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Publishable Report**

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COllaboration for Housing Nearly Zero-Energy RENOVation

Publishable Report

- May 2016 -



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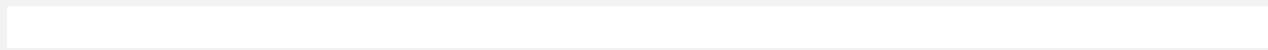
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Executive Summary

The building stock has a big importance in reaching Europe's climate goals. The Energy Performance of Buildings Directive therefore states the need for nearly zero-energy buildings. Nearly zero-energy buildings are a key aspect to reduce the energy use of the built environment. Since a large share of the building stock of 2050 currently already is present, focus should not only be on energy targets for newly built dwellings, but attention should also go to renovation of the current building stock. Renovation to nearly zero-energy buildings (NZEB) however is currently not standard and often deals with many barriers. These barriers currently impede the occurrence of a volume market for NZEB renovations.

The IEE-funded project Collaboration for Housing Nearly Zero-Energy Renovation (COHERENO) aims to assist in creating such volume market, specific for single-family owner-occupied houses. The five participating countries include Austria, Belgium, Germany, Norway and the Netherlands. The main objective of COHERENO is to strengthen the collaboration of enterprises in innovative business schemes to develop NZEB renovation in owner-occupied single-family homes.

The project shows how existing barriers to effective cooperation can be eliminated and better services for different customer segments can be developed. While technological solutions for NZEB renovation are available at a demonstration level, there is a lack of supply-chain collaboration models. Better communication and awareness of each other's activities is one of the central ideas in promoting better collaboration between different service providers. Therefore, during the early stages of the project, experienced market players in participating countries and their roles within the renovation chain were mapped.

Business Collaboration Events were organized in participating countries to counter supply-side market fragmentation and encourage collaboration. BCEs pave the way for the uptake of new business models and represent the starting point for a long-term NZEB renovation network beyond COHERENO. With participants of the BCEs expressing interest and other interested NZEB frontrunners real business models (also called collaboration structures and consortia) were developed, being the final output of COHERENO.

The 14th October 2015 COHERENO project partners presented results of analysis of collaboration structures and of workshops with actors of the planning and construction process about business modelling. The event focused on collaboration structures and a best-practise-example of every country was presented. You can see the whole final conference via YouTube-video:

https://www.youtube.com/watch?v=1tBW1pT4a34&list=PLPwg_sPwHEvizdY-4EiW9UKy6O_1HgaEf

See also the COHERENO website: www.cohereno.eu for all project outcomes.

1 NZEB definitions renovation

1.1 NZEB radars

According to the EPBD (Article 9), Member States should develop policies in order to encourage the renovation of buildings to NZEB levels. So far the NZEB requirements established by the European Commission only address directly new buildings to be constructed from 2020 onwards. No mandatory requirements have been introduced for NZEB renovations.

Each COHERENO country developed a set of criteria and so-called NZEB radar to identify the different types of renovation, including renovations close to NZEB levels and deep renovation of building components (e.g., walls, windows, roofs etc.) that can lead to an entire NZEB house renovation. Criteria were based on national market conditions in each country using existing instruments, such as Energy Performance Certificates (EPC), to track relevant projects in a practical and simple way. The toolbox of instruments was defined and detailed individually through intensive dialogue between project partners and national stakeholders; these stakeholders comprise National Advisory Boards in each country. The radar has a scale for NZEB renovations ranging from 1 to 4, with 1 being the best. Figure 1 shows the general concept of the NZEB radars.

Examples of NZEB single-family house renovations in the five partner countries have been used to identify experienced actors.

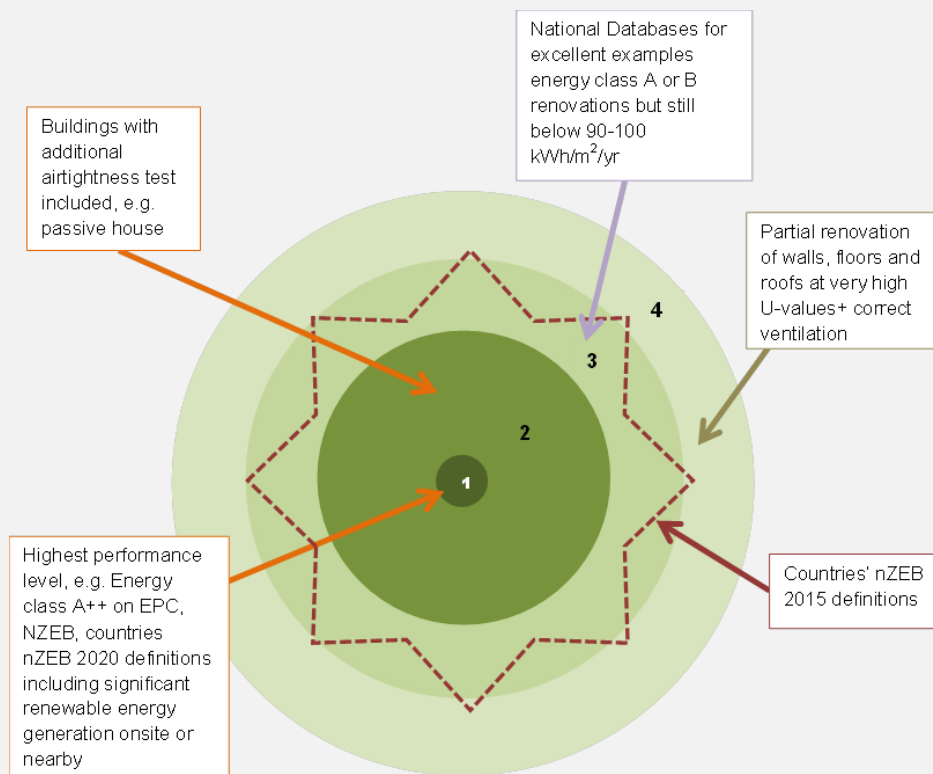


Figure 1: NZEB radars

1.2 Current status NZEB definition for existing buildings

In the factsheet ‘nearly Zero-Energy Buildings definitions across Europe’¹, BPIE summarises the current status (as of April 2015) of different approaches and indicators used by EU Member States (and Norway) for the NZEB definition of new and existing buildings. Criteria for NZEB renovation of buildings have been identified in 13 jurisdictions, but definitions have so far only been set in eight, as shown in **Table 1**.

