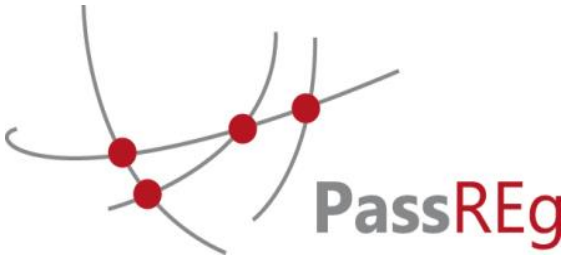
Co-funded by the Intelligent Energy Europe Programme of the European Union



IEE PassREg

PASSIVE HOUSE REGIONS WITH RENEWABLE ENERGY

Success Model

Arnhem-Nijmegen Region

aspiring region involved in PassREg project

Version 7.0 - final / april 30th 2015

Inhoud

I N T R O D U C T I O N

Note:

In terms "nearly zero-energy building" and "passive building" used in this text is put the same meaning. PassREg project aims to establish the "passive house" standard of as the basis for the definitions of "nearly zero-energy building", which are currently under development and are to be adopted in any member country of the European Union.

Just a few years ago the concept of Passive House was very unknown in the Arnhem-Nijmegen Region in The Netherlands. During the PassReg project participants from the city region and from DNA in de Bouw have joined forces to put the concept on the map. The timing is relatively favourable with the EPBD directives leading to more political ambition in the domain of sustainable building and renewable energy sources. As a result of the PassReg project we now have multiple passive house beacon projects in the region and we have created more awareness amongst government officials, suppliers and consumers of the opportunities that the passive house concept offers for improving the energy performance of buildings.

The road to success however is paved with obstacles and profound learning processes and there is still a long way to go. The PassReg project has shown us that a multi-actor approach is absolutely necessary to achieve the goals that are set. Strong political and market forces, existing cultural habits, the complexity of bringing technical innovations (like the Passive House concept) to the mainstream market and the need for social innovation all ask for skilful process management.

In this success model we seek to analyse and describe the path we have travelled in the PassReg project so far and the conditions we encountered. Based on these we identify strengths, weaknesses, opportunities and threats for implementing the Passive House concept with Renewable Energy sources in the region. We also give a roadmap based on these insights.

We hope that the success model can guide actions beyond the PassReg project and perhaps inspire other regions to learn from our experience in their own quests for more sustainable building.

1 ENERGY AND BUILDING POLICY AND LEGISLATION

1.1 *National framework: Implementation of EPBD in The Netherlands*

[redacted]National Plan

The EPBD demands a national plan to reduce energy use and reduce emissions of carbon dioxide. This has been written in the Netherlands and published at the site of the national government at 28 September 2012. The targets in this plan are for all (new) government buildings after 2018 to be NZEB and all other new buildings after 2020. The plan contains a set of distinct measures, ranging from regulation to local innovative programs and pilots. Some highlights are described in this article.

[redacted]Legislation

(Part of) the EPBD has been translated into national regulation: BEG (Besluit Energieprestatie Gebouwen/Resolution Energy performance Buildings) and REG (Regeling Energieprestatie Gebouwen/ Regulation Energy performance Buildings) and the "Activiteitenbesluit" (Activities Resolution).

- The BEG contains a translation of some important facets of the EPBD. The main topics are:
- Compulsory official energy performance certificate/energy label (EPC) for each built or sold building (excluded are certain monuments).
- Compulsory public display of energy performance certificate of public buildings larger than 1000m2 (the EPBD demands 500m2 and from july 9 2015: 250m2)
- Airconditioningssystems (>= 12kW) are inspected at least once every five years by a an independent and qualified expert. The rapport will contain a judgement and an advice for improvements for the user.
- The REG gives more details on how this resolution should be put into practice. For example, what should an Energy performance certificate/energy label look like (assessment and advice) and who is allowed to give these labels (only EPBD-certified inspectors, from The Netherlands and other EU countries).
- The Activiteitenbesluit describes the environmental requirements for installations.

The main reason that some of the parts of the EPBD have not been implemented in time, has been that the proposed legislation was rejected by the legislative house. More time was needed to create a new proposal.

[redacted]Energy Performance Label

There is a standard energy performance label in The Netherlands which is called EPC (energy performance coefficient). The calculations that lead to this are registered in the NEN-norm

7120 and they are included in the “Bouwbesluit”(Building Resolution), which regulates all building activities in The Netherlands.

In 1996 for the first time there was an EPC requirement for new residential buildings: the EPC had to be below 1.4. (a value of 1 was the average energy performance of a house in 1990). The norm was tightened every few years since then, after a feasibility study. The current EPC requirement is 0.6 for residential buildings and from 1-1-2015 it will be 0.4. For non-residential buildings the current EPC-requirement varies between 1.1 and 2.6, depending on the main function of the building. From 1-1-2015 the requirement is that the energy performance of a non-residential building is 50% better than in 2007.

Important principle in the NEN norm is that regardless of the type, shape or size of the house,similar provisions will lead to more or less the same performance: in other words, big houses with a lot of roof- or facade area are allowed to use more energy to meet the same performance-requirements. A building that is completely energy neutral has an EPC of 0.

Because builders are allowed to determine the measures for reaching the norm themselves, the government states with the EPC requirement a minimum Rc-value for the shell, to stimulate energy reduction.

For collective sources of energy there is a norm since july 1st 2012, called EMG (energy performance measures at a regional level). It contains the calculations needed to take collective energy measures into account when labeling a building. Since it is a very recent norm, it is not complete yet: this period is being used to experiment with it. Also, it is not possible to build a non-energy efficient building by using the regional measures as main input for the EPC: there is a minimum requirement for the building itself (without counting the EMG the energy performance of the building itself is not allowed to be worse than 1,33 times the EPC requirement).

The different norms are now restricted to new buildings, but will be used for existing buildings in the future.

Use of Renewable energy sources

The EPC is set up in a way that stimulates the use of renewable sources of energy. These will give a better EPC-value compared to use of traditional, non-renewable sources.

Change in the EPC: simplification and enforcement

The Europian Union has started two legal procedures against The Netherlands. One for not starting the implementation of the EPBD in time. The other is for not implementing the right way. This second procedure is mainly about the fact that The Netherlands does not enforce the rules on energylabels. As a result of this legal procedure our minister has worked on a system to start enforcing and consulted with other EU member states to find a good way to do this.

The label for private home-owners will be simplified, so that it will be cheaper and more useful with regard to growing the consciousness of home-owners for the expected energy-costs. It is expected that this will motivate owners better to invest in energysaving measures than the current “complicated” calculations. Because a large part of the existing Dutch

homes is fairly uniform, it is possible to use reference-houses to determine the a large part of the features asked for in the calculation of the EPC without having to visit the particular house. This means that in general there is only a very limited number of features, 7-12, that has to be determined per individual house. The home-owner can be helped by ICT and an expert at a distance, to fill out these remaining features and add some digital proof, like pictures. An independent expert can than judge the label from a distance for only a fraction of the price the owner had to pay for an energy advice with the old method. After this approval the label will be registered in a national database. It is called “the definitive energylabel”.

It is of course still possible to use the comprehensive method and get an energy performance certificate. From January 1st 2015 this will no longer be called an EPC, but an Energy-index. This index will than contain the simple calculation and its corresponding label (the definitive energylabel), as well as the comprehensive calculation. The latter is especially useful for making decisions about investments. This said, the minister expects there will still be a demand for the comprehensive energy performance certificates/the energy-index. Not in the least because the energylabel is integrated in all standard systems that calculate the value of a building: a better label means a higher value.

This chosen route is in line with a general attitude in The Netherlands, which prefers stimulating over regulating: by raising consciousness it hopes to create a free will to improve the energy-efficiency. The simplified label should serve this purpose better.

The label for non-residential buildings will not be simplified.

