterprise Hook Norton Low Carbon Limited (www.hnlc.org.uk) to create a Community Land Trust in Hook Norton to provide low energy, affordable housing for their community. Through shared-equity homes, fixing the resale percentage, they will enable occupiers to pay for the use of buildings and services at prices they can afford. The value of land, subsidies, planning gain and other equity benefits are permanently locked in by HNCLT who holds the asset in trust for long-term community benefit.

Funding

The funding for the project came from the Department of Energy and Climate Change (DECC) Low Carbon Community Challenge (LCCC). The long term aim is to create a rolling fund, initially seeded by DECC money via the LCCC. All loans will be paid back to HNLC to be re-invested in future projects. In conjunction with this it is planned to generate revenue from renewable energy and carbon reduction to

ensure the sustainability of the fund, bring further benefit to members and allow HNLC to start helping other communities.

2.3.2 Low Carbon Living Ladock Cornwall, United Kingdom

The Low Carbon Living project is working to make the rural Mid-Cornwall villages of Ladock and Grampound Road a test bed for achieving sustainable living on a community-wide scale.

Development

The local community put in a bid to the Government's Low Carbon Community Challenge. This scheme provided up to half a million pounds to 24 communities across the UK to introduce measures to aid transition to low carbon living.

EeB

Twelve sets of photovoltaic panels and 5 sets of solar thermal panels have been fitted to properties. Two buildings have had biomass boilers installed, 2 have had ground source heat pumps, and 2 have had air source heat pumps. Insulation was due to have been installed in 7 properties, but has only been done in 4 of these. The main one where it did not take place was the use of external cladding on a Victorian stone built house, and the reason was that planning permission was refused. As well as the work on various properties, a 20KW wind turbine was erected on a farmer's field and has now been in operation for over a year. As another way of reducing carbon dioxide money was provided for an edible woodland. As the trees grow carbon dioxide will be absorbed, and it will also provide a source of food in the future.

Funding

The funding for the project came from the Department Energy and Climate Change (DECC) Low Carbon Community Challenge (LCCC). A community managed fund has been be set up to ensure that income made by electricity generating aspects of the scheme remain a rolling resource that will benefit the wider community. Income from feed-in tariffs and anticipated Renewable Heat Incentives (RHI) from the government will be reinvested in more carbon saving measures so that the benefits of the programme of will far exceed the initial targets of the project.

2.3.3 Parkhill Estate Residents Association (PETRA), Essex, United Kingdom

PETRA (Parkhill Estate Tenants and Residents Association) is a tenant management organisation that aims to create a more sustainable future for the residents of its social housing estate in Hornchurch. PETRA manages the estate on a day to day basis on behalf of its residents and comes under the London Borough of Havering. PETRA took over the local housing management services from the Havering Council in 2003. The estate contains three tower blocks.

Development

Tenant Management Organisations involve tenants in an area taking responsibility for day-to-day management and repairs. The Council still owns the property and tenants keep their secure tenancy. To

take over management, the tenants must set up a properly constituted organisation – a Tenant Management Organisation (TMO). The responsibilities of the Council and the TMO are negotiated and set out in a management agreement. Each TMO must have a committee, elected by members that oversees the management of the estate. People with specialist skills may be co-opted onto the board to offer particular knowledge or experience.
Strong resident involvement and the skills and resources they have developed through managing the estate since 2003 are behind their progress and plans.

EeB

The work on the tower blocks has included installing double glazed windows and cavity insulation, upgrading lighting, replacing front doors and frames, and insulating and reroofing the blocks. They are also looking at card meters and fuel poverty issues. Solar panels will be a priority once the new roofs are installed.

Funding

Local Authority funding for this project.
Efficient management of its council funding has produced a surplus to spend on environmental projects. Initiatives include improving recycling facilities, growing fruit and vegetables on the estate, a furniture recycling scheme, and tracking carbon emissions. The bursary would allow PETRA to move forward with further proposals for green roofs, composting schemes, beekeeping and further food growing projects on the estate.

2.3.4 Edward Woods Estate, London, United Kingdom

Edward Woods is a large estate in the Shepherd's Bush Green ward in the north of the London Borough of Hammersmith and Fulham. The estate contains three high-rise blocks, where a landmark regeneration scheme has been underway since 2009. The scheme has multiple regeneration objectives, the major one of which is to improve the energy efficiency of the buildings.

Development

The study, High Rise Hope (Bates, Lane and Power, 2012), highlighted that effective resident engagement was important to encourage support for the project. The potential of the works to deliver both energy and financial savings is substantial, but will only be realised through resident participation and energy behaviour change over time.
The council's project objectives at the outset were to:

- transform the visual impact of Edward Woods at both estate and wider neighbourhood scale;
- address the problems of unsatisfactory stock conditions and an unattractive environment caused by deficient design and historic underinvestment;
- deliver reductions in energy consumption and costs, and hence CO_2 emissions;
- create a flagship renewable energy project within the Borough by providing solar cells to generate electricity.

EeB

Energy efficiency and acoustics in the blocks were improved through exterior wall and roof insulation and double-glazed windows in communal areas. Cladding the blocks also improved their physical appearance. Photovoltaic solar panels were fitted on the south sides of the blocks to power lifts and communal area lighting, and new central heating systems were installed in studio flats, replacing inefficient and expensive storage heating.

Funding

The £16.13 million regeneration project is being led by the London Borough of Hammersmith and Fulham, who commissioned EcD Architects and the building contractors, Breyer. Rockwool are the insulation provider.

2.3.5 Myhrerenga Borettslag, Oslo, Norway

Seven separate apartment buildings located in Oslo were renovated between 2009 and 2011. The Myhrerenga housing cooperative consists in 7 similar blocks located 15 km North-East of Oslo, in Skedsmokorset, owned by the USBL Cooperative Building and Housing Association. The buildings were erected between 1968 and 1970 and consist of 24 apartments in each block, divided in 3 floors and a basement. There are 6 one-bedroom flats of 54 m^2 each situated at the ends of each building, and 18 68 m^2 two-bedrooms flats situated in the central part of each building. Whole complex consists of 168 dwelling units. The buildings needed to be renovated because of the poor condition of the materials in the facades, the little insulation in the floors, and the poor air quality in the apartments. As a result, the measured yearly energy use of each building was on average 290 kWh/m^2.