Table 1: Countries with NZEB definition for existing buildings (Source: BPIE)

Country	Maximum primary energy [kWh/m ² y]		Definition compared to new buildings?
	Residential buildings	Non-residential buildings	
Austria	200	250 (from 2021)	Less strict
Brussels Capital Region	54	~ 108 ²	Less strict
Cyprus	100	125	As for new buildings
Czech Republic	75-80percent ³⁴	90percent ⁵	As for new buildings
Denmark	20	25	As for new buildings
France	80 ⁶	60percent PE ⁷	Less strict
Latvia	95	95	As for new buildings
Lithuania	Included in the calculation; building needs to comply with class A++	Included in the calculation; building needs to comply with class A++	As for new buildings

Of these jurisdictions, Austria, France, and Brussels Capital Region have set primary energy use requirements for renovation at a less strict limit compared to new buildings. Germany, Ireland and Slovenia envisage doing likewise, though the renovation definitions for these countries have not yet been set. Denmark and Lithuania have the same NZEB definition for new and existing buildings, as do Bulgaria, Cyprus, Italy and Latvia, where the NZEB definition for new buildings is also applied for deep renovations.

The EPBD neither prescribes a common approach to implement Nearly Zero-Energy Buildings nor describes the assessment categories in detail. Thus, member states have established different parameters, both in terms of quantity and quality, in their NZEB definitions. This makes the comparison of the different NZEB definitions – even when expressed in kWh/m²y – far from evident.

¹ http://bpie.eu/wp-content/uploads/2015/09/BPIE_factsheet_NZEB_definitions_across_Europe.pdf

² Depending on the reference building

³ Depending on the reference building

⁴ Maximum primary energy consumption defined as a percentage of the primary energy consumption (PE) of a reference building. In the Czech Republic, the non-renewable primary energy is considered instead of the primary energy

⁵ Idem as 3

⁶ Depending on the location

⁷ Depending on the reference building

2 Frontrunners in NZEB renovation

2.1 Actor listing COHERENO partner countries

There is a great deal of interest on information, networking and the development of business structures and routines for NZEB renovation in participating countries. The main reason that no stronger collaboration was developed until now is because the market for truly NZEB renovations is still a niche. This fact makes it even more important to have reliable networking structures and pragmatic tools for the identification of experienced actors.

The NZEB radar was used to select those experts with relevant project experience, depending on the national context. This process resulted in drafting regional actors' lists, with which homeowners can identify experienced service providers. A tool for recommendations or ratings by and for homeowners should be included as part of the listing. Recommended service providers could be identified as those whose recommendations outweigh their disapproval ratings. It should be as simple and pragmatic as possible for all involved parties. All identified actors should be listed in grouped categories: contractors, energy consultants, architects and others, e.g. quality assessment professionals.

Experience shows that country-specific actors' lists can provide suitable tools to increase collaboration of market actors for deep renovation. Lists enable people to identify relevant and experienced actors and simplify the initiative.

- Austria: the main listing is the klimaaktiv list, consisting of 476 actors who passed a postgraduate course on NZEB construction and renovation, as well as actors involved in at least one energy efficient building. As for the listing of projects, it was found that in Austria, most energy efficient renovations are done on bigger projects, but only a few single-family houses exist in a database.
- Belgium: the main listing is the existing BEN-voorlopers (NZEB-frontrunners) in Flanders, since it is a listing supported by the government. This list contains 714 actors of all types. It was noted that the list is not yet fully optimal since actors cannot yet be sorted by renovation. But this will change as part of the Renovatiepact activities, making the list endorsed by all parties who signed this Renovatiepact. Since a lot of professionals today are active in both new construction and renovation, the lack of differentiation on the site today is not seen as a major problem. Nevertheless, to bridge the time until the integration of the Renovatiepact into the BEN-voorlopers listing, the members of the NAB put forward different other listings that focus on qualitative actors for renovation. These lists also link the actors involved to renovation projects: www.ecobouwers.be with 31 projects and www.devlaamserenovatiedag.be/2016 with 75 projects.
- Germany: In Germany two important and very established actors lists for energy-efficient buildings and refurbishments exist: (1) database of Energy-Efficiency Experts for government subsidy programmes organised by dena (about 13.000 experts listed) and (2) dena database for Efficiency House Experts (about 7.600 experts). This database will be merged stepwise in the above database in a continuous process. The database of Energy-Efficiency Experts for government subsidy programmes is initiated by the Federal Ministry for Economic Affairs and Energy, the Federal Office of Economics and Export Control and the KfW. Energy consultants

who want to sign grant applications for government subsidy programmes have to be listed in the database. At the moment more than 13.000 experts are registered and the list is continuously growing and involved in a political process, e.g. National Energy Efficiency Action Plan. In the dena database for Efficiency House Experts a COHERENO-button has been integrated signifying nZEB renovation knowledge of the experts. This is a possibility for other experts (architects, energy advisors and craftsmen) to find potential experienced partners. Here the COHERENO-experts are public communicated. But not all within the COHERENO project identified persons are registered in this database. A few experts can only be found in the database of Energy Efficiency Experts for government subsidy programmes.