At the moment there is a different calculation for the label for existing and new buildings. The intention is to make these into one and the same calculation so the labels can be better compared.

The new NEN 7120: Dutch calculations for the EPC/energy index

The European Norm, in effect guidelines for calculation, that underlies the Dutch NEN-7120 and EPC calculation, is expected to change in 2016. It will no longer be allowed to use average or standardized values, but instead the calculation needs to be based on real values. In anticipation of this fact, a commission is working on the new NEN-7120, because the current Dutch norm is mainly based on standardized values. The past years there has already been strong criticism on the current Dutch norm from Dutch building-experts, because it often leads to higher investment costs for building projects and lower results in energy performance compared to an alternative calculation like the PHPP. In the NEN 7120 commission there are currently still some major differences of opinion about how the conformance to the new European norm in 2016 should be achieved, mainly because of the different interest-groups represented in the commission. They target to resolve these differences before the end of 2014.

DNA in de Bouw has been lobbying to get the method of PHPP accepted as a standard measurement in building. A lot of relevant people are in favor of this choice, but the name has to be changed to create a level playing field for all concepts in sustainable building. Working name is now NZEB-tool. Negotiations with PHI in Germany take place to organize a good arrangement. Members of DNA in de Bouw have finished the first concept version for

the tool in may 2015. It will be optimized during the summer months of 2015 by a number of building professionals that volunteered to help, in exchange for a discount on the definitive version that will be ready fall 2015.

[redacted]Programmes

19 Areas in The Netherlands are running programs of national and regional governments to stimulate experimenting with energy efficient building. Different consortia do building projects using innovative techniques and trying to make them more cost effective and ready to market, by innovation of processes and techniques. Knowledge gained in these programs is actively spread in the building community with the aim of speeding up the transition to energy efficient building. Local governments outside these experimental areas are not allowed to sharpen requirements in their local building policies. The government chooses a role of facilitator in these programmes, bringing building parties and potential clients together.

There are also programs running that target the existing buildings. They gain experience in for example how to reach cost-effective energy efficiency in major renovations and how to stimulate consumers to take these measures. The governmental program "Stroomversnelling" has been successful in stimulating housing corporations and home-owners to create NZEB-s as pilot projects. It has also stimulated building consortia to develop concepts for increasingly lower prices. In these projects passive house principles have been regularly applied. These and other programs have led to the fact that in 2015 dozens of concepts are being offered by consortia and individual building professionals to create and renovate to NZEB. Demand is still growing only slowly, but this seems to be a matter of time.

Programmes are financed from several different funds, public and private.

In the region Arnhem-Nijmegen several pilot NZEB-homes have been delivered and are regularly opened to a broad public of consumers and professionals.

[redacted]Smart Meters and behavioural change

So-called Smart Meters have been introduced and are mandatory in new buildings, with deep retrofitting, with regular maintenance and when the consumer does a personal request. These smart meters give direct insight in energy use and are regarded as an important aid in changing consumer behaviour.

Also research is being conducted, commissioned by the government, to find out what drives consumers decisions and behaviour regarding sustainable renovations, so that this information can be used for improving the effectivity of policymaking and marketing efforts.

1.2 *Regional Framework: Political will, policy and legislation*

Cityregion Arnhem-Nijmegen is located in the province of Gelderland and consists of 19 municiplatities in total: Arnhem, Beuningen, Doesburg, Duiven, Groesbeek, Heumen,

Lingewaard, Millingen aan de Rijn, Montferland, Nijmegen, Overbetuwe, Renkum, Rheden, Rijnwaarden, Rozendaal, Ubbergen, Westervoort, Wijchen and Zevenaar. The total amount of houses in this region in 2010 was:

Rented houses:	132.850
Owner-occupied houses:	152.050

Province of Gelderland

The province has an official policy to increase the energy efficiency of new and existing buildings. It has also made specific agreements on this with all of its regions.

The goal is to be energy neutral as a province in 2050. In 2020 14% of all energy supply should be from renewable sources. And in 2020 there should be a reduction of energy use of 20% from the baseline in 2010. The strategy chosen is to strengthen the EMT sector (energy, environment, technology), to stimulate saving energy and to support creation and use of renewable energy sources. Resources that are used are for example two forums that regularly meet for exchanging ideas, knowledge and networking and realizing projects (with municipalities, companies, innovators, university and other relevant parties), financial aid (subsidies or loans from a revolving fund), advice and leading by example (in projects of the province).

Gelderland commissioned the creation of the EnergieAtlas. It is a tool, accessible for everyone through internet, that provides an overview of initiatives and realized projects in Gelderland concerning the energy transition. It does this by providing a number of maps, which combined can answer questions like:

- Which locations in the province offer a good opportunity for new energy initiatives?
- What is the potential of different renewable energy sources?
- Which specific aspects are relevant for the spatial integration of energysystems in the landscape?

The Province of Gelderland has been subsidizing one of PassReg's beacon projects GWLO: a passive project of three houses.

Nijmegen: initiator of Power2Nijmegen

The municipality of Nijmegen has the ambition to become an energyneutral city in 2045, by reducing energy-use by 50% and gaining the rest from renewable energy sources. Many projects have been initiated since 2008 and it has already resulted in an energy reduction of 7%. In 2012 the program Power2Nijmegen was initiated as a co-creation between the municipality, companies, knowledge institutes, social organisations and other experts to jointly investigate and initiate ideas in different fields to reach the ambitious goal of becoming energyneutral as a city. A routemap has been developed with all sorts of projects to reach the end goal. One of the fields is sustainable building and this working group has projected large scale passive building and renovation in Nijmegen from the year 2025 onwards. Intermediate steps towards this end have been identified and are intended to be addressed in the coming years. Other examples of major energy projects are the building of

a district heating net that uses the rest-warmth of a waste treatment plant, which will supply energy for 11.000 houses from 2015 onwards and the building of a big biogas-installation using green waste, which has been realised already. This gas is being used by for example city buses. A park with wind-turbines is now being built which will provide 8000 homes with energy from 2016 onwards. There was also an initiative to change the energy consumption behaviour of residents in the city area of Neerbosch-Oost, using a combination of interventions and with a high emphasis on involving neighbourhood-residents. The PassReg project is also part of the movement of Power2Nijmegen.

In 2013 a Green Deal was made between 20 municipalities in Gelderland, corporations and businesses about using GPR (an assessment tool for the sustainability of buildings) and developing a common language in sustainable building as well as agreeing to lead their organizations on outlines towards more sustainable practices. The main purpose of this green deal, which was initiated by the government, is to create more consciousness and commitment in organisations, so that this will inspire more ambitious steps in the future.

In October 2014 several government officials from the municipality joint the excursion to Heidelberg, Germany, organized by DNA in de Bouw. They were specifically interested in how Nijmegen could benefit from a project like this.

[redacted] Arnhem: Participant in National Green Deal Smart Energy Cities and initiator of the program Energy Made in Arnhem

The national Green Deal Smart Cities aims to supply 100.000 buildings with smart (and sustainable) energy systems before 2019. Energy made in Arnhem is a program from the municipality, working with inhabitants and entrepreneurs, aiming to make fast progress in sustainability, energy saving, renewable energy sources and development and stimulation of innovations and employment in energy and environmental technology.

Several initiatives are being coordinated from these programmes to stimulate (learning about) green energy. One example is POWERLAB, an experience center for sustainable electric energy, meant for children in primary or secondary school, for students and for businesses to learn about and work with sustainable electric energy.

Several conferences and meetings are yearly being organized or hosted by the municipality of Arnhem to increase awareness for sustainable energy with businesses and residents and to stimulate local entrepreneurs in sustainability in developing their business and connecting to other businesses in this field.