Development process

The residential community of Myhrerenga contacted initially the architectural firm Arkitektskap in order to initiate a process of rehabilitation of the buildings' facades in 2007. Following this Norwegian Husbanken in collaboration with SINTEF Byggforsk considered this a good opportunity for applying a massive upgrade of the buildings to Passive House standards. The project took place between 2009 and 2011. The project was listed in the EKSBO project, which is a 4-year research project funded by the Norwegian Research Council, aimed at increasing the energy efficiency and use of renewable energy in the existing Norwegian housing stock. The EKSBO project is affiliated with the Task 37 of the Solar Heating and Cooling program within the International Energy Agency. The Task 37 focuses on advanced housing renovation projects.

EeB measures

The renovation project is based on super-insulating the existing building envelope, reducing the thermal bridges, installing new, better windows, installing a high efficiency ventilation system with heat recovery, making use of the existing hydronic heating system (radiators) for connecting a new heat pump, and

installing on the roof a solar system to be connected with the heat pump. In terms of insulating the envelope and reducing the thermal bridges the adopted measures are:

- Blown-in insulation in the existing roof construction (up to 500 mm thickness)
- Addition of an external 200-mm thick mineral wool layer to the existing facades
- Addition of 100 mm insulation layer to the basement ceiling
- Replacement of the existing windows with triple-glazed windows with argon insulation and lo-energy glass
- Removal of the existing concrete balconies and placement of steel-frame and glass balconies, which are detached from the building load bearing structure

In term of installation of the new heating and ventilation systems, the adopted measures are:

- Installation of a centralized ventilation system with a 83% efficiency heating recovery system
- Substitution of the existing oil boilers with 3 air-to-water heat pumps 25 kW each.
- Installation of 44 vacuum solar collectors connected to the heat pumps.

The yearly energy use is calculated to be reduced from 290 to 80 kWh/m^2.

Funding

The total costs were estimated to be approximately EUR 9.4 million, which are equal to 850 EUR/m^2. When comparing the estimated cost of the proposed upgrade to a standard renovation the additional cost results to be less than 250 EUR/m^2. The Norwegian energy agency ENOVA granted a funding of approximately EUR 800.000, which reduces the additional cost to 160 EUR/m^2. This extra cost is calculated to be covered by the lower cost for the energy use, which results to be 10% lower than that of for a conventional façade renovation. The funding for the renovation was provided by the USBL Cooperative Building and Housing Association.

2.3.6 Volmarijnstraat, Rotterdam, the Netherlands

Initiative for renovating the row-houses in the Volmarijnstraat in Rotterdam was coming from the inhabitants themselves, that disagreed with the municipal plan to demolish the houses for reasons of bad foundation work. The existing inhabitants wanted to prevent the loss of social structure of the street, and decided to start up the association of inhabitants called Marinus (2000).

Houses have been stripped to the bare structure of separating walls, floors and roof. These shells were offered for sale back to the inhabitants. Inhabitants were allowed to customize their houses completely. During the retrofitting process, the inhabitants and association were supported by the housing association Woonbron / Maasoevers. In the end, 17 houses were realised and delivered in 2007.

Development process:

Taking all the development phases into consideration, the first sign of the association of inhabitants to opt for renovation up to the delivery of 17 houses, has taken about 7 years. Some delay was caused due

to the resistance of some inhabitants to move out, some other by the reluctance of the commercial housing association Woonbron/ Maasoever to provide sufficient support in the process, technically, organisationally and legally. Often the association of inhabitants and the municipality had to find out something themselves and/or pursue the housing association to do something.

EeB measures

Technical improvements included all of the main structure (foundation, separation walls, roofs, floors and facades. The collective renovation part was considered to improve the main structure and infrastructure (pipes, fitting etc.). Besides, the individual home owners were allowed to customize the whole house according to their wishes (that part of the renovation was based on the individual self-organisation ideology). In the end, the project has not been designed with the purpose of energy efficiency at all. Main purpose was to remain the characteristic old houses, the social structure of the people living there.

Funding

The commercial housing association Woonbron/ Maasoever helped the association of inhabitants with process support and financial back up (demand from the municipality in order to cooperate with the renovation plan of the inhabitants). In return the housing association was allowed to provide expertise and feedback in the design and technical description stage of the development process. In reality, the association of inhabitants was so well organised and professionally managed that the buildings, the design, the contractor and finances were all arranged in time and to the satisfaction of all, so that the commercial housing association had much less to do than anticipated.

One minor conflict in the process was the persistence of some renters to cooperate, and refused to move out. In the end, the commercial housing association has been forced to provide for alternative living space to continue the project.

Houses initially were owned by the municipality of Rotterdam, who presented the plan for demolition. Probably the property value of the houses were considered non at that time. After approval of the inhabitants plan to renovate the houses, cost were covered by the inhabitants through regular commercial mortgage and loans structures. Costs for renovation of the collective part (foundation, walls, roof and flooring) came back through selling the shells of the buildings per m^2 back to the inhabitants. Individual customization of the houses were paid by the individual inhabitants obviously.

2.3.7 Wilhelmina Warehouse, Amsterdam, the Netherlands

Squatters occupying this old warehouse building for a long time already. This group started an association with the objective to keep the building for its unique value to its environment. The municipality of Amsterdam, owning the property, approves the plan to keep the building, with the argumentation that is would be important to support the local creative and start-up economy.

In the end, the association of occupiers, inhabitants and end-users organise the funding and approval of the renovation plans of the whole old warehouse. It foresees in many creative work and living units for upcoming artists and other creative professions.

Development process:

Since 1988, the warehouse Wilhelmina is occupied by a group of squatting creative professionals and artists. As from 1997, the municipality of Amsterdam decided to keep the building and its occupancy for the use of start-ups in the creative industry and art. A project task group, chaired by the alderman of Amsterdam, was started with the objective to provide cheap working spaces for artists and creative professionals in the city of Amsterdam.

The initiative was supported by the occupants and an association of end-users was established to lead the further developments. It was this association in the end who organised the planning, arranged for the approval of building permissions, the funding, the contractor etc. The single requirement the municipality demanded, was the process to be supported by a professional partner, De Regie (www.deregie.nl) in this case.

In 2003 the project was delivered and over 80 work units were available for the creative industry in Amsterdam.

Result of successful renovation and restoration of the old warehouse, is its value for the cultural scene of this area. Next to housing, also different functions can be thought of by renovation of cultural buildings.

EeB Measures

Renovation of the building was focused mainly on the main structure elements like walls, floors and facades. Further interior work and finishing was done by the inhabitants themselves. The municipality provided the building in a leasehold construction to the end-users.

