

# From demonstration projects to volume market

Based on preliminary experiences from IEA SHC Task 37

Authors:

Civ.Architect Are Rødsjø, Special advisor

The Norwegian State Housing Bank

[Are.rodso@husbanken.no](mailto:Are.rodso@husbanken.no)

[www.husbanken.no](http://www.husbanken.no) and [www.lavenergiboliger.no](http://www.lavenergiboliger.no)

MBA Trond Haavik, Director international operations

SEGEL AS

[Trond.haavik@segel.no](mailto:Trond.haavik@segel.no)

[www.segel.no](http://www.segel.no)

**Key words:** market transition, passivehouse, new construction, renovation

## 1 Introduction

The World Business Council for Sustainable Development – states in a report from 2008 that

- The challenge of reducing greenhouse gas emissions to combat climate change is even greater than projections had suggested because current emissions are even higher than the “business as usual” reference curve that is used as the basis for official projections.
- Buildings account for up to 40% of primary energy in most countries and consumption is rising.
- The buildings sector has a high level of electricity use and hence the total of direct and indirect emissions in this sector is much higher than direct emissions alone. (*Electricity used for heating could be replaced by bio energy or other renewable energy and instead be used to replace use of fossil fuels elsewhere, e.g. in the transport sector by use of electric cars. Bio-energy is also far more effective used for heating buildings than powering cars.*)
- The Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report estimates that by 2020 CO<sub>2</sub> emissions due to energy use in buildings can be reduced by 29% at no net cost.

The McKinsey Global Institute has published analysis, with a comprehensive cost curve for global greenhouse gas reduction measures which states that measures in the building stock are among the most profitable and that the measures needed to stabilize emissions at 450 ppm have a net cost near zero. Despite this, few companies have so far seen the huge potential in this opportunity. The building sector as a whole is however diverse, complex and rather conservative and is characterized by fragmentation and non integration. Several international and national reports has focused on the building sector through segmentation, analyses and scenarios, and have described how driving forces may be used to overcome barriers. Research has shown that there is a lot of awareness on the subject but a lack of involvement; the business is in many ways going on as usual, or worse. If we looked at the goal and the time frame and combined it with a traditional model of looking at market growth, could this bring some new perspectives and models for change in time?

This is the focus of this paper which is based on ongoing work in the IEA SHC Task 37 Advanced Housing renovation and earlier work in Task 28 Sustainable Solar Housing.

## 2 Three phases from demo projects to common praxis

### 2.1 Goal

The overall goal is to make the best sustainable solutions become common praxis as soon as possible.

### 2.2 Critical success factors

It is very important to understand that this is a dynamic process where involved actors, market segments, driving forces and barriers shifts as we move through different phases towards market penetration. As any other product or service, both **new construction and renovation** evolves according to the “Product Life Cycle Curve”<sup>1</sup>.

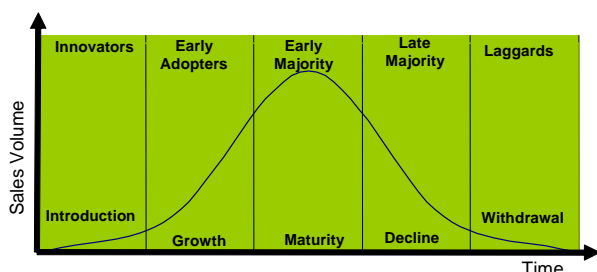


Fig. 1. Product Life cycle

The first step includes the introduction of the concept. In some countries as for instance Austria, the passive house (for new houses) is already in the growth phase. For retrofitting of existing dwellings, we are at the quite beginning of the introduction phase. This means that in most countries the first showcases are still at an early level. These examples will play an important role as demonstration for the projects to be realised in the growth phase.

For authorities and others who want to speed up the rate of sustainable renovation in the housing sector, it is important to understand the general dynamism of market evolvement for new innovations. The examples in the first phase play an important role for how fast the growing phase will develop.

In the next chapters we will discuss the three first phases of this process:

1. Introduction – Research and demo examples
2. Growth phase
3. Volume phase

<sup>1</sup> Rogers, E (2003), Diffusion of innovations, 5th edition Freepress, New York

When implemented, new solutions will last for 10-50 years. To meet the climate challenge it is crucial to speed up both the introduction phase, the growth phase and the maturity /volume phase. This process from demonstration to common praxis can be illustrated like in figure 2, where the red dotted circle represents a difficulty/resistance to reach the volume phase in time .