[redacted] Government supporting Change Agents that assist local initiatives

Many municipalities in the province of Gelderland have asked specialized agencies to assist and stimulate local energy and sustainability initiatives from homeowners and businesses and this way stimulate demand. This is a recent initiative and results are awaiting evaluation. Examples of these agencies are 5+1, Synthese and Rijn&IJssel. This type of agencies is relatively new in the market and still looking for viable business models. They can be categorized as “change agents” in the transition process towards sustainable building. By investing in these agencies the government is helping the rise of these important players in

the energy transition. It is important however that for the long term these players develop a business model independent of government funding. At the moment few market players are willing to invest in this type of process managers, even though they add value for these parties as well. Maybe the government funding can help them gain experience and this way prove their worth to the market players, so they will be willing to invest in them also.

1.3 *Economic levers*

Contracting practices

In The Netherlands most contracting practices, whether professional or private clients, are based on lowest cost. This means that the main criterion used by a client to select a contracting party is price. To be able to contract this way, the client has to specify his or her needs and preferred solution in advance and the bidders try to be as cheap as possible, otherwise they have no chance of winning the bid. This is a bad start if integrated high quality solutions within time and budget are sought after, a requisite for good passive house design and building. Also it often leads to exceeding the budget limits, time delays and costly mistakes. Unfortunately most clients do not realize this and are unwilling to change this practice.

Some government officials and departments are experimenting with alternative ways to contract, for example to weigh in certain quality aspects beside costs. Still, the way the bidding takes place does not stimulate an integrated approach with all building parties and the client at equal positions, striving for a common goal. Social and financial innovation is needed to find alternative ways for contracting, that enhance cooperation, communication and creativity and that way reduce the costs and risks for the clients as well as raise the delivered quality.

Some of the PassReg beacon projects already in 2012 and 2013 have taken a different approach to contracting. Here the client set a certain budget as a maximum, defined some important qualitative and quantitative results to be achieved and chose partners based on quality. Then they had these partners work together in an integrated manner from the start of the project and gave them the challenge of reaching certain results within the budget. This boosted creativity. Also the partners worked with open budgets, which means that everybody got a fair share of earnings, based on principles that were agreed on from the start with the client and each other. This way there was no need for hidden agenda's or foggy negotiations during the project. All of these projects remained within budget and the client and building partners were satisfied with the end result and the process leading towards it.

The lessons learned and results of this kind of cooperation should be spread so it can be used by other interested parties to improve practices and to raise the consciousness of clients about the risks of and alternatives to the known system. One of the members of DNA in de Bouw has presented this topic of innovative ways to cooperate in NZEB building projects at the NZEB conference in Brussels in November 2014. The foundation KERN is planning a part of the curriculum around this subject. Events organized by DNA in de Bouw practically always contain references to or information on this subject.

In 2015 the earlier mentioned governmental program Stroomversnelling has published model contracts based on performance instead of building specifications. They have used these contracts in their pilots in 2014/2015 and were enthousiastic about the results. Basically the contract consists of the guarantee of performance of the new or renovated building for an x amount of years (often 15 due to the installations), divided in energy performance, indoor climate performance and indoor environment. It has annexes of the maintenance plan, the monitoring plan and a user-manual for the inhabitants of the

building. The contract is relatively short and gives the contractors a lot of room for applying their own expertise. It also transfers most risk from the client to the contractor, which makes it more important for the contractor to assume responsibility and deliver quality.

Life Cycle Costing

Most consumers are not aware of the existence and consequences of lifecycle costs and therefore primarily focus on initial investment costs. This however gives an incomplete picture for a sound financial decision. These consumers are potentially deciding suboptimally. In a recent research organized by DNA in the Bouw compared a shortlist of 5 calculation tools available in Europe on 48 criteria in 5 themes: NZEB, lifecycle costing, using European calculation standards, applicable for renovation and new construction and the integration of renewable energy sources. The E-calculator developed in Belgium was selected as most promising, some other tools proved to be quite useful also. Instruments like this are not commonly used and should be promoted with suppliers and can be used for sales and project management purposes.

Opportunity: using a percentage of the energy bill for investing in the energy transition

Countries like Germany and Belgium have regulations that reserve a certain (small) percentage of the energy bill for investments in the energy transition. In the Netherlands this is not yet implemented. It could be a promising instrument however, to generate funding for example for developing exemplary buildings, performing studies, stimulating innovations, providing free advice for builders on sustainable building or for providing subsidies.

ESCo's

One reason for some consumers to not choose for (energyneutral) renovation has to do with the high initial investment costs, which they cannot afford. A possible solution is to create an Energy Service Company. In The Netherlands, and also in the region of Arnhem Nijmegen, different parties are experimenting with the possibilities. ESCO's are not new, they first developed in the late 1970's during the energy crisis. They have now regained interest. The basic idea of an ESCo is that it combines providing energy solutions with innovative financing methods, reducing the risk for the client. An example would be that the ESCo will carry the investment costs of the renovation and lead the renovation project to achieve NZEB. (A part of) the average monthly energy costs from before the renovation will be payed by the owners or tenants as a fee to the ESCo after the renovation for a period of time (usually 5-20 years), to cover the investment costs and interest. This way the monthly dues of the owners or tenants will not change or be lower, yet they can undergo deep renovation. There are several business models for ESCo's.

In The Netherlands and also in the region Arnhem-Nijmegen there are several examples of ESCO's financing deep renovations with RES. There are also ESCo's focusing on a specific product that aims at reducing use of energy, so called product-ESCo's. Because there is still a lack of knowledge and experience in The Netherlands on best practices with ESCo's, there is an independent platform that collects and distributes this knowledge: ESCoNetwerk Nederland. Some commercial companies have also started now to give advice on how to create a profitable ESCo and assist with this. It is a promising route to overcome some

financial and risk-associated barriers in the implementation of NZEB with RES concepts. The province of Gelderland actively stimulates the use of ESCo's where possible.

1.4 *Subsidies and special loans*

Subsidies for energy saving measures or for implementing renewable energy sources are issued regularly by national and local governments in The Netherlands. Although they usually have a short term effect on the creation of demand, there seems to be little long term vision and coherency in the policy. This leads to problems for the suppliers, because after a subsidy (for example for solar panels) has been abolished again, the consumers immediately stop buying and wait for the next round of subsidies. So suppliers experience a peak during the subsidized period, grow their business and then are in serious business trouble when the subsidy stops and demand plummets. This means the supply side has a hard time surviving, because they cannot foresee the government's policy and the effect on their business because of a lack of long term strategy.

Another point of improvement is that subsidies and loans are often provided for specific solutions instead of an integrated approach, for example for insulation or solar panels. The municipality of Arnhem for example has provided the opportunity for a loan with low interest rates in 2013, intended for measures improving sustainability of housing but only including solar panels. This means that people are biased to choose a solution that might objectively not be the best choice for them to make, which could lead to disappointment in the long run ánd it is possibly a missed opportunity for higher quality and higher energy savings. It might be better if subsidies would stimulate integrated advice and measures most effective for each specific case. Other municipalities, like Nijmegen, fortunately do extend the financed measures to a broad range. In the region of Arnhem Nijmegen this should be a topic to address in removing the barriers for NZEB with RES.

Beside these programs there are some financial incentives for companies and individuals to invest in energy-saving measures in their buildings, like a tax reduction on labour and for companies a tax deduction of the investment. Also since 2014 there is a revolving fund for private home owners: "the national savings fund" ("Nationaal Energie Bespaarfonds"). It contains public (national government) and private means (two banks) and provides loans with an attractive interest rate for energy-saving meaures.

Also recently (summer 2014), the province of Gelderland has opened a similar (but seperate) fund for cheap loans for energyneutral renovations in a few cities in Gelderland, amongst which are Arnhem and Nijmegen. People can apply for this loan also in combination/on top of the national loan. This gives private home-owners access to a large financial resource for investments.

The province has subsidies available for inhabitants that increase the insulation of their houses (maximum per household €500-€750). Gelderland evaluates this subsidy programme every few years for its effects.

Gelderland also has substantial subsidies available for entrepreneurs that realize installations and energy infrastructure that results in energy saving or renewable energy sources, as well as for starting a local energy company or an ESCo (50% of the subsidizable costs with a max of €75.000).