There was no specific energy efficiency objective in this project. The fact that the renovation work in a way brought the building performance up to the contemporary levels, is considered to be an substantial improvement in the end.

Funding:

The building and the site were owned by the municipality of Amsterdam. In the end, the association of end-users were offered the leasehold on the building and the site. Renovation activities were financed through the association too. The operation and maintenance of the building is in hands of the association of end-users still, that is also organising and facilitating the rent out of workspaces.

3. Observations from other WPs

In the introduction of this report, the structure of the Proficient work packages is explained. The first six work packages deal with specific research topics:

- CSO process models (WP1)
- SME network business models (WP2)
- End-user's demand and requirements (WP3)
- Business cases for technology solutions (WP4)
- Financial, regulatory and assessment tools (WP5)
- E-marketplace and BIM (WP6)

WP7 is coordinating the case-based demonstration activities. This means that the results of the research conducted at the different WPs will be validated through the demonstration case studies if possible. It does not, however, mean that WP7 conducts research into the specific topics of the individual WPs. This is done by the WPs themselves.

The individual WPs conduct in-depth research into well-defined topics, such as process models (WP1) or technology solutions (WP4). For the purpose of this report, the individual WPs have been asked to give a short summary of their findings over the past 18 months – from the start of Proficient until the deadline of this report. The summaries listed in the following paragraphs are written by the respective WPs and collected here to give an overview of the work being done and the preliminary results achieved. The results described in this chapter were developed parallel to the work being done in WP7. They therefore do not refer to the case studies listed in this report, but rather to their own work and/or findings.

3.1 WP1: Process models

The process models definition for CSO district retrofitting is mainly aimed to define an overall roadmap describing all the lifecycle phases of the process, the stakeholders and their role according to the specific local policies and market context.

The research conducted so far in the field of process models has tried to figure-out, at a general level, which phases or steps, according with the participatory design and concurrent design procedures, could mainly influence the pathway and/or the outcomes of the process itself, as basis for an effective new model covering action plan and take-up strategies to be followed for CSO energy efficient district retrofitting interventions.

One crucial point to be focused on is that the meaning of CSO assumes different meanings depending on the referred context. For examples, in Western countries and Scandinavia it means a strongly community driven project. Consequently, this changing meaning influence differently the overall process. Furthermore, in terms of retrofit intervention, a potential offered stands, for example, in changing a condominium in a CSO.

After the first year of the research, the CSO case studies analysed so far, demonstrate that each CSO intervention, being collective and self-organized and so that characterized by a strong participation of the

client/end-user, must be intended as a distinguish one, according to the community vision and aims, the geographical, social, political and environmental context. Pursuant to that, it is also important to underline that in a retrofit process the influence of tenants may assume a relevant role.
Anyway, any processes follow a pathway which, in addition to the variability due to the "case by case", defines the constants of the system.
These constants are represented by the phases of the process, here following listed:

- Community reorganization
- Development
- Design
- Implementation
- Operation/Maintenance

The main difference between new construction development and retrofit intervention is that the second one doesn't require the community forming step, assuming that the group is already existing and they must only define a common vision and reorganize themselves in a legal subject.
A second different aspect consists on the lack of the site selection and acquisition steps, considering the existing owned building as the object of intervention.

The diagram below illustrates the process flowchart as agreed on by the Proficient Consortium.

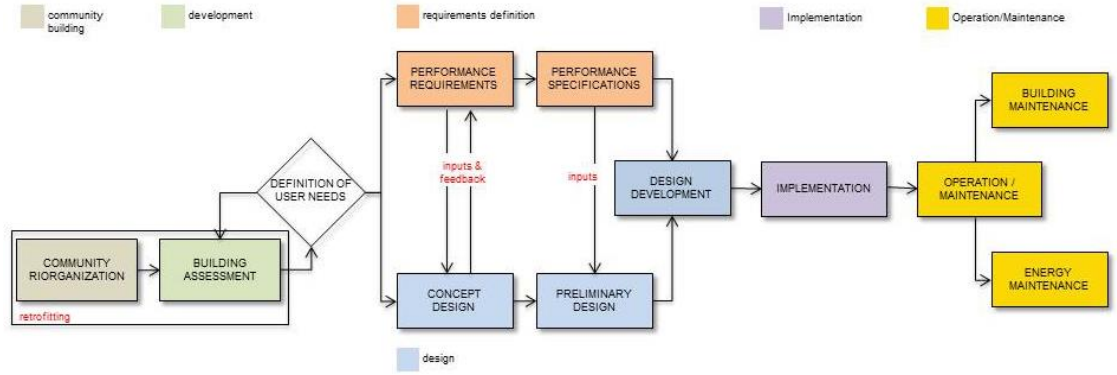

Figure 1. Illustration of the CSO process flowchart

As previously stated, this kind of processes generally starts from a group of inhabitants organizing themselves into a community to conduct together a retrofit intervention on their own property with the common objective of improving their own settlement. So, differently from the new district development, it can be mainly considered a bottom-up kind process. This assumption doesn't mean that a third subject would not have an active role in promoting and starting the process. In the Proficient aim, this role can be held by a SME or a Municipality, according with the opportunities this kind of interventions can provide. For example, a SME – e.g. an ESCO - can look at CSO developments as a new business opportunity, while a Municipality as an opportunity of urban renovation.

Furthermore, the cases analysed so far highlighted that CSO projects are characterized by a non-linear process, in which the phases overlap and are possibly iterative. Due to its non-linear nature, the crucial aspect of this kind of processes is *how much* each phase interferes with the others and how.
Indeed, within the CSO process case studied, the design phase acquires a key-role as it is the phase through which the community realize its purposes, starting at a very early stage and relating to all the other phases.
In fact, the other phases affect the design phase producing exchanges of information through an input and feedback mechanism - e.g. the vision of the community or the land constraints. These information exchanges can be classified according to the level of design affection, as procedural level - e.g. target of end-users, participation rules; economic level - e.g. end-users income or economic targets; functional level - e.g. target of end-users, environmental targets and requirements in general; and will be therefore used as basis for the design activities.

3.2 WP2: SME network business models

The role of CSOs in retrofitting projects

CSOs role in the retrofitting projects are much more diverse and harder to nail than in the case of new constructions. As a result of the fact that it is a significantly larger market – potentially all types of mostly owner occupied multi-unit buildings belong – it becomes harder to find the focus of CSO retrofitting and differentiate them from other “normal retrofitting”. From a business point of view however, this means relatively big opportunities, but makes the creation of useful and specific business models more complicated. The wide variety of retrofitting cases is demonstrated by the case studies, that include not only projects themselves (some of them are CSOs some of them are not) but also support schemes or the description of some specific actors.