- The Netherlands: the main listing was during the project the COHERENO Networking platform, containing 86 actors, with 11 having published a reference project as an endorsement of their experience. TU Delft negotiated since the BCE's with the owners of the "Huis vol Energie" website and community, which resulted in collaboration. A new site was launched in 2016. The collaboration is very interesting, since the Huis vol Energie already contains a listing of 133 pilot renovation projects and 136 experts.
- Norway: the main listing is Enova's Energy efficiency advisor listing (Rådgiverregisteret), containing 274 professionals aimed at home-owners who passed a specialist passive house design course. The Norwegian project list is linked to the online list arkitektur.no. This list at the moment contains only 3 renovation projects of single-family houses (though it contains a lot of other interesting projects). The low number of projects is explained by the early stage of very energy efficient renovation in Norway. The projects that are listed are very ambitious (two renovations of buildings with historical architectural value and one towards passivehouse standard).

2.2 Recommendations country-specific actors' lists

COHERENO highly recommends establishing similar lists and mapping frontrunners in countries not involved in the project. The methodology to identify frontrunners can be used in an analogous manner in all countries due to its high flexibility. It is especially suitable if no other tools exist. The experience of actors is proven automatically when contacts are identified via completed projects.

Nevertheless, the experience of COHERENO showed that existing approaches can be included in the development of high quality listings. For cases where comprehensive lists of market actors already exist, making use of them is a better choice. Existing lists can be improved and adjusted for the specific needs of NZEB market actors. Another approach would be to extract relevant contacts and create additional lists where qualification for NZEB renovation would additionally be checked.

Based on the COHERENO experience the following 9 criteria should be considered when setting up a list of frontrunners in non-participating countries:

1. Check if an NZEB actors list can be generated from and/or included in an already existing infrastructure to avoid overlap.
2. Involve national associations and federations of contractors, consultants and representative homeowners to ensure their support.
3. Set up transparent criteria regarding who is accepted on the list.

4. Ensure that all listed actors meet the required criteria.
5. Highlight and promote the benefits of actors being on the list.
6. Ensure regular updates and maintenance of the list.
7. Include a tool for comments and recommendations by and for home-owners.
8. Make the list easy to access and understandable for each target group.
9. Provide all necessary information while ensuring data protection.

3 Barriers and Opportunities for Business Collaboration

3.1 Methodology Barriers and Opportunities

Questioned in COHERENO were the barriers and opportunities for enterprises to engage in collaborative business model development for NZEB owner-occupied single-family homes renovation. This main question was explored with three questions in the five partner countries:

1. What are new insights from (emerging) national developments and on-going initiatives on the emergence of collaboration for NZEB owner-occupied single-family homes renovation?
2. What are current experiences of supply-side frontrunners in the NZEB owner-occupied single-family homes renovation market in the partner countries?
3. What are the main problems and solutions to step into (collaboration for) the market of NZEB housing renovation in the partner countries?

To answer the first question, the COHERENO partners determined current national experiences and developments. The partners investigated national energy and innovation policy development in their country related to collaboration in the construction sector, particularly for NZEB owner-occupied single-family homes renovation. To answer the second question the COHERENO partners each interviewed supply-side frontrunners in their country, related to different NZEB owner-occupied single-family homes renovation projects. To answer the third question COHERENO partners organized a national workshop with frontrunners in their country. This workshop assembled selected individuals to discuss and comment on, from personal experience, the topic of NZEB owner-occupied single-family homes renovation. External presenters from the supply-side showed inspiring national examples about successful NZEB realizations and/or collaboration for realizing an NZEB owner-occupied single-family homes renovation.

3.2 Market potential for single-family homes NZEB renovation

The market potential for single-family homes NZEB renovation can be based upon national statistics and other available national data about the total number and types of single-family dwellings, construction years, single-family dwellings in need of deep renovation, energy performance certificates of these dwellings, investments in energy saving measures, etc.

The EU-funded project ENTRANZE provides some data about the EU-27 housing stock (<http://www.entranze.enerdata.eu/>). Figure 2 displays the share of owner-occupied houses in the EU-27 and Norway; Figure 3 shows the share of single-family houses in the EU-27 and Norway. Unfortunately a break-down by ownership combined with single-family houses is not possible. The targeted housing stock (single-family, owner-occupied houses) in the five countries is in total approximately 17,000,000 dwellings.

The current renovation rate in Europe is about 1percent. 85percent of the renovations is rated as ‘minor’, 10percent ‘moderate’, 5percent ‘deep’ energy renovations and the share of NZEB renovations is yet negligible (BPIE, 2011). With an annual renovation rate of 1percent, yearly 170,000 houses will be renovated at a moderate level. The calculated NZEB renovations will probably have some overlap with these basic numbers, but the impact of the renovations will be much higher.



Figure 2: Share of owner-occupied dwellings in EU-27+ Norway



Figure 3: Share of single-family dwelling in EU-27 + Norway



3.3 Barriers

The supply side for owner-occupied single-family homes renovation is suffering from a severe image problem of lack of knowledge, inefficient construction processes, insufficient quality assurance and absence of communication with other participants of the construction process and with homeowners. Home-owners further expect independent advice and tailored pricing. While collaboration between supply-side actors is seen as a part of the solution to increase competitiveness, many SMEs are still largely unfamiliar with collaboration. The research showed that as the complexity of integrated

renovation services increases, a shift in collaboration structures can be expected, likely towards quality assurance and performance contracting. Frontrunners have found opportunities to eliminate barriers for business collaboration in the NZEB owner-occupied single-family homes renovation market. These opportunities can be considered as ‘guidelines’ for actors who want to develop a way to collaborative business development for NZEB owner-occupied single-family homes renovation. Various frontrunners offer integrated quality solutions that are unburdening.