[redacted]Loans and mortgages with banks

An increasing number of banks gives a discount on the interest rate of a mortgage or loan, when energy saving measures are implemented in a building. For home owners this is an increasingly interesting development. The advisors in these banks might in the future also be trained to raise awareness with their customers of the advantages of an integrated approach in determining which measures to implement: to save costs and increase the quality of living and the energy performance, thus the value of their property.

As from 1 january 2014 the mortgage-limit for owners of houses that are energyneutral are raised with €13.500. That means this is the amount of money they can lend on top of what they are allowed for based on income.

2 KEY ACTORS

2.1 *National Authorities*

Ministry of Infrastructure and Environment

Government Service for Entrepreneurs (Rijksdienst voor Ondernemend Nederland)

Ministry of Economic Affairs

Minister for housing and government dervice

2.2 *Regional Authorities*

Municipalities in the Region

City Region Arnhem-Nijmegen (has been stopped in 2014)

Province of Gelderland

2.3 *Suppliers*

Producers and material suppliers

Planners, architects, building engineers

Project developers

Facility managers

Investors

Contractors

Installers

Craftsmen

Renovation-shops (“one-stop-shops”)

2.4 *Demand creating businesses*

Advisory Agencies: Process managers

Marketing agencies

2.5 *Knowledge Institutes and training centers*

Universities

High Schools

Vocational Schools or Training centers

Regional cooperations between schools and businesses

Private & commercial educators

Supplier based training centers.

2.6 *Certifying Institutes*

Stichting Passief Bouwen (NL) - Quality label Passief Bouwen

PHI Germany / PHP Belgium

EPC

Normcommission NEN-norm 7120

2.7 *Suppliers of calculation tools*

GPR-Gebouw

BREEAM

PHPP

EPC

2.8 *Local networks of suppliers*

DNA in de Bouw

Verduursaam Achterhoek

2.9 *Energy Companies*

Energy suppliers

ESCo's

EPC consultants

Energy engineers

2.10 *DNA: an association networking with the local government*

DNA in de Bouw is a regional association of small scale building professionals like architects, contractors and engineers. It has the ambition to change building as we know it, to become sustainable and cooperate multidisciplinary and in an integrated manner during the complete lifecycle of a project. A lot of little parties makes a big one is the idea behind this collective. By actively participating in DNA small building parties with a big vision can make a difference. They have taken up the PassReg project for its chance to help in this ambition. One way for DNA in de Bouw to win involvement of the government has been to very actively network within the municipalities of Arnhem and Nijmegen and the socalled City Region. DNA members went to search for key officials in the government: They found people that were truly passionate on the subject and possibly influential ánd people that were potential bottlenecks for the process because they were in a key position but uninterested or even opposed because of other priorities and interests. DNA decided to invest most time in the enthusiastic ones.

These officials were involved in meetings, DNA had several informal talks with them about progress over a cup of coffee and mutual interests were actively explored to find synergy between activities of both parties. Within DNA the people that were most talented to network like this played the biggest role in this process. Results for example have been that provincial and municipal officials were visibly present at events (good PR for sustainable building and passive houses), that some funding for the activities of DNA was granted from the cityregion, that DNA was linked to interesting other parties and that DNA was given a visible place with one of the beacon projects at the Dutch Green Building week opening market. This networking process has a long-term scope: DNA notices the fruits of the investment of time and energy is paying off increasingly. On the other hand, there is always a risk for getting a setback, when a key official is transferred to another job or place. By developing a broad baseline of contacts in the regional government and focussing on the “sustainable building-passionate” officials (who are most likely to stay in this sector) this risk is partly mitigated.

One of the most important shared interests with the regional governments is of helping small regional entrepreneurs succeed, an important basis for regional economic and social success. Being an association of many regional small entrepreneurs in building DNA is also relatively unbiased as a partner for the government. It gives regional entrepreneurs a voice and a face, without having a dominant direct commercial interest in the contact with the regional government, something that can put government officials off.

Success factors identified by DNA so far in dealing with the regional governments are:

- Choose strategically which officials to invest time in and which not
- When possible work around bottlenecks as opposed to trying to convince them of the good cause: that usually costs too much energy and it delivers little results
- Decision makers are important for the key issues, but also maintain good connections with their staff workers: the latter are often the stable part of the office and can introduce you to the new decision maker when the new political term starts. Also they can be important advisors for the decision maker and they are the ones that can keep the knowledge and lessons learned in the office during political changes.
- Develop a broad and “resilient” base of contacts

- Be interested, open and respectful for the other party and their daily reality and interests: Look for mutual interests, or investigate how you achieving your interest/goals can help the other achieving their interest/goals and take this angle to connect with each other
- Do not only take, also give!
- Results do not come overnight. Give it the time it needs, do not force anything but stay active at it with positive energy: do not give up. Make sure you stay visible in a positive and supportive way.

A nice success at the end of the PassReg project was a big conference organised by DNA in the Jaarbeurs Utrecht, a well known conference center, where some serious names from regional and national governments as well as the EU appeared on stage. The beta-version of the NZEB tool was presented as a highlight of the meeting. A big, interested crowd and several journalists from well known (news)papers visited. In organizing this event it became clear how much networking had been done in the years before which made this commitment possible.

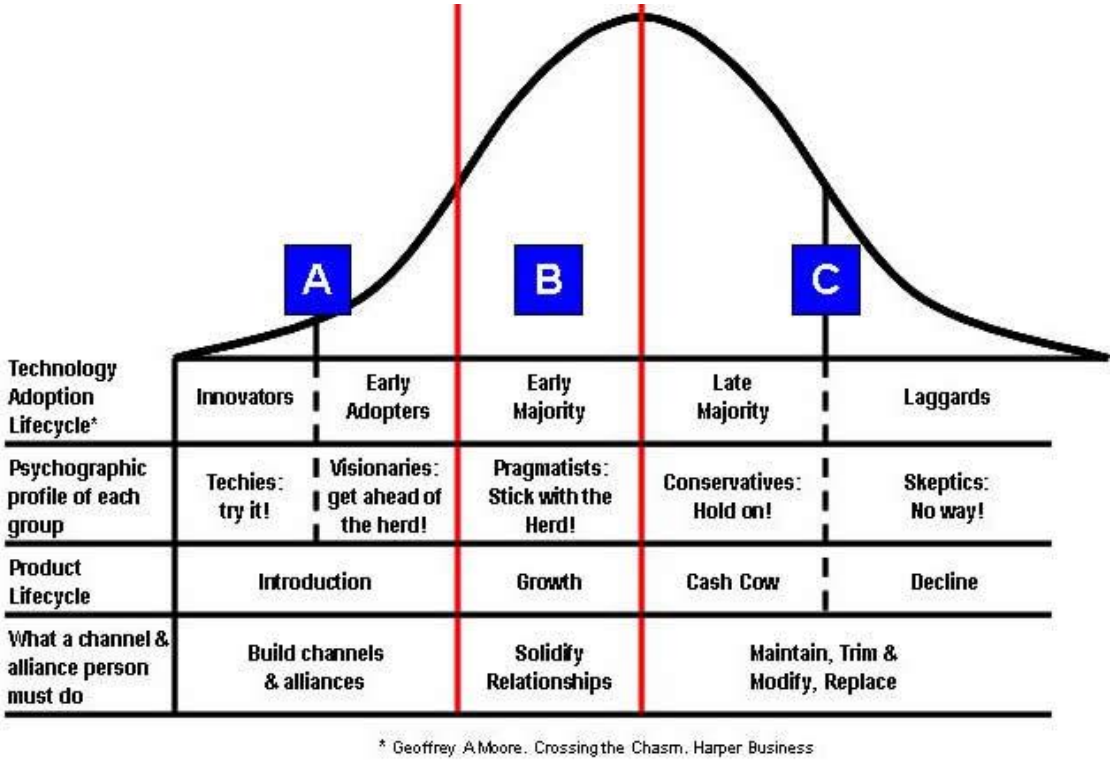
3 CREATING DEMAND: THE LOCAL MARKET FOR PASSIVE BUILDINGS

Next to creating supply, which will be addressed in the next chapter, the important challenge to achieve a higher number of passive houses in the region is to create demand for this technology. A systemic approach is needed here to overcome current barriers to create demand and different stakeholders can contribute in different ways.