District level interventions

One way to find a focus in CSO retrofitting projects is through the introduction of the “district level” element. From a business opportunity point of view this would allow for a relatively cost effective intervention bringing in added values – like a local hydro plant or geothermal heating for a neighbourhood – that are not only energy efficient but can only be realized on a larger scale. On the other hand organisation of CSOs on district level seems to be a very complicated task which limits the market opportunity of such solutions. The cases used by Proficient do not fulfil the requirements of the district level intervention in a strict sense, however several of them work in a more expanded physical area. In case of the Raab-Sol project, the retrofitting project carried out in the city of Győr e.g. the 63 potentially effected buildings all belong to the same housing association. More cooperation among them could improve the quality and value of the energy efficient interventions.

Differentiated market for retrofitting

Another important question to ask from a business point of view is under what circumstances retrofitting projects in energy efficiency are worth to make. More precisely: is there an optimal period of cost

recovery that will make people interested in the investments? It seems that the situation is vastly different under different market conditions. Whereas in an upmarket era the time of return can be relatively long, with people expecting to make up for the costs not only by the acquired savings but also by the acquired additional value, in a downmarket era the possibility of value acquisition is very limited. Here shorter return periods and smaller scale retrofittings will pay off. However all the case studies contain technically complex retrofitting procedures including several measures at the same time (not step by step interventions) which may result in longer pay back period. Meanwhile it is a crucial question of the Proficient research whether the business model would like to concentrate on the mainstream market where short term payback period is more desirable and the interventions are of lower scale or – as the case studies show – would like to go for a more affluent market where technically complex rehabilitation is the major aim.
In order to make the interventions financially more favourable state and other subsidies are involved in all cases.

Role of networks

By presenting the E.nu case the possibly positive role of set up planning and implementation networks is characterised. (This can also be done by ESCO companies with the addition of a performance guarantee.) On the other hand it would be interesting to know by a more detailed analysis or analysis of less successful cases whether the already created networks can only be better choices or can lead to less competition and the lower level of quality and higher level of prices (like in more oligopoly or politically influenced markets).

Role of trust and creditworthiness

It is obvious from the cases that complex retrofitting projects can be implemented if certain actors with credibility towards the home owners are present: be it a cooperative management that already proved to be effective, a company that has good track records or an agency which is set up for providing intermediary services or funding.

Success and risk factors

The cases do not contain yet enough details to define the main success and failure factors in the retrofitting market but from a background information it seems to be clear that:

- The development of financial institutions is a key factor (as large scale long term loans can be found behind the complex projects)
- The political uncertainties heavily influence not only the project results but the possibility to start the projects (uncertainty of grant schemes, uncertainty of prices, uncertainty of the involvement of public actors)
- Financial and organisational incentives on local government or national level could be the main drivers of large scale retrofitting projects as financially and organisationally complicated projects where the pay off period is uncertain and several CSO members should decide on the project have very high transaction costs which must be broken by efficient incentives.

- Large scale retrofitting projects in general tend to follow more mainstream technical and organisational solutions than that of CSO new construction (mainly because of decreasing the high transaction costs).

3.3 WP3: End-user's demand

The common assumption in WP3 is that any initial set of end-users' demands can only be seen as a first in a series of interpretations of the end-users' / clients' needs. This assumption is based on the nature and complexity of problems and contexts faced in the CSO processes, as well as the expected inexperience of most end-users and for that matter of most SMEs involved in CSO process.
The 'openness' of end-user's demands necessarily causes (iterative) changes in time, which require additional (re)interpretations. These issues can only be properly addressed through dynamic briefing, both of the evolving perspectives and the evolving product-service solutions.
Therefore, it is very important to determine in how far performance requirements can be considered generic, and in how far project-bound, and additionally in which way they can best be reflected in procurements and contracts. In case of retrofit projects, it is expected that the number of iterations in meeting the end-users' demands would be less than in case of new-built projects (where the physical reference to the project is not present).

Reflecting on the description of retrofit demonstration and observation cases, following preliminary conclusions can be drawn.
It seems that the presence of a physical object in retrofitting projects makes it very difficult to speak about pro-active involvement of end-users. Because the focus naturally lies on the object, the building to be retrofitted, there is no natural match with existing end-users in terms of self-organised initiative.
Instead, in retrofitting projects the community is usually represented by another intermediate entity, which is often the true initiator of the project (even though the roles can be changed along the way, when and if the community is established and adopts the initiative).
In that sense, the solution proposals in retrofitting cases seems to precede definition of end-user demands. In other words, end-user's demands are generally assumed to be known – on base of which a set of solutions is presented to the end-users, almost as a means to get them involved.
This situation results in a paradox that the retrofitting cases look to be very suitable for CSO projects, while at the same time the (initial) lack of community spirit (as regarding new-built projects) poses the question as which initiatives can be looked upon as being truly the end-user Collective Self-Organised.
Looked from this perspective, e-Marketplace enabled approach for municipality or SME's initiated and CSO led processes seems to be a very promising direction; also from the point of view of possible procurement and contract solutions.

Therefore, even though an even bigger lack of information of suitable CSO retrofitting projects (compared to new-built) is identified, which makes the grounding of development of deliverables challenging, it shows that especially in retrofit market there is much room for improvement and a real

chance for SME's to provide a new service and process approach in dealing with CSO initiatives and respective end-users' demands.

3.4 WP4: Business cases for technology solutions

WP 4 focusses on the technological aspects of CSO housing. The target of the implemented technologies is mostly sustainability, which ecologically and economically means reduction of the use of natural resources like land, fossil energies, oil, gas, water etc. Sustainable building in the city begins with the utilization of urban land by not using new land in the surroundings or rural areas. As commonly known, urban sprawl means more traffic-load not only in the cities, but in the suburbs, as well. Other problems are social or financial with regard to a lack of urban variety and cultural offers and a lack of tax revenue. The high investments provided on the development of technical infrastructure that cities have to face when building in low density areas is well-known. In cities with a stagnating or even shrinking number of households new decentralized settlements lead directly to increase of costs and low energy-density. These are problems that many utility companies have understood and identified.

If there is the possibility for parties willing to buy and develop the land within the city, where they live and work, the result is a sustainable development of the city and a consolidation of civil engagement and identification with the city.