3.4 Opportunities

The various cases from the five countries are quite different and at this stage there are no clear indications that one collaboration structure might be more successful than another in the volume market of owner-occupied single-family homes NZEB renovation. It seems that different models may function satisfactory, but at this stage all of the presented cases are still at an early phase in their development. Apparently the market is just emerging, and the existing collaboration structures are not yet able to demonstrate “successful” long-term collaboration apart from their contribution to exemplary NZEB owner-occupied single-family homes renovation projects.

What is obvious from the research is that in all countries new collaboration structures for NZEB owner-occupied single-family homes renovation are indeed emerging and that various types of actors can collaborate. Several collaboration structures take on a perspective that integrates informing the client, consultancy, execution and/or follow-up. It can be questioned if the integration itself is a success factor, since more ‘traditional’ and loose collaborations also prevail in a market that is still a niche where engaged homeowners find dedicated contractors. Instead, transparency and effective collaboration - beyond product development towards process innovation, customer intimacy and market development - appear to be key success factors.

Stronger collaboration and trust-building is still needed between ‘traditional’ partners such as contractors, designers and consultants. Also, collaboration is recommended with new types of actors such as renovation advisors, project managers, ESCO’s, renovation stores, One Stop Shops, non-profit organisations and/or specific institutes. In each case, actors that address the NZEB owner-occupied single-family homes renovation market will benefit from good visibility in portals and supported listings. Collaboration structures still need to develop sound business models that propose scenarios for customer segments, explore partnerships, develop quality assurance and integrate alternative financing methods.

4 Creating customer confidence by quality assurance

4.1 *Quality assurance*

Quality assurance is an important aspect to create customer confidence. To investigate quality assurance in renovation practice, a proper definition on quality and quality assurance in this specific context is needed. Quality assurance mechanisms (QA mechanisms) comprise the entirety of instruments, tools, techniques, practices that are currently used or could be used by market actors to enable them to assure the delivery of quality within the context of energy saving renovations.

Market actors engaged in energy saving housing renovation (architects, energy experts, contractors,...) are considered to deliver quality when they:

- Display a consistent Modus Operandi (MO) or method of work when performing design, advice or on-site renovation activities;
- Allowing them to deliver upon completion of their work a predicted end result as promised in their offer to their respective clients;
- Within a given time frame and budgetary framework and in accordance with practical agreements as agreed upon with their clients.

To investigate the potential of quality assurance mechanisms and their possible impacts, understanding the current renovation practices is the key. Questioning home-owners in all COHERENO partner countries (Austria, Belgium, Germany, the Netherlands and Norway) revealed what drives home-owners to undertake a deep energy renovation. Not specific aspects showed to be of dominating importance, but a combination of factors drove the questioned home-owners to their decision. These factors include aspects on the building conditions, environmental issues, indoor comfort and health conditions as well as financial aspects. Since both environmental aspects and financial aspects are amongst the drivers to undergo renovation works, it is not surprising that most home-owners had specific energy saving targets in mind prior to the renovation works. These targets were met in most cases, even though sometimes only partially.

Besides home-owners, also supply side frontrunners were surveyed on the current renovation practice. The research revealed the aspects of the different stages of the renovation process where currently most problems occur. In general, the lack of independent energy advice is seen as the biggest problem during diagnosis phase. In design phase, there are mostly flaws in the concept or there is a lack of knowledge with the architect or advisor, hindering executing measures. Many problems were reported to occur during execution phase. Coordination and cooperation is reported most frequently to go less well during the renovation works across all 5 countries involved. Also on-site execution, on-site quality inspection and control of overall results often result in problems during the execution stage. Aspects that go less well during the hand-over and use are generally not as frequently mentioned as the aspects of the other phases. The major problem for hand-over can be identified in the lack of final quality controls after the hand-over and the delivery of instructions to home-owner. Concerning the use phase, the constant maintenance and replacement of building components is reported to have a certain importance.

4.2 Key elements for ensuring quality of energy saving renovations

Taking into account the list of common problems that occur during renovations, it shows that Quality Assurance in NZEB renovations requires attention throughout the entire renovation process, from the early stages until hand-over and further on during the use phase, from all involved parties. Because single-family house renovations often involve many actors, this requires good cooperation and coordination. Coming towards a collaborative and coordinated renovation process was thus listed a first key element for ensuring quality of energy saving renovations.

The second key element for ensuring quality is working towards the delivery of an aspired end result. Many of the listed problems that currently occur during renovation practice are related to a lack of clarity on the aspired end results, whereas surveys with home-owners that already renovated their house to NZEB standard showed this was important for them.

To address all listed problems, certain baseline requirements to be met are a third key element for successful renovations. Baseline requirements apply both on actors involved and products used.

Successful quality assured renovation practices and related QA mechanisms need to address all three key elements:

- Consistency in the method of works, leading to collaborative and coordinated renovation processes;
- The intention to ensure the delivery of the aspired end result;
- Baseline requirements for the actors involved, tools and techniques deployed and products used on site.