The most obvious challenge in The Netherlands at this moment, is to achieve a transition from serving a market of pioneers (“green enthusiasts”) with the passive house concept, to serving a more mainstream market. In The Netherlands there are not so many examples of built passive houses yet and for the majority of people the concept is either unknown or considered an innovation. We can therefore learn from research and theories on how innovations spread to mainstream markets and focus our efforts by using those insights.

We organised this chapter by intertwining descriptions of activities and situations in The Netherlands with a description of a well-known theoretic approach to the creation of demand for passive houses, based on two influential theories on this subject: the innovation adoption model by Rogers (2003) and the chasm model by Moore (1991). Also findings and insights from the doctoral thesis of Erwin Mlecnik (2013) have been used for this approach.

A well known model that originally stems from research in agriculture and home economics in the 50’s of last century, is the so called Technology Adoption Life Cycle Model. It is a sociological model that describes the adoption or acceptance of a new product or innovation as it relates to the specific demographic and psychological characteristic of five defined adopter groups: innovators, early adopters, early majority, late majority and laggards. You can see an overview of these characteristics in the picture below.



In the 60's Everett Rogers took this model to a new level in his book Diffusion of Innovations. The model and theory is still widely used to guide the way organizations develop the market for new products and innovations. In 1991 Geoffrey Moore wrote an important extension to the model and theory: Crossing the Chasm. In this he shows that, especially for discontinuous and disruptive innovations, there is a vast chasm, a big gap, between the adoption of innovations by early adopters and the adoption by the early majority.

Passive Houses are in fact a new product, an innovation. One could even see it as a disruptive innovation, in the sense that it could replace an existing market and existing set of values concerning building. This means that there are important lessons to be learned from tested models and theories like the above. Erwin Mlecnik has made a good start with this in his dissertation at the University of Delft in 2013, describing opportunities and challenges related to the adoption of passive houses.

Passive buildings in The Netherlands so far, have mainly been initiated by people that fall into the first two categories of the technology adoption life cycle: innovators ("green enthusiasts") or early adopters. These are people with a vision, a dream. And they are willing and eager to make a big step to a system that promises to deliver (part of) their dream. They often like being in a beacon project, enjoy the feeling of being a pioneer. And they are willing to take risks for this and pay a premium for a good product. They often do not mind if results are not perfect yet and are willing to help the provider optimize it after delivery. These people are generally very enthusiastic about living or working in a passive house.

Now comes the biggest problem in creating demand at the next level of adopters, the early majority. People in the early majority category are so-called pragmatists. And these pragmatists do not take the visionaries as an example, because they have a very different set of values and a different set of interests. Pragmatists want as little risk as possible, want continuity and good and reliable service during and after delivery, they want standards and

procedures, a one-stop-shop without any worries. They like to buy from market leaders and well-known suppliers, because they know that all other parties (like suppliers of spare parts) also concentrate around these. They want a complete product, no loose ends from beginning to end. Competition to them is a good sign: it means that many suppliers have embraced the concept and thus it is a safe bet. They do not want to pay a premium, but have a good price for the quality they receive. All of this is why they listen to people like themselves, not to visionaries. In other words: beacon projects from visionaries will not convince them. Beacon projects with their similar friends might.

There are at least three things to consider in approaching this issue:

1. Reality is not equal to perception. Perception is what drives behaviour.

Even if passive house technology is in fact reliable and affordable, if the market does not perceive it as such, they will not adopt it. Perception will have to be changed first. Thgis is why a sound and sophisticated communication strategy is very important.

In The Netherlands we know there is a lot of prejudice towards passive houses among people, consumers, in the mainstream market. This was increased some years ago when an ambitious housing project in Amersfoort made some big errors in their design, which caused huge inconvenience for the inhabitants. This is the pragmatists nightmare. It was widely communicated throughout the media, and even though it was technically fully explainable by the mistakes made by the building parties, many people mainly remember that one should not want to be living in a tightly insulated house, it is too risky.

2. The (early) majority market is divided in many specific segments, with specific needs and demands.

Approaching the complete market at once scatters resources and energy. It significantly reduces your chances to succeed. The best strategy for crossing the gap between the early adopters and the early majority, is to choose a specific segment of the majority market to start with. Focus all your energy to achieving the dominant leadership position in this segment as quickly as possible. Once the innovation has been adopted by this segment you can start conquering other segments from there. Remember: pragmatists only listen to other pragmatists (preferably in the same segment).

In The Netherlands there is no choosing of a specific market segment for implementation of sustainable building practices in general or passive houses in particular. The result is many scattered projects, no overview, no consistency in approaches and very little results in the mainstream market. There are some incremental innovations in the mainstream markets, but these are not enough to reach the European goals of NZEB in 2020. In spring 2013 lessons learned from the “blok-voor-blok programme” were published. In this programme, sponsored by the national government, 13 regional projects aspired to reach large scale energy savings in the existing stock of buildings. It was concluded that it was very hard to convince owners of houses on a large scale to take energy saving measures, even if it was a rationally good offer. On the topic of marketing the evaluation report commented that a strategy is needed that addresses “irrational factors” like personal drivers and concerns and sense of urgency.

If you segment a market well, it is easier to get a grasp on these “irrational factors” for this specific segment: you have a target group that you can really get to know well. In choosing this segment there are at least two important criteria:

a. The consumers in the segment are experiencing an urgent problem, that you can solve with your innovation. The more pain they experience from this problem, the bigger your chances of success.

b. The segment, by virtue of its other connections, will be an entry point for other segments. This is the strategic part of the choice, for the long term goal of conquering the whole majority market.

An example for the importance of the experience of an urgent problem for selling the passive house concept, is the following. Sellers of the passive house concept often emphasize to potential buyers that by making a one-time investment, they will significantly reduce their monthly energy bill. It turns out that many people, that can easily pay their monthly dues, do not care for this argument. It is not an urgent problem and it does not cause them any pain, so it does not stimulate them to buy. As a seller, it is a waste of energy to try to convince them with this argument. The same goes for the argument of being environmentally responsible by using the passive house concept. For visionaries environmental issues can be an urgent problem that causes them a lot of pain. For many in the mainstream markets it is considered a problem, but not so much theirs, and it causes them little to no pain. So they don't care to buy on that argument and the seller wastes his energy in emphasizing it. The important thing for the seller is to find what the segment does really care for and offer the solution to that. If such a problem or pain cannot be found in the segment, it will not be conquered. Trying wastes everybody's energy. It is like trying to sell a delicious, high quality steak to a vegetarian.

So how can you find the urgent and aching problem with the potential customer?

1. One way is to (market)research the targeted segment of people. This will help you find a list with averages. It can help to determine the general strategy or the basic marketing approach. It is rather old fashioned and very expensive, but can still give some relevant information.
2. The second way is to ask the targeted people themselves in a direct way. Nowadays this can easily and cost effectively be done by interactively using social media to start a lively conversation with them, for example at content websites, with blogs or by joining specific forums. It takes some skill to do this but every company can do this themselves and create a great pond to fish in.
3. The third way is specifically relevant for the building party that is trying to sell their product or service to a potential customer in a one-on-one conversation, either by phone or in person. Selling starts with listening and asking questions. In 2014 in The Netherlands DNA in de Bouw has created several realtime learning experiences in this area. They invited a real potential customer to join in the learning experience and give feedback on the process. The first part of this process was of course the intake, where the customer explains their question and the suppliers try to win the trust so they get the deal. The most important feedback from the customers, time and time again was: "As soon as you start talking about the solutions in this first intake, my energy completely drains away and you loose me." It was a real eye-opener to the building parties present. And even when they heard it several times, they still often tended to repeat the unproductive behaviour. Most suppliers know so much and are so enthusiastic about their solutions, they forget to pay attention to the problem, they just start talking and talking and talking. About themselves and their solution. And 9 times out of 10, the way they present their solution does not

address that customer's specific problem and pain. And the customer does not feel heard and does not buy.