The idea of CSO-housing is not necessarily combined with innovative technologies like, for example low energy building, passive housing or zero-energy-building or even plus-energy building. But innovative ecological technologies with a high primary invest are often realized within a CSO housing project. The reason is that within a collective the building process can potentially be more self-determined and more cost-effective. Costs are shared in the collective and there is often a second motivation –be careful with the environment- that causes the willingness of owners to spend more money on a long or even never paying back investment. Another reason why cost-intensive technologies are often implemented is, that the members of a building collective are often persons with an excellent education and with an above-average income. The third reason may be that the collectives often consist of young families with children and their parents feel more responsible for sustainable solutions that have positive effects on the future and the next generation(s). Many of the German CSO-Projects are Passive houses or even better. In fact in Germany the passive house is almost the state-of-the-art caused by building law.

It can be shown on basis of many CSO housing projects -both retrofitting or new construction- that a sustainable main concept that requires higher invest in the building phase (e.g. for more insulation, use of solar or geothermal energy) in the end pays off through significantly lower running costs. If the business model is just based on short term payback periods there is of course the idea of creating the most profit while selling. In that case the Proficient idea of creating a more self-determined business model from the perspective of the users is focusing intensively on EeB solutions.

The difference between new districts that have to be developed for CSO housing projects and the retrofitting approach regarding energy demand concepts is driven by a different engineering process. While the new development has a main focus on best applicable efficient available technologies and their idealistic combination that can be sponsored by the design of the buildings and the district´s premises the retrofitting is more influenced by the still existing requirements and conditions of the area that has to be retrofitted. An expert driven analysis of the basics covering all aspects from urban building law to building law and technological state-of-the-art is needed to develop under these complex premises the best fitting solution. Regularly the retrofitting does not offer the grade of freeness of creation than the new district development.

Nevertheless the energy concept and consumption and the environmental-friendly concepts drive the CSO housing groups differing in their investment intensity and attitude. At the European level of the approach –at the moment the most projects are realized in Germany- there is a significant difference regarding the attitude towards green architecture combined with CSO housing. While the member states of the northern hemisphere have always been aware of energy driven necessities of buildings of any kind the Midwest countries are faced with more comfortable climate demands and the South member states have a much less demanding climate requirements. Of course these different conditions cause a specific attitude on regional and at least national level leading to the creation of special law and at least an awareness of all stakeholders including the end-user. In that case the motivation of a CSO housing group to look for innovative solutions in the field of EeB is different but always existing on a certain level.

3.5 WP5: Financial, regulatory and assessment tools

The objective of WP5 is to generate a set of supporting financial and regulatory instruments to encourage CSO housing process and to create a conducive business environment for SMEs.

So far WP5 has produced a review report on existing loans, incentives, subsidies for energy efficiency. The review will form the basis for the development of innovative financial instruments with positive impact on affordability (at the demand side) and competitiveness (at the supply side. Part of the review is a description of case studies in energy policy which examine the details of the measures applicable to residential dwellings (municipal housing, social housing and privately owned dwellings) within specific countries in order to further understand the effectiveness of specific policies relating directly to the residential housing stock.

The importance of energy efficiency in the residential sector for meeting The European Union's Europe 2020 Strategy for sustainable growth is clear. Nearly 40% of total energy consumption and 36% of greenhouse gas emissions are from buildings. The introduction of energy saving measures in both residential and non-residential buildings belong to the most cost-effective means of delivering on EU targets of 20% emission reductions. Only by the take-up of innovative technologies will the EU targets be met. Evidence has shown, however, that a range of barriers to the adoption of energy efficient measures

in the sector remain. Through an analysis of the literature, we have identified a number of categories of barriers to be overcome, namely physical, political, cultural, individual, economic and knowledge based.

A range of policies have been introduced across the EU-27 countries to address these barriers. We have used the concepts of hard and soft policies to distinguish between legislative and regulatory compulsion (push factors) and incentivising schemes (pull factors). Hard policies include Building Energy Codes for new builds and retrofits. Soft policies include public information, subsidies, grants and soft loans. We have identified that policy instruments need to address both the production domain (incorporating the design, production and installation of energy efficient technologies) and the user domain (incorporating the end-users and cultural framework of energy efficiency and new technology adoption). We have provided a range of case studies of particular countries to identify effective practice in both domains.

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We have found a range of policies to be particularly effective. Hard policy initiatives (legislation and regulation) have shown the greatest impact where these address the thermal envelope of the new and existing building stock. Soft policy initiatives (information, financial and fiscal) have been less effective, where these measures have not been adequately tailored to the existing socio-technical regimes. Soft measures directed at the production domain are overall more effective. Where direct financial instruments for retrofitting have been directed to householders this has been effective on the whole,

Financial instruments directed at improving the thermal envelope and space heating requirements of multi-household and apartment buildings have been particularly cost-effective, as they reduce overall consumption for a number of households. The effectiveness of these measures indicates that similar measures for community self-organised housing will be similarly positive.

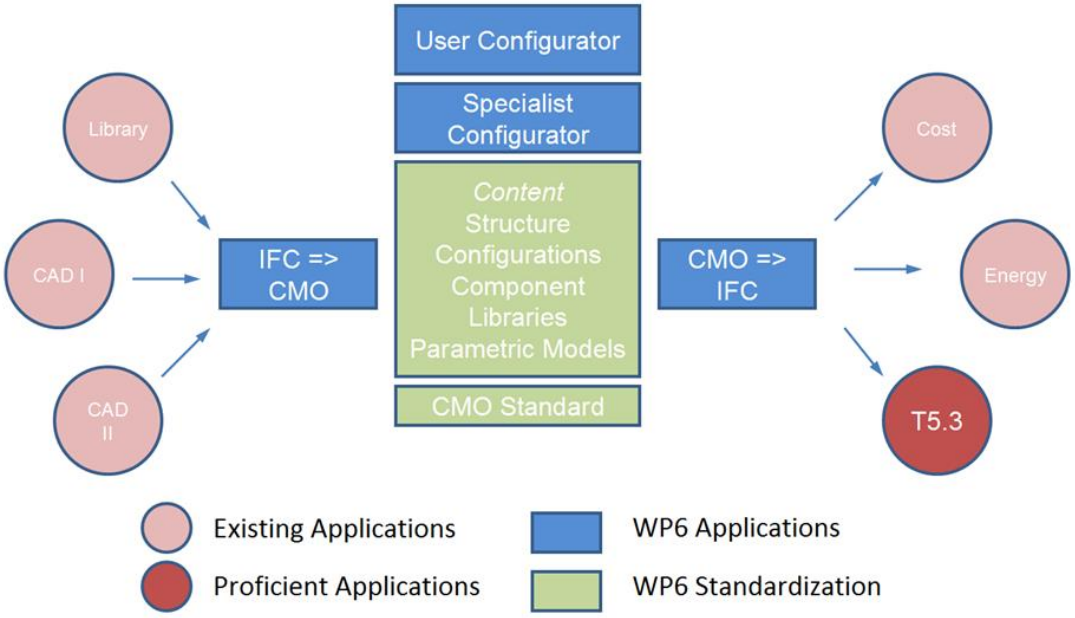
Please see for detailed information, references and sources the draft deliverable report: “D5.2: Review of existing loans, incentives, subsidies: An overview and critical analysis of relevant financial tools”.