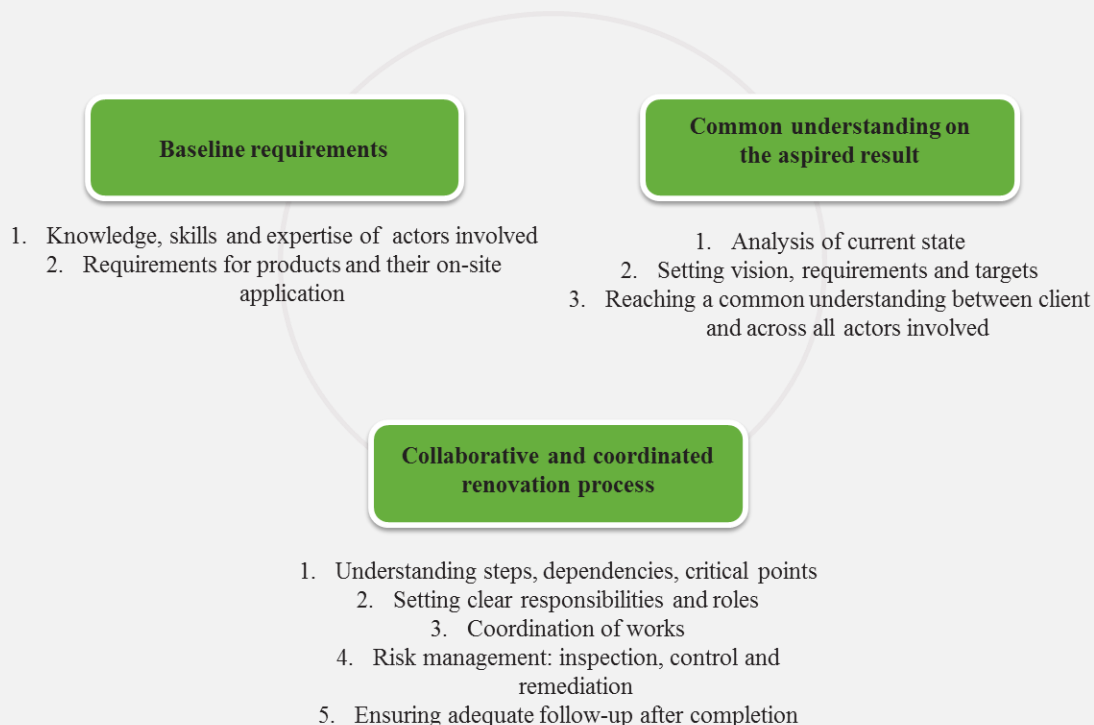


Figure 4: Key elements of successful quality assured renovation practices and related QA mechanisms

For all three key elements, tools and mechanisms contributing to this key element were listed. A distinction of these mechanisms was made on for who they create value and how confidence is created:

- A: valuable from the perspective of supply side actors
- B: valuable both to supply side actors and end clients, by a trust-based relationship
- C: valuable both to supply side actors and end clients, by third-party endorsement
- D: valuable both to supply side actors and end clients, by third-party control
- E: specific contractual forms imposing (energy) performance criteria

This distinction of QA tools is thus based on the quality of the tools, with D-level tools considered as the strongest and A-level tools as the weakest ones.

4.3 Current and possible future use of QA tools in COHERENO partner countries

The current use and the possible future use of the proposed tools were investigated with frontrunners from the supply-side. Results of these surveys showed great variations in the use of different tools among COHERENO partner countries. Also large variations between the tools were reported. However, in general, preference seemed not to go to the D-level tools. Awareness raising on the importance of strong quality assurance tools with supply side frontrunners thus remains important. Comparing the current use with the intention of possible future use resulted in the market potential and the potential for growth. Also here, large variations were noticed, but potential for growth seemed bigger for strong QA tools than for the weaker tools.

When presenting the suggested QA tools to home-owners, regarding the current use, it showed that mostly tools for products are used. For actors, home-owners often rely on recommendation by people they know. Besides the current use, also the potential to provide confidence with home-owners was investigated. Comparing the share of home-owners indicating that QA mechanisms could provide them confidence with their current use, shows there still is a large potential for facilitating parties (government, third parties) to help home-owners find the way to these instruments. As with frontrunners, also home-owners indicated no clear preference for stronger tools, showing the need for awareness rising is also present with home-owners.

The aspects on quality assurance investigated within the COHERENO project related closely to other aspects of the project. Quality assurance was a key aspect of all business collaboration events in the partner countries and was also further taken into account in the workshops with new business collaboration structures.

Thus, the COHERENO project and the new business collaboration structures resulting from it, can act as key point for the anchoring of quality assurance in NZEB renovations of single-family houses. This can help to increase customer confidence and to facilitate a volume market for NZEB renovations.



Figure 5: Example Hand-on recommendations (outside pages)