So the lesson here is: first explore the customers life, issues and emotions around the subject, empathize with it and only then, after all of this has been explored extensively, talk about possible solutions. It will then be much easier to adapt your story in a way that convinces the customer. In addition to the fact that he probably started to like you by then, because you actually care about him. It is not about you, the builder, with your great skills and solutions. It is all about the customer. Most building parties, especially the more idealistically driven, need to work hard on their sales skills. In our region we are now building capacity to help builders with these kind of skills in addition to the "hard skills".

Recently an interesting process innovation has been done by a company in The Netherlands. It can now manufacture a passive house in a factory and assemble its components at the building site in a few days, and finish the house in a few weeks. This type of finesse in production and delivery can be attractive to a pragmatist buyer. Also, it can lower prices which is crucial to reaching the mainstream market.

Another important factor for pragmatists is service level. Things should just work on delivery and if they do not, the supplier should get it fixed a.s.a.p. Speed of delivery and service standards have risen very much the last decades. This means that pragmatists will want this for the passive house too. In reality, this is many times not yet the case. A real-time example in The Netherlands: A contractor, not specialized in passive houses, likes the concept and decides to do a project for starting home-owners. The project is realized and the owners have been living there for about a year. When asked for their experiences some of them say the top floor is too hot in summer and they cannot heat their ground floor office enough in winter. They went to the contractor, who checked things and then stated that except for a special intervention to raise the heat on the ground floor in winter by blowing in hot air, there was not much they could do. And that was it. Another pragmatists nightmare? These home-owners stated it was okay to live there but they would probably not choose a passive house again. And they probably tell their friends too. This incident is not on its own. Installations that do not work as planned and other disturbances are fairly common in The Netherlands, especially when inexperienced or unknowledgeable building parties pick up the passive house concept. One solution to this might be a quality system (like certification), but it is also about the attitude of service towards the consumer. Maybe the builder likes to experiment, but should the consumer pay the price? And what price does the sustainable building sector pay because of this often lousy service level? It is not just this customer's opinion that is affected, but also the opinion of the people in his or her network. And with the social media, that can be a very big network.

In the Netherlands and in the region Arnhem-Nijmegen, we are still at the beginning of considering and acting on the issues above. But some steps have been taken and are listed below.

3.1 *Initiatives by the regional and local governments to create demand*

[redacted]Province of Gelderland hosted Dutch Green Building Week in 2014

To signal their green intentions and experiences to a wider audience the province decided to host this well known event in The Netherlands. Many regional projects were showcased and lessons learned were shared with an audience of government officials, businesses from the building sector and other building- or sustainability enthusiasts, either private or business. it got a lot of media attention, regionally as well as nationally.

[redacted]One stop shops as independent advisors for home owners

In 2011 a one-stop-shop for sustainable building was created in the center of Nijmegen. It was meant to promote sustainable building and give independent advise to home owners on this subject. The municipality co-financed this enterprise. Unfortunately it went bankrupt after two years. Allegedly one of the reasons for this was the fact that most home owners are not willing to pay for this type of advice. A recent research in Scandinavia on one-stop-shops confirms this view. Since January 2014 there is a similar private initiative for a one stop shop, the “E-novatiewinkel”, which takes a different approach business wise and is now slowly starting to grow. There is also a foundation “Energie Prestatie Loket” in Nijmegen with a comparable business model. It will be interesting to observe their experiences and gain more lessons learned on the subject of one-stop-shops.

[redacted]Stimulating primary schools to become sustainable

The province of Gelderland tries to influence primary schools in choosing for sustainable renovation and implementing renewable energy sources. A change of law in January 2015 has made schools responsible for maintaining their own buildings. This means that for some schools there is a good possibility to reduce monthly costs when investing in sustainable renovation and increase the air quality which, according to recent research, can have a profound effect on the children’s study results. There is at least one example of a school in the region that has used an ESCo to finance a sustainable renovation and is very content with the results. The lessons learned of this project are actively spread by the projectteam to inspire others.

During the Dutch Building Week an instrument was introduced for measuring the sustainability of schools, especially aimed at children: the BREEAM-NL Junior. Children of three primary schools in Gelderland have used this instrument during the Dutch Green Building Week to assess their own school. After this they discussed the results with the major of Arnhem, another government official from Nijmegen and some CEO’s from commercial businesses. This event signalled the starting point for a government program to stimulate all primary schools in Gelderland to become sustainable. Municipalities find their own strategies to reach this goal. For instance, plans are being made by the municipality of Nijmegen and DNA in de Bouw to organize an event in which the results for one school will be showcased and a scrumteam will publicly perform the integrated design process for this school. This way the advantages can be shown on a real life example and this may inspire schools to go down this path.

3.2 *Initiatives by suppliers to create demand*

Unfortunately marketing and actively creating demand is a severely underdeveloped area in the dutch commercial building sector. The government also does not

stimulate it in her activities around NZEB: the government emphasizes to the building professionals that the government will make sure that demand rises, but the building professionals should create concepts that can be bought once the market grows. Healthy entrepreneurship however demands an entrepreneur to completely take its own responsibility, also concerning creation of demand. The attitude and communication of the national and regional government does not stimulate this in The Netherlands at the moment. Many building professionals, maybe in response to this, just wait for the market to develop. This puts them in a dependant position, out of control. Hopefully the general trend in the sector, instigated by the economic crisis, of giving more attention to marketing (see also chapter 6), will spread to the suppliers of NZEB with RES.

4 CAPACITY FOR PLANNING, DESIGN AND CONSTRUCTION

Mlecnik states as one of his conclusions (p305): “A policy focus on improving the affordability and competitiveness of highly energy-efficient housing is not recommended while the market infrastructure is still being developed.”

This view is also reflected in a concern expressed by the government side in the Arnhem-Nijmegen region, that the government is working hard right now to improve demand, but as soon as demand will rise there is a problem on the supply side, especially with small local building parties. The concern is that the supply side will not be able to keep up with demand the coming years. One of the ways the government tries to influence this, is by the agreement “Stroomversnelling Koop” in which it challenges demand and supply oriented companies, big and small, to unite in the mission of improving sustainable renovations. Municipalities of Arnhem and Nijmegen are actively supporting this initiative and trying to encourage local market players to join. But, they also see that the market itself has to organize itself. That is why they have also been supportive of DNA in the Bouw, being a large and still growing initiative in the region to unite sustainable builders and spread knowledge.

Another signal from the market, picked up by consortia that are starting to try and sell NZEB concepts, is that potential buyers want to be shown what is possible, and preferably where it has been done before. It is not enough to be a set of talented building professionals as a consortium, the customer wants to see a concept before he buys. This means the supply market has to develop their skills for demand to be able to grow.

4.1 *The suppliers organizational challenge for serving mainstream markets*

Comparable to consumers, suppliers can also be divided in the categories of innovators, early adopters, early majority, late majority and laggards when it comes to innovation adoption. A lot of the current passive house suppliers in The Netherlands can be characterized as being in the innovator or early adopter category. They like to innovate and generally dislike industry standards, administration, common interfaces and adaptations to installed solutions especially when they are technically inferior. They are not likely to cooperate in compromises needed and can be disruptive to groups that do seek this out. Also when it comes to selling, people in these categories often have a talent for selling to visionaries and think big. But when they have to sell to the mainstream market it is often hard for them to relate to the interests of the pragmatists in that category and to find the motivation to develop a complete product package, including guarantees, service and standards and actually executing this.