3.6 WP6: CMO and e-Marketplace

CMO stands for Concept Modelling Ontology and is the main open standard used by the e-Marketplace to enable the parametric online configurator.

In the research so far we focussed on the requirements coming from other WP’s and the partners within Proficient. This resulted in requirements for what needs to be modelled, but also to be able to apply the technology in a very early stage of the overall CSO processes. Next to this for the e-Marketplace itself not only configuration of knowledge is important but also the coordination of knowledge. Knowledge and experience from other projects but also the techniques and state-of-the-art solutions to collaborate and communicate within a CSO between housing owners themselves as well as potential suppliers of knowledge and services.

CMO itself is based on Semantic Web and acts as a small layer with extra limitations for ontologies on top of the existing Semantic Web technology OWL from W3C. Next to the standard abilities to communicate/interact with OWL content (including any CMO ontology) we also conducted conversion from/to existing and well known open ICT standards in the Building and Construction sector. An inventorial of existing work on conversions is done, based on this most relevant work not yet available is put in a alpha development. This resulted in an alpha development of tools that enable converting IFC to and from CMO and the e-Marketplace. During the final development of the e-Marketplace these alpha developments will be improved to make real use of interaction with applications that import and/or export IFC as the most widely accepted and mature open standard.



4. Review of state-of-the-art of case studies

The purpose of studying CSO case studies from different countries is to determine what is being done and in what way. Each project is developed independently from the next, with different people, different locations, different budgets and different parties involved. By analysing the differences and commonalities between the different project, as well as determining the specific factors that attributed to the success, or failure if documented, valuable lessons can be learned that can be applied to new CSO projects.

This chapter gives information, albeit rather generic, about factors that were of influence on the success of a number of CSO case studies. If new projects are initiated, it may be wise to check if any of the success factors listed in this chapter are involved in the new project. If not, the viability of the project may need critical evaluation.

Table 1 lists in a condensed form the most important drivers behind the different case studies described.

Table 1: driving forces behind case studies

Project	Project drivers
Zelená úsporám, CZ	Home owners association contracted consultant
Raab-Sol, HU	Corporation collaborated with ESCO. Municipality financially involved, good communication with residents
Zagreb project, HU	Housing association contracted consultancy. Government and, municipality funding. Consultancy leading. Good communication with tenants.
Energy leap, NL	Government program
MMM, NL	Government, housing corporations, construction and installation sector and energy companies collaboration initiative
Kies-groen-licht, NL	SME initiative
E.nu, NL	SME initiative
ZEB, NO	Research centre for Zero Emission Buildings
Hook Norton, UK	Local community association to promote energy saving through competitive financial construction, backed by government funded revolving fund
Low Carbon Living Ladock , UK	Government program, community led initiative
PETRA, UK	Tenants initiative, local government funding
Edward Woods Estate, UK	Local government project, good communication with residents
Myhrerenga Borettslag, NO	Tenants initiative, housing association and government funded
Volmarijnstraat, NL	Tenants initiative, housing association provided process, technical and financial support/backing
Wilhelmina Warehouse, NL	Municipality initiative, supported by end-users association and professional process consultant

4.1 Project drivers

In each building project, there is a driving force that takes initiative and is essential to its development. When looking at the case studies listed in this report, it becomes clear that large scale retrofitting projects are seldom strictly end-user oriented/initiated. Most involve government funding at some level, be it local, national or even at European level. In addition, large scale retrofitting projects are often SME driven, meaning that an SME or consortium of SMEs developed a business model specifically aimed at retrofitting, either at individual end-user or at large scale. The only cases in which large scale retrofitting of individual homes is initiated by the end-users themselves, is when they are united in a home-owners association, which takes initiative in name of all the owners, and invites one or more SMEs to make a proposal to improve the buildings.

As a general guideline, the chances of a successful project increase with the quality of communication between the end-users and the executing parties.

4.1.1 Government initiated projects

Government programs come in various shapes and sizes, ranging from agreements and subsidy programs on a European level to national and municipal programs focussing on energy conservation.

Although all programs aim to reduce the energy consumption of the building stock, the approach they take varies. From the case studies described in this report, the following funding schemes can be distinguished:

- Subsidy to reduce cost for technical measures. Usually, the subsidy covers part of the cost.
- Programs to increase innovation and knowledge of EeB in the building industry
- Programs to stimulate the development of new market concepts aimed at building owners
- Creation of a revolving fund to provide cheap loans for EeB projects

Reduce cost

Programs to reduce the cost of EeB measures are used to increase the likelihood that such projects are initiated. For many people that are interested in improving the energy performance of their home, the upfront costs associated with the execution of such measures can be prohibiting.

The structure of subsidy programs can differ between projects and countries. For example, in the Zagreb case in Hungary, one third of the costs is paid for by the Hungarian government, one third is paid for by the municipality, while the remaining third is paid for by the housing association and an ESCO.

In another example, Myhrerenga Borettslag in Norway, the Norwegian energy agency funded part of the cost, while the housing association covered the rest of the costs.

Increase knowledge

The Dutch example Energy leap encourages innovation, primarily by supporting projects, financially or process-specific. The support is not so much for technical aspects, but more for the innovation process. By stimulating projects that go beyond the ‘standard’ level of renovation, knowledge creation and

experience in EeB is gained. In order to be eligible for subsidy, the gained knowledge and experience from a project becomes public and is shared nationwide.

Stimulate market concepts

The Dutch case More with Less is a joint initiative from the government, housing corporations, the construction and installation sectors and energy companies. Rather than subsidising individual projects or knowledge creation, the purpose of the program is to define and create market concepts tailored for various customer groups. This way, they help the building sector to create their own business and make it profitable for them to initiate EeB projects.