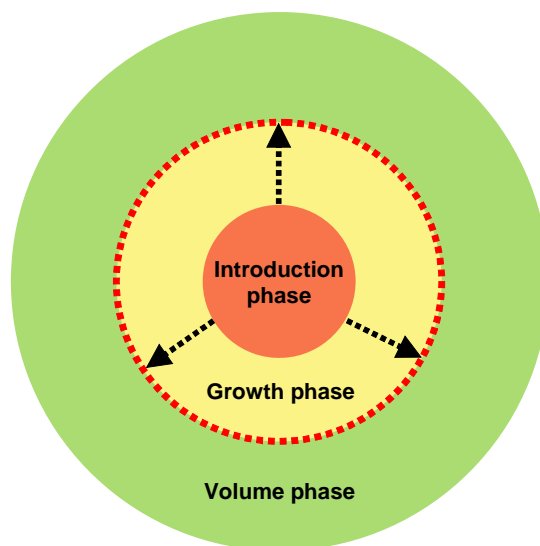


Fig. 2. The growth-wave challenging barriers

## 3 Introduction phase

### 3.1 Goal for this phase

The goal for this phase is to

- Develop and secure quality of new solutions
- Completion of successful, well documented and quality assured demonstration projects in all regional markets
- Prepare the transition to the growth phase through:
  - Develop product packages
  - Communicate results to professionals in the building sector and to consumer organisation etc

This phase may be divided in two sub-phases:

- Research phase
- Demonstration phase
- In the research phase, each country has to decide on goals and long term activities. The main headlines for a national introduction of low-energy

and passive house solutions should be made.

### 3.2 Critical success factors

- To select demonstration projects which are suitable as reference cases for a larger number of house types (new and existing).
- Established network joining key persons from innovative companies, research institutes and public authorities.
- National and local adoptions of best practice from other countries, so they may be recognised as “relevant” for the specific market.
- Trustworthy actors presenting and representing the demonstration projects.
- Involvement of house owner/occupant and the craftsmen during the working process in all phases
- The target groups are crucial to define also in the introduction phase. In many projects the architect is also the “customer” of his project, or the innovative companies are selling the houses or apartments which they initiate and build. The customer-side is important.

### 3.3 The most important actors

- Research institutes
- Innovative companies
- Public funding agencies

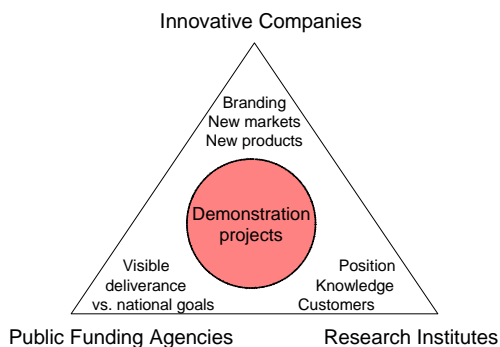


Fig. 2. Main actors in the introduction phase

This figure illustrates the interdependence between the three major actors in this early stage and which different interests meet in a win/win/win in the demo projects. In order to build the foundation for entering the growth phase, a good and coordinated cooperation between these key actors in the research and demonstration phase is a prerequisite.

#### 3.3.1 Public funding agencies

The public sector’ main motivation is to stimulate activities which may help the national authorities in achieving their obligations in the Kyoto protocol as well their national goals. The funding as such is of course a prerequisite for serious work in this phase. Some of these actors play also an important role as facilitator and driving force towards the other actors, in order to increase ambition level (on quality) and to realise demonstration projects. Funding should normally be used to reduce initial extraordinary costs for use of experts, quality securing, tests, analyses, reports, and dissemination of knowledge, not for reducing the price of products.

The public funding agencies are the governments extended arm into the market. By using this tool effectively, the government can point out both direction and speed of the development. It might also be important to mention that at times such as now, with a financial crisis effecting global markets, the governmental opportunity is even bigger.

#### 3.3.2 Research Institutes

The research institutes which are playing a crucial role within the development of new low energy houses and energy efficient retrofits cooperate on an international level. They are therefore an important key to combine international learning with national “realities”. The core competences within the institutes constitute of expertise in building physics, architecture, energy supply systems and climate science and they play a very important role as advisers in demonstration projects. To a less extent expertise within marketing and social science is represented in these research programs.

#### 3.3.3 Innovative companies

Innovative companies are often small and medium sized and often driven by the motivation of one or a few persons. We have to distinguish between two main groups of innovative companies:

- Architect and engineer companies
- Construction companies and building material suppliers

##### Architect and engineer companies

Their professional skills together with a strong enthusiasm for the subject of sustainability form the motivation for these actors.