This pattern has been visible in The Netherlands too. There is a gap between what current, often “innovator-type”, suppliers can offer now and what is needed to conquer the mainstream market. An example is described in the next paragraph.

<u>Creating unity and respect among different supply parties: round table sessions</u>

In The Netherlands there are a few separated “movements” that are actively promoting the passive house concept, usually built up around a few innovative, fairly idealistic and knowledgeable personalities. Although their basic philosophy is similar, there are also some differences in opinion between these people and movements about how to deal with certain practical or political issues. There has been a tendency during the past years to (publicly) express negative feelings or negative opinions from some of these parties towards others.

Some of them also refuse to talk to each other. One could say there are some clashing ego's present in the passive house scene. This is a serious barrier to the further spread of the Passive House concept for at least a few reasons:

- The general public will not gain faith in the concept by hearing parties quarrel over all kinds of issues related to it. It is not professional and reliable.
- The chance to achieve results with policy makers by lobby is reduced for the same reason: It is not professional and reliable.

It would be better to create a broad consensus or at least save the discussions for private meetings between the parties. For this reason DNA in de Bouw has initiated a round-table meeting in November 2014. All known relevant (supply) parties in the passive house movement have been invited. One prominent party has refused to come for the reason of not wanting to talk to certain other people there present. Purpose of this meeting is to create awareness for this issue and find a way to approach it collectively, a way that is beneficial to all parties involved. This could be for example to have regular round table sessions where important issues are discussed, where people get to know and respect each other despite differences and where a collective strategy is crafted and execution planned towards influencing policymakers and the market.

4.2 *Possible solutions for the supply side to develop competencies to serve the mainstream markets*

A possible solution can be found in actively approaching and involving companies from the early majority category in the passive house movement, companies that know from experience how to approach majority markets. In The Netherlands this is happening for example in experiments of housing corporations that involve big, settled building parties in creating energy neutral pilot houses, aimed to convince their renters to agree on their plans of deep renovation. Some of these pilots involve a passive house concept. Disadvantage of this approach is that the in-depth knowledge and experience of the innovative and early adopters suppliers, often small entrepeneurs, is rarely tapped. The result is that, for example with passive houses, mistakes are being made in design and execution, that could easily have been prevented by better consultation of experts.

Initiatives to bring these two types of businesses closer together and having them exchange knowledge and experience, should be welcomed. A recent initiative (September 2014) to do this has been de "stroomversnelling koop", a deal between governmental parties, supply-side parties and demand-creating parties which expresses the intention to, in the next two years, develop energy neutral concepts for a specific and very common type of house in The Netherlands and test these concepts by building pilots. By inviting big as well as small parties to join, it is hoped that fruitful synergies will develop. Unfortunately, this is not yet being strategically managed and chances are limited that the big companies, with such a different corporate culture from the small entrepreneurs, will actively seek out cooperation, or the other way around. This indicates what could be a valuable factor in the successmodel: for change agents to help organizations with such different characteristics to work together better and create synergy and viable business models. This is in fact related to the domain of alliance management, a fairly new and upcoming theme in the Dutch building scene.

It is also possible to bring “new blood” to the pioneering, often small, organizations: employees or managers that have the skills and personality to manage the transition from the early market to the majority market. This however requires a lot of leadership and cooperating skills from the (often “pioneer-type”-) owner of the pioneering organization. For most pioneering leaders and entrepreneurs this will be too much to ask. It would possibly be more rewarding and fruitful to appreciate the differences between all parties involved and seek out the best place and role for each. For example, maybe the pioneering organisations should just keep at pioneering and not changing their target audience towards the mainstream market. This however possibly means they cannot cash-in on their early market investments of research and testing. To resolve this issue innovative business models to for example profitably disseminate their knowledge towards bigger companies should be considered. Here too, process managers or change agents could play a major role, sponsored either by the companies themselves, by branche organisations or by governmental institutions. in The Netherlands we know of no initiatives yet that specifically address this issue.

4.3 *DNA in de Bouw expert meetings*

Association DNA in de Bouw organizes expert meetings to discuss all kind of aspects of passive building, energy neutral building in general, ecological building and renewable energy sources. For members of DNA (around 40 in 2015) these are freely accessible. Non-members can join twice for a small fee. On average there are two to three meetings a month. The attendance has grown from a handful of people per meeting in 2013 to at least 15-20 people per meeting in 2015, many of them attending on a regular and frequent basis. Part of the success has been to appoint a process manager for the meetings. This is someone who is not a building expert, but interested and active in the building sector and specialized in coordinating group processes. The advantage is that the meetings have become more orderly and this way more satisfying for the attendees. Experts have a tendency to dive into details and thorough discussions and sometimes lose track of the programmed subject completely. An independent process manager can bring them back to the topic, make sure the purpose of the meeting stays in sight clearly and keep it interesting for all.

4.4 *Scrumteams and Morphological Analysis: Social Innovation going hand-in-hand with the technical innovation*

Among the members of DNA in de Bouw there is a strong conviction that implementation of the passive house concept can only be completely successful when building parties also innovate the way they work together in the designing and building process. The passive house concept with renewable energy sources relies on the integration of knowledge and best practices from all disciplines involved. This means that the building parties should actively work together from beginning to the end, whereas the traditional approach means that the different parties get involved one after each other with a small overlap. The big question was how to structure this working together jointly from the start? The members of DNA in de Bouw have experimented with combining two methods of working together, that have proved their worth in other sectors. The method of “scrumteams” comes from the Agile approach in software development in the IT sector. The method of morphological

analysis originates in astronomy and rocket science. Both methods are shortly explained in the next paragraphs.

[redacted]Scrumteams

The Agile method of developing software systems was introduced as a response to the so called Waterfall method, that is widely in use in the building sector. The Waterfall method means that the following steps are done strictly sequentially: generating specifications, design, implementation, integration, testing, installation, maintenance. Critics of this method claim that this does not work in reality, mainly because specifications always change in the process, knowledge of specialized people in the execution is not used in the design phase and it takes a lot of time and energy to document all information in the process. Using another method can possibly prevent mistakes and rework, increase creativity, increase the delivered quality and reduce time and costs associated with the project.

Scrum is a form of agile development. A small multi-disciplinary team works together in short sprints called “iterations” towards the end goal. After each short sprint a result is delivered. A scrumteam contains the relevant experts and a scrummaster, all at the same level: there is no hierarchy. The scrummaster makes sure that all conditions are met for the team to work effectively and he or she makes sure the scrum process is followed correctly. Communication is open, direct, personal and informal. Documentation is limited to only that which is deemed absolutely necessary. The level of knowledge and skills of the different team members has to be high, because there is a higher risk involved in involving low or mediocre levels of specialists. The scrumteam meets daily for at least one very short session to check progress and issues. Also lessons learned are explicitly discussed very regularly.

[redacted]Morphological Analysis

This is a method of organizing and analysing information to find an integrated solution for a complex problem. It contains several general steps:

1. Defining the problem
2. Analysing the problem and determining the main dimensions that form the problem
3. Creating a matrix that contains all possible conditions for every dimension
4. Evaluating the possible solutions
5. Deciding on a solution.

For a building project this can mean the following.

In step 1 the question of the client is being explored and the ultimate problem defined. E. g. energyneutral renovation of building X within budget Y, complete lifecyclecosts staying at or below € Z,-- and the building has to be fit for lifelong use, et cetera.

In step 2 all relevant dimensions are listed in the matrix (vertically): e.g. foundation of the house, insulation, energysources, electricity, roof, …. The presence of different perspectives in the team reduces the chance of forgetting relevant dimensions.

In step 3 all possible solutions for every dimension are listed. For example: energy sources can be the existing electricity and gas grid, solar panels, heat pipes, central heating through wood pieces or woodchips, et cetera. The different perspectives in the team will enhance creativity and completeness in this step.