Revolving fund

Another possibility to stimulate EeB renovations, is by providing a comparatively cheap way to lend money to finance measures. The revenue from the loans is fed back into the fund, thus creating a rolling or revolving fund that is able to sustain itself once an initial amount is made available. The initial funds required to create such a revolving fund can be provided by the government. Examples can be found in the UK (see also the Hook Norton case) and more recently in The Netherlands (het energieakkoord).

4.1.2 SME initiated projects

Based on the case studies, instances where large scale retrofitting projects are initiated by SMEs, there are usually a number of SMEs involved that have formed a consortium and are able to handle the whole process together. Their offerings include process management, technical consultants, installation companies and contractors and sometimes even financial services. This way, they aim to provide one-stop solutions to anyone who would like to retrofit a building or home, effectively making it easier for them to start a project.

4.1.3 End-user initiated projects

Large scale retrofitting projects are difficult in case each individual dwelling has to give consent to the proposed measures. It is possible, but requires a lot of communication with the end-users and good process management, as demonstrated in the Raab-Sol and Zagreb cases.

In case the initiative for renovations come from the end-users, it is almost always in the form of a home-owners association, that speaks on behalf of all its members. The board of the association contacts the relevant SMEs (e.g. contractors, consultants) and acts as a spokesperson on behalf of the individual owners. Potential solutions and measures are discussed with home owners at meetings, before a final decisions are made.

4.2 Critical Review of CSO projects

This paragraph reflects on the key findings of the SEV study, based on the in depth analysis of over 50 case studies (SEV, 2010[1]), which includes a considerable amount on renovation cases too. TNO was partner in this study, and therefore has detailed knowledge about it. Most important factors being analysed here are the matter of costs (are CSO projects cheaper than ordinary housing projects?), process wise (are CSO project characterised by longer time planning, preparation and construction than ordinary housing projects), and third; are CSO projects characterised by a better quality, better architecture, better neighbourhood, is genuine the satisfaction of people living in CSO houses higher than in ordinary houses?

Based on an extensive survey, sent out to a representative number of end-users living in CSO and PSO projects in the Netherlands, including a considerable number of renovation cases, we refer here mainly on the conclusions relevant for the retrofitting cases:

- Many of the CSO housing retrofitting projects are initiated by the inhabitants themselves. Often as a response to certain suggestions by the local municipality or housing associations, the sitting inhabitants organise themselves and present alternative plans. Many of these retrofitting cases are concrete alternatives for demolition and new construction.
- Often inhabitants refer to the living quality of the direct surrounding environment, the social cohesion within the neighbourhood that makes them want to endeavour for remaining the houses, the structure and the inhabitants. To a lesser extent the people are really concerned with the building quality, or the energy efficiency of the premise.
- For Local municipalities and / or housing associations the organisation of the inhabitants, their effort in coming up with alternative plans, in some cases even their role as client and future owner of the project, is rather new, and relatively challenging to deal with from their authority point of view.
- Project costs of retrofitting are extremely difficult to compare. The fact that there are fewer projects to compare, and that each retrofitting project is unique in a certain way (at least in the North – West European countries, due to a lack of certain standardized housing typologies). This might be different from Central and Eastern European countries perspective.
- Even in those cases, the retrofitting projects have become the concrete alternative for demolition and new construction, there is no sounds evidence the retrofitting cases cost less than demolition and new construction.
- CSO housing projects take up a significant longer period of time for preparation, planning and construction, compared to ordinary housing projects. Extra time goes mainly to the coordination of planning and preparation of end-user demand, organisation of a legal entity to request for

[1] Zelfbouw in reflectie – Evaluatie SEV-experimenten (C)PO/MO, Universiteit Utrecht en TNO, 2010; SEV Zelf Bouwen in Nederland, 10 jaar experimenten, 2010

finances and building permissions. In the end, the construction time consumed by contractors is not much differently than traditional projects.

- Support of the inhabitants initiative is often a request from the local municipality or housing association for their cooperation. This support is offered by commercial project supporting offices in the Netherlands, or by the experience of housing associations themselves. The professional support is bridging the lack of profession in most groups formed by inhabitants towards the field of professionals the housing retrofitting is taking place.
- CSO projects realize a better relation between the community of end-users and their living environment, as well as a much stronger community sense within the community itself for obvious reasons. Stronger social cohesion is becoming an argument in itself to stimulate for CSO. For establishing a better social cohesion it is advised to dedicate certain projects to a particular target group, like seniors, families with children or people with a shared vision.
- Stimulation of CSO initiatives, particularly in existing urban regions is possible and necessary in order to create a larger share of CSO projects in the total housing production. Ways of doing so differ from discounting the available site locations, to beneficial lease hold constructions (like Wilhelmina Warehouse project in Amsterdam), up to the revision of existing zoning and urban planning, or less strict interpretation of the architecture directives.
- It is been identified that CSO projects and retrofitting cases have a great potential in realizing a quality boost, impact in existing neighbourhoods by revitalisation plans.
- Typical CSO housing retrofitting cases exist of two levels of intervention. First level is the collective organisation of project ownership, restoration of the basic lay-out, structural improvement to walls, floors and facades. Second level is the personal and individual adjustment or customization of the interior of the dwellings. The latter is basically a personal fill-in of the structural basis, according to individual demands and financial capacity.
- Furthermore the results so far with CSO projects in the Netherlands have led to signs that the real estate value of CSO projects increases faster in the first ten years after delivery than ordinary projects. This signal is supported by the observation that houses in existing CSO projects are less longer for sale.
- It is further identified that CSO and PSO projects can contribute in the demand for more sustainable housing in the Netherlands and the EU as a total. The ambition of many private end-users are (far) beyond the requirements from building codes and regulations.
- Design and construction processes differ significantly. Some project are supervised by only one architect and are realised by one contractor (main). Others are developed by different architects, and many contractors, often coordinated by an urban planner as supervisor. Intermediate solutions are also found, where a standard structure has been agreed upon, and each individual can adjust within and customize within borders.

Review of costs:

Retrofitting projects are rather difficult to compare, as projects are quite different from character and identity. In the best cases, the retrofitting of certain housing projects is a good alternative for demolition

and new construction of some sort. More challenging is to compare these options from the financial point of view, including the impact on the surrounding environment. Financially it is often efficient to demolish and rebuild something new, but this might have negative impact on the existing urban texture and social networks in the neighbourhood.
Considering some former projects in Central and Eastern Europe, the retrofitting option is alternative to no intervention. In most of these cases the intervention to renovate, make the houses more energy efficient is next to financially beneficial also generating an positive impact on the direct environment (exposure, architecture, and social allure).
Of great importance is to create a general overview of costs and benefits throughout the total project life time (TCO). Certain solutions to compensate for investments upfront might be considered like roof-top extension, or deep renovation of energy and or heat supply system (business model for future income).