In order to have a payback of their own development costs, they will actively try to re-use the knowledge gained from the first pilots. They are therefore an important driving force for multiplying the demonstration projects.

#### Construction companies and material suppliers

We have seen all sizes of companies involved in sustainable development projects. Some smaller involved in single family houses and bigger involved in multi family houses. The interesting point is that irrespective of the size they seem to have strategies to be innovative and focus on quality. Such companies see it as an interesting opportunity to be among the first to introduce the most sustainable solutions to the market. They expect that this will strengthen their image and increase sales and/or margins on longer term. In order to be trustworthy the companies are dependent on tight cooperation with research institutes for two main reasons; a) such institutes are recognized as objective, and b) they simply need access to international expertise in sustainable building solutions.

### **3.4 Main drivers in the research and demonstration phase**

- Governmental attitude and action.
- International research networks.
- Very interested journalists.
- Innovative companies.
- Tailor-made documentation/information for all playing actors in the market.

It is a big difference whether the authorities simply play the role as a funder through public calls, or they take an active role towards the main actors in this phase.

### **3.5 Main barriers in the research and demonstration phase**

- Lack of national communication plans.
- Limited of knowledge about state of the art.
- Few documented retrofit projects
- Too strong focus on cost savings relative to investment costs, instead on focusing on developing a complete package offering added value to the consumer.
- Lack of funding.
- As main focus is technical solutions, the documentations may often lack the users' perspective.

### **3.6 Differences between new construction and renovation**

Demonstration projects for new construction can be developed and carried through by professionals, without direct involvement of occupants. In new construction it is also possible to develop concepts and solutions that can be repeated without major changes.

In renovation, the buildings and occupants are already there. A great number of buildings, with different construction types and different level of renovation needs, make the challenge bigger both technically and economically. Depending on the type of ownership there will be different decision processes to get through. In this phase it will be of importance to spot which upcoming demonstration projects that have the greatest possibility to be initiated and completed with success.

Based on information from different projects we have made a draft checklist for the probability to initiate good demonstration project for renovation.

1. The technical standard of the building should be low and the actual measured energy consumption should be high.
2. No energy saving initiatives or other major building upgrades have been done the last 10 years
3. The owner(s)/the board have to be positive.
4. There should be persons in the board / among the occupants who are positive and has the power and enthusiasm to influence attitudes and decisions.
5. A significant number of the occupants
  - are of the opinion that the energy bills are too high.
  - fear rising energy costs.
  - feel the need for improved indoor climate and comfort.
  - have higher education (Increased probability for idealistic motives)
  - have moved in the last 5 years (Increased probability for wanting change)
  - a high income level (above average in the country)

## 4 Growth phase

### 4.1 Goal for this phase:

- To spread knowledge, competence, production and demand for sustainable solutions in new construction and renovation to all areas with dense habitation (and to an extent that makes it possible and legitimate to level the building code)

### 4.2 Critical success factors

- To establish a national infrastructure that supports dissemination of demonstration projects, synergy, cooperation and coordination
- A complete product concept that makes it easy to understand, produce, sell, quality secure and use the products
- Public funding
- Key market players as well as local authorities must possess knowledge about applied sustainable solutions.

### 4.3 The most important actors

- National and local authorities
- Research institutes
- Public funding agencies
- Second movers among building companies and house owners
- Educational institutions
- Bank and utility companies
- Early adaptors among customers
- Media

In the growth phase the product is defined, well-known to the supplier, documented and ready to be introduced in the market. At the same time the needs in the market are known through various segmentation analyses. At this stage it is crucial to define the link – make the bridge - between the customer's needs and the product. By finding the Unique Selling Propositions (USP) the product bond to the customer. Making use of USPs is branding the product.

National cross departmental programs can play a very important role in setting the national agenda and support synergy and coordination that speeds up the process of change. Local authorities play an important role in creating a picture of the regional future and to motivate competition and ambition level among local actors. By doing this they also prepare for the next phase, the volume phase.

Municipalities may be an important driving force through; special actions for upgrading

parts of towns (for instance social areas) in a sustainable way or use of sustainable solutions both in new and renovation of own buildings, in particular kindergartens and schools.

Building Stock analyses and scenarios made by research institutes makes it possible to make long term plans for renovation and new construction and opens up markets both in a short and long perspective. Research institutes also play a role in developing education. With a shortage of consultants big companies will “buy out” researchers from the institutes. To a certain extent this is useful for spreading competence.