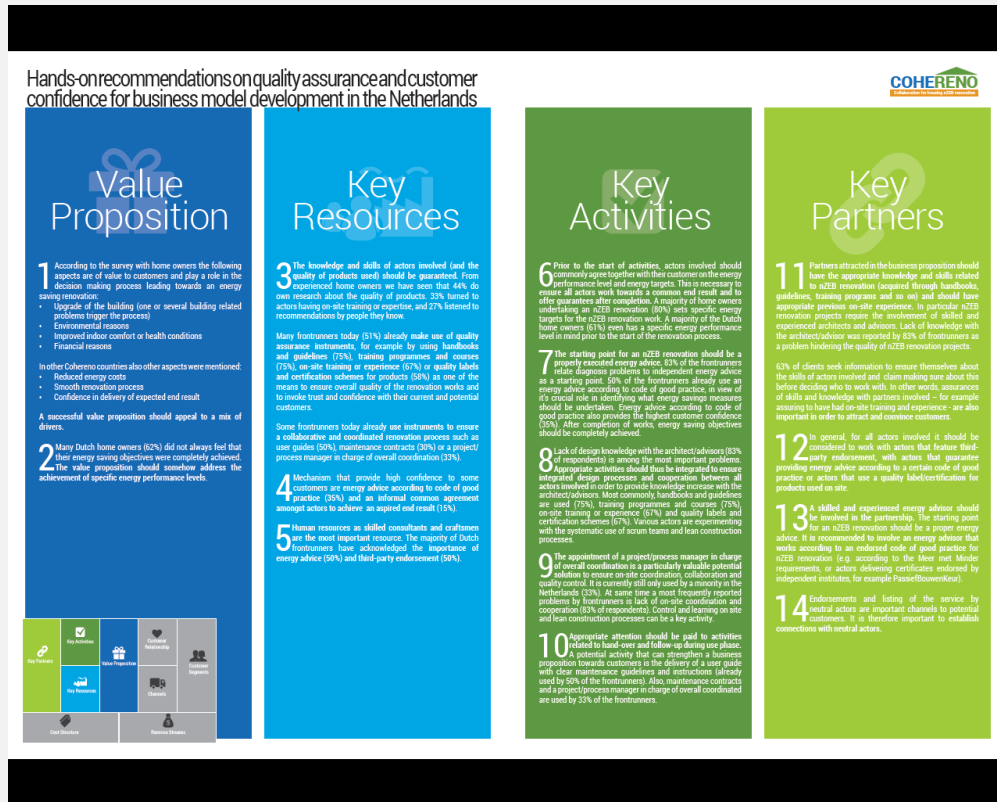


Figure 6: Example Hand-on recommendations (inside pages)

5 Business Collaboration Events

5.1 BCEs in COHERENO partner countries

In order to counter the fragmentation of market players on the supply-side and to encourage collaboration along the supply-chain, Business Collaboration Events have been implemented in the COHERENO partner countries. The events were intended to fulfil two main objectives: They should pave the way for the uptake of new business models and furthermore they should have the potential to be a starting point for a long term B2B networking initiative - even beyond the COHERENO project - that is dedicated to the widespread offer of integrated, collaborative services for NZEB housing renovation across Europe, increasing both the quantity and quality of single-family housing renovations.

Within the scope of COHERENO two regional business events were organised in each of the five participating countries as a starting point. In addition to strengthen the collaboration success factors and recommendations for increasing customer confidence were actively promoted and exchanged.

Generally, the participant's experience with NZEB renovation was quite high. The events specifically attracted experienced frontrunners, especially in Austria, Norway and The Netherlands. The 'most desired' collaboration partners stated by participants are contractors, followed by energy advisors. It can also be noted, that there is distinctive interest in collaboration with a quality assessment actor, which gives an indication of the importance of quality assurance in such projects. As a matter of fact assurance mechanisms are key instruments for increasing the competitiveness of businesses in energy renovation and offer a unique selling proposition. The customer-oriented focus of the Business Model Canvas (See Figure 7) was highly appreciated by participants.

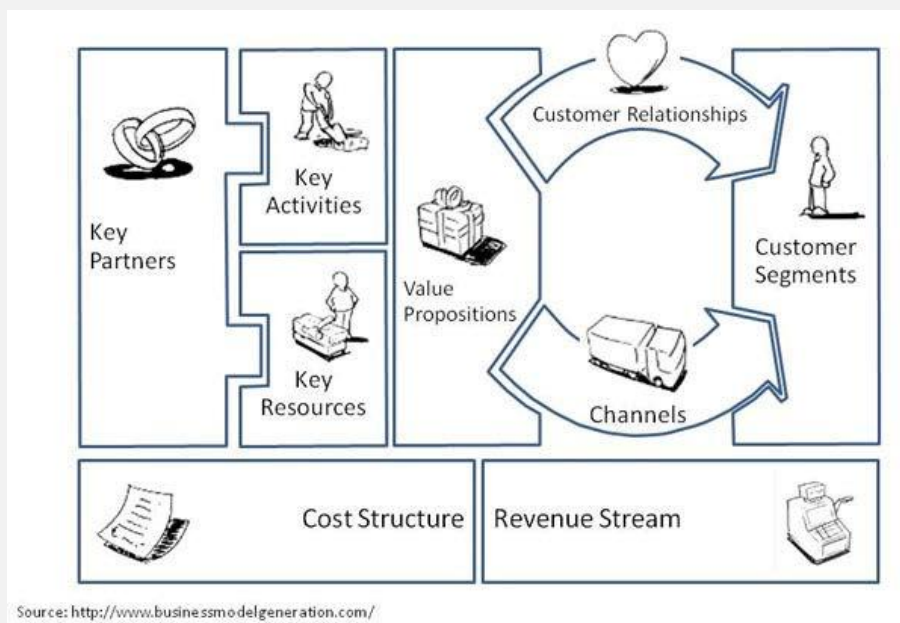


Figure 7 Business Model Canvas (Osterwalder and Pigneur, 2009 (1))

5.2 Recommendations when organising and performing a Business Collaboration Event

The chosen approach and the work carried out within the project offers both a methodological framework within which to undertake the preparation and organisation of Business Collaboration Events and a model to frame results and findings (Business Model Canvas).

The preparation of the events:

- requires a careful and early preparation, preferably supported by briefing documents and templates. Understanding the business modeling and the ability to adopt the method is central to the success;
- the selection of moderators is crucial for a successful event. On the one hand moderators should bring some knowledge about NZEB buildings and the construction sector, on the other hand they should be familiar in working with the Business Model Canvas;
- webinars can be a useful method to prepare moderators. A webinar offers to get in direct contact with moderators, it gives the opportunity to continue to reach them when the broadcast is over (recording), allows interaction by a dedicated ‘question and answers’ session and they save time, provided this is done in a common framework (standardised documents and agenda);
- it is crucial to have a short special training session some days before each event with the involved moderators.