Review of process time:

Against the long-time preparation of many new CSO housing projects compared to traditional new construction, the retrofitting projects are rather difficult again to compare with average retrofitting. One might conclude that the applied split in retrofitting construction typically seen in the Netherlands, results in a general repair and renovation of the main structure of the building, collectively commissioned is rather easy to control and sharp to plan. The second stage, the individual fill in of the building shell is offering complete tailoring interiors and finishing; which might lead to extensive construction times (new contracting partners, all individual projects). Some of these cases, the end-users also decide to take a certain share of the finishing work to do by themselves.
It is easily concluded that the more standardized refurbishment work is to be done, and the more collectively is decided upon, the faster a retrofitting project can be finished. But in the end this is not much different than new construction again.

Review of satisfaction:

Extensive surveying in the SEV study proved that the average satisfaction of end-users in CSO projects is significantly higher than traditional projects. This accounts both for new CSO housing projects, as for retrofitting cases. The fact residents live longer in CSO housing projects on average than in other projects, the real estate value increases faster than similar objects in the neighbourhood, properties for sale find a new owner faster than alternative properties, and the satisfaction with the social engaged neighbourhood is larger than elsewhere, makes a good impression for high end-user satisfaction.

5. Stakeholders' experiences

Considering the cases studied in the SEV analysis here once more, completed with additional outcomes of interviews with end-users, architects, and process managers; this section provides a first impression of what stakeholders experience in the run of CSO projects. In this research no differentiation is made between new construction or retrofitting type of projects.

For this reason we differentiate three main categories of stakeholders:

- (local) governmental authorities (municipality, banks, regional authorities etc.)
- Supply oriented business partners (architect, contractor, suppliers, process support, advisors, etc.)
- Collective Self-Organised Housing End-users, demand driven.

The next subsections will provide a general description of the stakeholder experiences (or the role they fulfil), categorised as mentioned above.

Governmental authorities:

Considering the traditional way of urban planning and city development, regional authorities and municipalities dictate top down the priorities, the main structure, the volumes, local zoning plans, what will be build, what it should look like and what target groups are supposed to live there (so called Programming).

Experiences with some of the retrofitting cases illustrates that the local municipality is still crucial when it comes to the success of a project, but in a different role. In the Volmarijnstraat project in Rotterdam (see also paragraph 2.3.6), it was the municipality at first, planning to demolish the houses, and build something new. But after resistance of the residents, the direction of planning was shifted up site down. The association of residents (after approving the process) decided and organised the way to retrofit the project.

Also other projects in Europe (e.g. The Zagreb project in paragraph 2.2.1 or Raab-Sol in paragraph 2.1.2) illustrate the new role of local municipalities and authorities: less pre-describing what and how to be built and renovated, but instead facilitating the initiatives coming from the grass rote level: from a collective of individuals, an architect or a consortium with an ESCO, offering a business plan to retrofit an existing housing project in a sustainable way.

Supply oriented business partners:

Architects, contractors, suppliers, technicians, consultants etc. all have a commercial perspective on their role in the process. They participating to make an earning, to sell.

Many of these businesses are not used to work for private people, and are most of the time oriented to a professional client, being a housing association or real estate developer. Architects are best equipped to manage the contact and wishes of end-users in CSO projects. For contractors, suppliers and consultants it is often more complex and requires more explanation compared to regular projects where one deals with professional stakeholders.
In a small number of cases the misinterpretation between end-users and contractor has led to conflicts: financial, organisation wise and/ or coordination wise. As end-users keep on changing their wishes up to the end of the project, and a contractor prefers to have things decided upon as early as possible, this is a great challenge.

For new organisations, for instance the process support businesses, the emergence of CSO and PSO projects opens up a new business opportunity for them. The process support for instance is a new role, an intermediate position between the non-professional end-users on the one side, and the professional organisations like contractor, municipality, architect or land owners on the other side.
These process supporting advisors see a new business opportunity in this market, and specialise in the guidance of these CSO projects from start to delivery. They seem to be able to speed up the process time, and prevent the large hurdles coming forth from the non-expertise side of the end-users. Many projects in the Netherlands, the local municipality or authorities demanded a professional project support, as pre-requirement for approval of CSO retrofitting project.

End-users

Most end-users have started the CSO housing process for several reasons, such as ideology, affordability, better living quality, social cohesion, environmental reasons etc. Almost all have had a unrealistically positive image of the process. Some people starting a CSO process, but quitted once it turned out the process took longer than expected, the location appointed or selected was not what they had expected , and/or the final cost estimates turned out to be higher than anticipated.
The study concluded based on surveys that most of the people are very satisfied with the result, and indicate to be more happy with the new house and environment than their previous one, indicating that people's effort in time and money pay off. In analysing the answers of end-users, the outcomes have not been corrected for what is called cognitive dissonance.
Objective argumentation can be found in the length people tend to live in the CSO and PSO projects, compared to ordinary housing projects. Answering the question if there is a willingness to move (after the project has been finished), the tendency for doing so in CSO and PSO projects is significantly lower than in ordinary projects.

6. Conclusions

Demonstration and observation projects in the category of retrofitting illustrate the great potential of this type of retrofitting intervention in the existing built environment. Especially if one compares the interventions with no intervention or demolishing and rebuilding type of projects. The energy performance of the buildings increase, one is able to remain the social network and cohesion in the neighbourhood, the architectural appearance of these projects improve significantly, and above all, the living quality for residents goes up in service level and comfort. A well organised intervention in an existing neighbourhood results often in a positive impact on its direct surrounding.

The overall EU picture teaches us, there are many differences in housing typologies, legal and organisation circumstances, conditions to take into account, and best practises proven to work in particular cases. Different business models and retrofitting methods have been applied throughout Europe, in order to improve the quality of the houses, improve energy efficiency, and let residents in with the organisation and planning for the future of their houses.

End-users might be supported better by providing good guidance materials, to inform them upfront of the process flow, some potential difficulties, and experience from other projects. It should be clear and realistic what to expect, in order to avoid disappointments along the process or at the end.
This is exactly where the role of supply oriented business partners comes in. With the right experience and cooperation, they can organise the best fit solutions for the end-users, mediating between the professional organised authorities on the one side, and the non-professional end-users in the end.