Public funding have two main effects; a) balance the additional investment to what is perceived as the value of the increased comfort level, and b) an objective body is signalling that this is a rational investment. In this phase funding is also needed to support development of education and network cooperation.

The growth phase needs support from professional education. This can be universities or other public institutions or private institutes. This means that the ordinary system for education and training must have integrated sustainable building solutions in their programs. In addition post educations programs must be well established in connection to the relevant institutions.

Companies that enters this phase is not necessarily innovative but can be described as second movers, eager to take an early position in a new market. Bigger actors may either pick up others “open” inventions and/or buy up smaller innovative companies, in order to boost up the speed of market development

The early adopters among consumers must have understood the concept and find it attractive enough to take on such extra investment costs when they are in the buying process.

Professional magazines and national news channels are important in the demonstration phase. In the growth phase the local media plays an increasing role.

Some products and product related activities are very important in order to support the growth phase. Based on Norwegian

experiences we have made a proposal for a list of obligatory parts to be included:

1. Building Stock analyses and scenarios
2. Holistic concepts and solution sets
3. Guidance for the planning process
4. Calculation tools for economy (long perspective cradle to grave)
5. Calculation tools for indoor climate and ventilation
6. Passivhouse components and construction details
7. Guidance for the building process
8. Guidance for marketing
9. National standards for energy performance
10. Certifications of buildings and components

#### ***4.4 Main barriers in the growth phase***

- Lack of regional and pan regional cooperation and coordination.
- Lack of professional sales channels for holistic and complete deliverance (One stop shop).
- Too few actors involved in education
- Lack of quality assurance.
- One sided focus on payback-time of the higher investment cost.
- Lack of concept thinking and marketing knowledge as well as communication skills.

If there does not exist a neutral institution or system which assure quality, the number of unserious actors and bad examples will grow. A negative experience in one project is good stuff for the media.

#### ***4.5 Main drivers in the growth phase***

- Announced stepwise enforcement of national building codes and legislation
- Competitive orientated companies seeking profitable business opportunities
- Project competitions and demonstration projects
- Product labels, energy certificates
- Media

Announced stepwise enforcement of national building codes combined with project competitions and demonstration projects are strong driving forces that set the agenda and establish a strong demand for information and education. This has to be followed up with

nation wide educational programs that uses existing educational structures and/or establish new ones. Competition between companies leads to marketing campaigns in which the single actor actively promote the advantages of his particular solution.

Energy labelling system and certificates will make it possible to compare different solutions and buildings regarding energy requirements.

#### ***4.6 Differences between new construction and renovation***

In Norway we are still in the introduction phase for new construction and in the very early demonstration phase for renovation. If we include Sweden in this Norwegian picture we are moving some steps forward. What is happening in new construction has a strong influence on what is going to happen in renovation. The interest for renovation is now very high and renovation could soon catch up with new construction concerning ambition level. The hindrances are anyway much bigger here and the growth phase will arrive later than in new construction. There is a lack of suppliers which design a holistic complete and tailor-made solution for the specific house. For retrofitting in particular there is a lack of counter for complete renovation solutions especially toward the big Norwegian segment with non professional house owners. Here it is difficult to navigate in "the jungle" of suppliers of single products and services.

## 5 Volume/maturity phase

### 5.1 Goal

The goal is to make sustainable solution to become common practice within international agreed time schedules.

### 5.2 Critical success factors

- All actors in all regions must have knowledge, high ambitions, competence and production ability.
- The concept must be well known among consumers so the demand-side is well established. This leads to high demand for sustainable solutions and reasonable profit for companies involved.

### 5.3 Most important actors

- National authorities
- Municipalities
- The building industry
- Central building cooperatives

### 5.4 Main barriers to reach the volume phase

- Politicians that do not believe that climate change is caused by human activities.
- Lack of political agreement on what to do and in the right speed
- Fear of structural changes and reduced profit among companies.
- For advanced renovation projects in multi family houses the decision making process is often complicated.
- As also the “laggards” enter the market, the number of bad projects may increase due to poor quality control.

### 5.5 Main drivers to reach the volume phase

- Pan national agreements and legislations.
- Influence from high national goals in other countries
- National cross political agreements
- Scenarios telling the threats.
- Reports on climate change.
- Outlook to big profits for companies
- Foreign companies entering domestic market and results in increased competition.