The next step in a successful implementation of a Business Collaboration Event is a careful organisation of the event itself. The following recommendations can be therefore taken into consideration:

- the specific target group of contractors, consulting or informing actors, manufacturers and policy actors has been reached best by direct email invitations. Personal contacts within a broad network pay dividends. Furthermore it is important to have co-organizers with an additional network to the target groups. Organizers should make sure to involve experienced and less experienced actors as well;
- time and location of the venue are of essential criterion in order to attract the main target group. Contractors are not easy to attract, especially when they are intended to be frontrunners in their field of profession. The event should not be organised in busy periods, even Saturdays can be appropriate if the interest is shown. Although COHERENO BCEs were planned as half-day plus events, the target group was also willing to spend a full day. The location could be linked to a fair or other event closely related to the sector. This increases the participation rate;
- the use of a networking platform in connection with the registration of events was in case of the COHERENO project not practical to ensure a simple and collaborative approach. First, the different language in order to create a profile and to enter a personal profile caused some confusion and misunderstanding. Secondly, handling a series of events in one website also caused some confusion. The willingness to enter a profile has been reserved and/or has not been explained properly. Thirdly, registering on a website may create the impression that it is not

mandatory, i.e. can always be revoked. Personal contact which has been the main communication channel to attract participants supports this thesis;

- starting the business modelling at the events, one could involve real home-owners as well as introduce prepared renovation examples before the business modelling part, in order to support the first steps of business modelling and to work effectively on realistic role models.

The events could be seen as an appetizer for real business modelling at a further stage. The working groups at the events are very often not the groups to continue with the work. Typically, on one participant at the event a new group is formed based on his locally network.

Meeting the challenge to develop innovative, collaborative business models requires much more focus to find and select suitable partners willing to enter the customer segment of highly ambitious single-family home renovations. The ten Business Collaboration Events organised in the framework of COHERENO constitute the starting point for actor's collaboration and first experiences in working with the established method of the Business Model Canvas.

6 Business Models

6.1 Real business modelling

With participants of the BCEs expressing interest and other interested NZEB frontrunners real business models (also called collaboration structures and consortia) were developed, being the final output of COHERENO.

There is a strong variety of how the twenty-four business models are constituted in terms of companies participating. Some are dominated by contractors, others by advising actors and even some by initiatives by local authorities and regional authorities.

The participants feel that they have just started, and would like to get more assistance to implement their common business models. They are still in the introduction phase to an embryonic market. There remain some challenges both in terms of turning this into a mass market, and to increase the ambitions in each upgrading project towards NZEB level.

The consortia, often various SME's, that develop quality-assured NZEB renovation services for homeowners will be able to take a position as front-runners in an emerging market.

6.2 Methodology Business Modelling

First step - Preparation for collaboration - Status Analysis

First, a broad understanding is needed of the competitive arena in which the business model is to operate.

- The framework conditions are presented and discussed. The participants at the workshop add their comments. A general PEST form can be used as a checklist during the discussions. PEST analysis is a tool for defining the most important Political, Economic, Social and Technological issues that influence the environment and framework for the business;
- A presentation and discussions on relevant information on barriers and opportunities;
- A presentation and discussions on relevant information on Quality Assurance;
- The conclusions from each of these analysis/discussions are fed into a SWOT analysis, which summarises the internal Strengths and Weaknesses and external Opportunities and Threats. It forms the information foundation from which the business model shall be developed.

Second step – Business Modelling - Business model sketching

Start the work on the full scale business model using the Osterwalder & Pigneur “Business Model Canvas” (1), which consists of the following nine blocks: customer segment, value proposition, key activities, key partners, key resources, customer relationship, channels (communication, distribution and sales), cost structure, and revenue stream. These building blocks, which form the basis for a tool called “business model canvas”, are used to discuss a full-service or one-stop-shop concept for energy-efficient renovation.

Third step - Strategic focus and implementation - Strategies and action plan

Based on the SWOT analysis and the Business Model, the partnership between the actors contributing to a One Stop Shop must define their level of ambition through a vision statement. How to reach the vision

must be expressed first through their strategic choices. The main questions to answer are: 1) What is to be sold (what is unique about the product/service); 2) Who are the target groups? (It is recommended that the market-oriented people answer this first); and 3) How should it be sold?

In order to implement the strategies that have been developed, a specific action plan is needed which defines planned progress, responsibilities, and the necessary resources (financial and human).

6.3 Recommendations methodology

The methodology applied in this project is well documented, and it showed to function quite well in all countries. One common challenge was that two workshops to do this work were too strict. All countries did therefore not follow the guideline strictly. It became important to adapt the schedule to what was possible for the participating companies. We therefore recommend following the Guideline developed in the "OneStopShop Project" where it is described three workshops (2).

COHERENO partners feared that SME's would not have time to participate in two full days workshops. However, when SMEs see this fits into their strategy to target the upgrading market, they are more than happy to receive the assistance to develop adequate strategies together with partners.

The COHERENO partners have their core competence within sustainable construction, except from Segel, which is a consulting company. This company was responsible for the processes in Norway but Sintef assisted with its technical competence. This was proven as a good mix of competence for running good processes.

A critical factor in assisting groups especially when it comes to the business modelling can be determined in the moderator's objectiveness. When the process gets bogged down or currently leads into a dead end, moderators support groups to structure their ideas and to bring them back on track. However, there is a risk that with the ongoing process you find the same patterns and advice in several groups, which may influence the whole business model. A rotation of moderators can therefore be suggested in order to provide an unbiased and open-minded assistance.