### 5.6 How to reach the volume phase - differences between new construction and renovation

The building sector is complex and is characterized by fragmentation and non integration. The sector a whole is rather conservative and there are few signs to day that

it can change to a holistic sustainable praxis and deliver solutions to an extent and in a speed that can combat the climate challenge. The demonstration phase and the growth phase can be reached through good cooperation between the most pro active public and private actors in the building sector. The volume segment will not be reached in time without use of legislation. The goal for the two first phases is to bring attitudes, knowledge and praxis to a level where this is possible.

#### 5.6.1 New construction

In new construction one solution is to announce a stepwise enforcement of the national building code. Enforcement of the building code traditionally brings the market from the growth phase to the volume phase. What is new is a forced stepwise plan that supports a fast transition through the demonstration and growth phase and that in the end pushes a big number of “latecomers” and “laggards” into the volume phase.

#### 5.6.2 Renovation

As already written, in renovation, the buildings and occupants are already there. A great number of buildings, with different constructions types and different level of renovation needs, make the challenge bigger both technically and economically. The decision-making process for advanced renovation is more complicated than for new houses. Too often limited renovation is carried out that block for more long term solutions. As also suggested in the ERABUILD report, energy regulations for the existing building stock could be a proper instrument.

One way to reach the volume phase for sustainable renovation in the existing building stock is to introduce instruments that resemble the building code. With enforcement, the EPBD and energy certificates could be such an instrument. A draft model for such enforcement:

Step 1: Energy labelling

Step 2: For all labelled buildings there must be made plans how to renovate to the highest possible label.

Step 3: All renovation must be carried through according to such plans.

Step 4: Mandatory renovation

To make this possible it would be necessary to use strong financial tools for step 1 and 2.

## 6 Summary

The effects of the climate change are speeding up and the proper initiatives to reduce greenhouse gas emissions are still too few. There is a big potential for reducing CO<sub>2</sub> emission related to the building stock and the costs for doing it are very low.

The building sector is complex and is characterized by fragmentation and non integration. The sector as a whole is rather conservative and there are few signs today that it can change to a holistic sustainable praxis and deliver solutions to an extent and in a speed that can combat the climate challenge. There is a strong need for new sustainable mega trends in this sector. Said in a different way; we are at war and it is necessary to initiate planned and coordinated action on all levels from the political to the individual. It has to be combined with use of the strong legislation and the strongest financial, public and market actors and forces. This paper suggests that national authorities have to form consistent policies within these areas in order to drive more sustainability in the building sector:

- National and regional master plans for involving and coordinating municipalities, research, education and pro active actors in building sector. Communication is an overall critical factor. It is important to define specific goals on longer and shorter term, which may be operational for each involved actor.
- R&D policy  
Introduction phase  
Focus on international cross learning and demonstration projects.  
Growth phase  
Focus on dissemination of experiences from demo projects and market research.  
Volume phase  
Focus on projects which may improve solutions and methodologies applied.
- Education policy  
Introduction phase  
Involvement of technical universities in international research projects.  
Develop training programs for all professions involved in the building process.  
Growth phase  
Implement post training programs.  
Implement new curriculum in universities and secondary handcraft schools.  
Volume phase  
Focus on QA in the building process.

- Building codes and legislation  
Introduction phase  
Municipalities must be flexible regarding building regulations which may restrict good solutions for demo projects.  
Example: allow thicker outer walls despite it challenges space regulations.  
Growth phase  
Communicate that legislation/building codes will be improved in “near future”.  
Volume phase  
Enforce building codes stepwise.
- Funding policies  
Introduction phase  
Support demo projects with high multiplication potential.  
Growth phase  
Use of funding tools which are easy to understand for consumer and easy to run for the bureaucracy  
Volume phase  
Funding should only be used in special occasions. Other financial tools, e.g. tax deductions and lower interest on loans may be more appropriate in this phase.
- The public sector must also play the role as “route sign” for the market. Local, regional and national authorities represent an important part of the demand-side in the building market. By using their demand power through, the supply-side will have to develop good sustainable solutions for the market.

Use of demonstration projects and competitions on a large and coordinated scale can create regional arenas and centres for dissemination of ambitions, experiences knowledge, education and development of the regional markets concerning production and demand. Action within the same timeframe will set the national and regional agenda and add power for change.

## References

IEA SHC Task 28: Haavik and co-authors (2006), Business Opportunities in Sustainable Housing.  
IEA SHC Task 37: Brochures, [www.iea-shc.org/task37](http://www.iea-shc.org/task37)  
ERABUILD: Itard and co-authors (2008), Building Renovation and Modernisation in Europe: State of the art review. Final report  
WBCSD: (2008) Energy Efficiency in Buildings Business: Realities and opportunities  
The Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report