The processes showed that some struggled with using the business model canvas as a tool for developing business for collaboration structures involving various companies. The canvas can be regarded from the perspective of the consortium serving the companies as clients, or as a model for the individual businesses serving home-owners. This duality sometimes leads to confusion. The important question in order to clarify this issue is to conclude whose business model is this. If the group agrees that one of the companies should be the one contact point and invoice the client, they must see it from this perspective, and see the other companies as "key partners". In the cases where this is not obvious, the perspective has to be seen as a consortium (as it would be for a corporate business).

6.4 Recommendations business modelling NZEB renovation market

The best way of recruiting companies for collaboration, is first to find one enthusiastic company that invites complementary companies that have already some experience in working together with.

Business models could be checked on the “The Five Disciplines For Creating What Customers Want” (Carlson & Wilmot, 2006 (3)), rewritten in the context of COHERENO:

1. Is there a holistic understanding of the customers' needs – which normally encompasses more than just energy efficiency?
 - All groups have defined customer needs and even some checked it on existing homeowners.
2. Do the "value propositions" fulfil the needs?
 - All groups have addressed the most important needs in defining their value propositions. However, as earlier discussed, there is room for further improvements (in particular for those who did not check it out towards homeowners).
3. Are there one or more enthusiastic persons who are committed to the process?
 - In each of the groups, there are several very committed persons.
4. How do you consider the team multi-disciplinary?
 - Many groups are multi-disciplinary, those not intend to have collaboration with missing disciplines as external partners. The question remains however, if all of the companies are committed enough to contribute actively in realizing the collaboration.
5. Is the project supported by the top management and in line with each of the companies' strategies?
 - Most companies (except from the largest companies) have involved top management and state that this is in line with their strategies.

For those planning to form new groups, the five points above must be on place if the collaboration shall be successful.

Based on the learnings from our processes in the COHERENO project, we made a "**checklist**" to be used during the process for creating or modifying business models for one-stop-shop for NZEB renovation of single-family houses:

- Clear idea of target groups
- A strong holistic perspective
- One contact point and sender of invoices
- Check ideas towards existing customers
- Make use of existing reputation (which should be strong in the local market)
- Good starting point is cooperation with companies you already know
- Make a strong commitment with each other within the group, for example by establishing a separate company together
- Using an open calculation model builds confidence and distributes risk in a fair way between the group and the customer
- Find new type of partners as for instance Web portals addressing this issue and look for cooperation with local municipalities
- Including hardware stores into the group opens a broader marketing channel
- Include assistance in how to achieve funding and financing of upgrading projects.

In order to learn from the weaknesses the following points have to be remembered:

- To establish a tight cooperation takes time, to build trust between the partners and find the "right" model for the group
- It is important to get the first pilot project ready short time after the business model development
- All partners in the group must put high priority on this development work
- All needs defined for the targeted customer segment should be well responded in the value proposition and the rest of the business model
- Quality assurance should have a strong focus during the whole process.

6.5 Focus on QA and NZEB renovations

Already at the first workshop with each group, the COHERENO facilitators made use of the outcome of the previous work in this project related to quality assurance in NZEB renovations. Consequently, all groups included elements of QA in their business models. As their ambition levels are towards NZEB level, we see that the targeted customer segments are families with higher incomes. This is necessary as such high ambitions are quite costly. We experienced also that many groups are pragmatic about the ambition level for each retrofitting project, in order to reach a wider market. The most important point for all groups is to get started with any project just to get the experience in working together. Through real projects, they can elaborate their QA procedures across the disciplines. Only two workshops is too little to reach to a complete and ideal collaboration structure.

Idealistically, NZEB upgrading should be so cost-efficient that it should be available for a broad market. However, any innovation (like a NZEB renovation) is first accepted by a minor part of the market. When local reference examples are visible, a growth can be expected. Therefore, we see the importance of continuation of these measures:

- Operationalise QA-procedures and –tools across the disciplines.
- Harvest from the experiences of operation from the collaboration groups developed as part of the COHERENO project. A follow-up program, which includes monitoring, should be set up.
- Develop methodologies for more cost-efficient retrofitting. Preferably, this includes the use of prefabricated solutions in order to reduce on site construction. This will also reduce the burden for the homeowners.

National authorities should make sure that adequate subventions programs support the embryonic development of this market. In this respect, it is important to identify how more of the best cases can be realised in the first stage, and secondly how these can rapidly be replicated. Measures both on the supply and demand side should be synchronized.

References

1. Business Model Generation, Osterwalder & Pigneur (2009)
2. Guidelines – How to develop a business model for One Stop Shop house renovation, Haavik & Aabrekk, et al. (2012); <http://www.one-stop-shop.org/sites/default/files/Guidelines-How-to-develop-a-business-model.pdf>
3. The Five Disciplines for Creating What Customers Want, Carlson, C.R. and, Wilmot, W.W. (2006)

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- nZEB criteria for typical single-family home renovations in various countries
- Executive summary "Mapping of frontrunners in nZEB renovation of single-family houses"
- Customer segments and value propositions in the nZEB single-family housing renovation market
- Barriers and opportunities for business collaboration in the nZEB single-family housing renovation market
- Executive summary "Barriers and opportunities for business collaboration in the nZEB single-family housing renovation market"
- Hands-on recommendations on Quality Assurance:
 - o Austria (in German and English)
 - o Belgium (in Dutch, French and English)
 - o Germany (in German and English)
 - o The Netherlands (in Dutch and English)
 - o Norway (in Norwegian and English)
- Report on creating customer confidence through quality assurance
- Evaluation report of the Business Collaboration Events, focusing on opportunities and barriers for strengthening collaboration including the evaluation questionnaires
- Report on business models for NZEB renovation of single- family houses including cross-country analysis