In step 4 solutions and combinations of solutions are explored, weighed against different criteria and discussed extensively in the team. The different perspectives enhance the depth and width of the discussion.

In step 5 the client will have a clear overview of the possible solutions, the pro's and con's of every possibility and how it scores at the relevant criteria. A choice can now be made.

An example of a morphological map is the illustration below.


Keuze matrix Energetisch renoveren
Project: FAM JONKER WOONHUIS
Naam:
Datum:
Grond idee:
ALLE INSTALLATIES IN HUIS OP DE RIJ
Pelletkachel
Zonneboiler
WKO warmtepomp
Elektrische spiraal
Houtkachel
BUITEN OPSTELLING
Tegenstroom WTW
Balansventilatie JAGA+ of Climalad
Breathing Window
ZONNE BOILER HEATPIPES
Elektrische geiser
Warmtepomp
Douche WTW
Zomernachtventilatie
Aardwisselaar
Grondbuis
Variabele temperatuur
LED LAMPEN
Smartgrid
Energie monitoring
Domotica
DC 24 VOLT
PV PANELEN
Regenwater opslag
Grijswatercircuit
Infiltratiebox
VACUUM TOILET
ZWART WATER
URINOIR
KEUKEN GRINDER
Hyfoftenfilter
DNA
De nieuwe aanpak in de bouw
PassREg

4.5 *The approach and learning process at DNA and the importance of culture for success*

At DNA an interdisciplinary team is formed, often starting even before the design phase, to investigate the customer's question. After the client's question has been explored extensively with the client, three or four sessions are planned using Morphological Analysis to discover all possible solutions, weigh them against specific criteria and help the customer make a sound decision. At important moments the client takes part in these sessions. Usually some time is planned between the sessions to let the new insights sink in before starting the next session. After a decision has been made, usually after the third or fourth session, the team starts a process of working out details and executing the plans. The integrated approach is maintained throughout the whole project until delivery. Of course in different phases of the project different knowledge and skills will be dominant in the process, but the complete team is at least involved in the relevant decision making during every phase. Lessons learned are discussed very frequently and the customer is also regularly involved in this.

Results so far have been very promising: a high customer satisfaction, reduction of total projectcosts, less failure (costs), increased creativity, increased teamspirit and little documentation burden. However, it has also been learned that the necessary culture to succeed with this method is not common practice yet in the building sector: A culture of complete openness, of continuous learning, of trust in and respect for each other and a lack of hierarchy. In the association of DNA in de Bouw this culture is starting to develop amongst the members. Non-members and new members often detect a difference in the way members communicate with each other compared to the general practice in the sector. As the association grows, it is a challenge to maintain and cultivate this vulnerable, evolving new culture and protect it from other influences, originating in the dominant building tradition. Like a Dutch saying explains: "Trust comes by foot and goes on horseback." Many lessons learned like this one have been documented already and are being shared on a regular basis, among existing members and towards new members or outsiders.

4.6 *Changing attitude and behaviour amongst the craftsmen and –women in building*

The building tradition in The Netherlands has historically evolved from the principle of "sitting cosy and warm around the stove and have natural ventilation". Although comfort is suboptimal in this scenario, many builders have a conscious or unconscious conviction that one should not be too precise in building, because then natural ventilation is guaranteed. There is no culture of thoroughness and precision and the emphasis on craftsmanship has decreased in the past decennia. There is also very little societal (and financial) appreciation for craftsmanship. As the success of the passive house concept is also based on craftsmanship and precision in the execution, it does not automatically resonate with the average builder or even consumer. Even politicians scare away from making policy and law too strict. They rather leave responsibility in the market and take the role of inspirators and facilitators. This strategy also fits with the general Dutch culture of not wanting to be told what to do: we can be a rather stubborn people. This is an important issue to consider when

developing a strategy for implementing the passive house concept on a broad basis in The Netherlands.

Many architects and building engineers developing a passive house project, have difficulties managing the contractors in the quality of execution. Sometimes this has a severe negative effect on the end result, for example on user comfort and the performance of installations. There are very little contractors and craftsmen educated in passive house technology and regular parties often cannot rightly value the importance of precision. Some contractors that do understand scare away from the risks they associate with this precision: the dominant Dutch building and contracting culture is usually not about sharing risk but about blaming and suing the other involved parties. Combining this factor with the fact that is hard to convince craftsmen to be precise and not being able to look over their shoulder on a daily basis, some contractors rather decline the opportunity to build passively. This is in fact a leadership or management issue that could be approached by sharing knowledge and skills on how to select, educate and motivate your staff and on alternative ways of contracting, partnering and cooperating in integrated teams.

Another approach could be to emphasize the economic chances to market parties of becoming a competent niche player in this: financial rewards can be profound. At least one contractor in The Netherlands that specialised fully on the passive house technology has seen his profits rise rapidly because of this decision. The same happened to a contractor that chose a specific biobased approach as his core business. Stories like his should be analysed for lessons learned, communicated and used as stimulation for others.

4.7 *Training of regional stakeholders*

Current Situation in The Netherlands

In the Netherlands Passive House training opportunity for builders, craftsmen, architects and constructional engineers is very scarce and active players in this field have not managed to install a successful training program until now. Some incidental courses took place, provided by Saxion Hoge School, Stichting Passief bouwen and Bouwnext and seminars where given by several Passive House experts. People normally do trainings abroad at e.g. Passiefhuis Platform (B) or Passivhaus Institut (D).

KERN: a private and national initiative to educate suppliers in energy-efficient retrofit and new building

For this reason some of the members of DNA in de Bouw have taken up the initiative to cocreate with some educational parties, an independent platform for knowledge and skills in passive building: the foundation KERN (Knowledge institute Energyneutral Renovation and New building). It has been officially founded in 2015.

The objective of KERN is to make knowledge of Passive house design easily accessible to the Dutch building-sector, to collect knowledge, to provide trainings and to support a high standard certification- issuance for Passive houses and PH-retrofit. All knowledge and advice is independent and based on facts, there will be no influence of commerce on the subject material. The topics offered in the curriculum vary from very practical instruction to scientific theory to soft skills like integrated project development. To emphasize the independence of this institute it has taken the legal form of a foundation. The founders find

this independence important because until now many of the courses in The Netherlands have been given by suppliers, who have an interest in selling their own product. Also the courses until now have been splintered, they did not fit into a clear curriculum. The foundation should signal to the suppliers (and the market) that passive building is a coherent set of techniques, materials and methods and is a thorough and mature way of building.

Target groups

Considering that the whole sector, from planners to executing professionals, deficits training, the institute aims to serve the entire range of professions in the building sector: project developers, architects, contractors and installers as well as electricians, plumbers, masons, other craftsmen, et cetera. Supported by the PassREg program the institute will first start to provide courses to the craftsmen. Later on additional courses will be organized for designers and architects. Also the institute will contribute to spread free accessible information to all interested persons and organizations. Certificates of Passive Houses and PH-retrofit will serve investors and homeowners.

Craftsmen-course

The institute supports a network of approximately 45 education centers with knowledge and trainers. In cooperation with the knowledge and advisory center for the building- and installation sector an obligatory study module will be developed. This study-module can be offered by regional education centers (ROC). The education centers can thereby extend their curriculum with passive house related courses.

Train-the-trainer

In the first stage trainers of KERN can provide this module within any possible education center. Quality of education material and experienced trainers can thereby be guaranteed. In the next stage new local trainers will be trained by KERN to teach this module. The company Bouwradius is the partner in this project making the link between the institute and de education centres. Bouwradius is a nationwide education centre for the building sector.

Designers-course

KERN will cooperate with higher technical schools and universities to install certified courses for the senior-professionals. Therefore some coordination with already existing course-providers and the PHI will have to take place.

Other stakeholders

Besides the courses, information conferences will be organized in cooperation with for instance local authorities and financial organizations, to inform interested house owners and people with building plans about the benefits of low energy housing.

Building certification

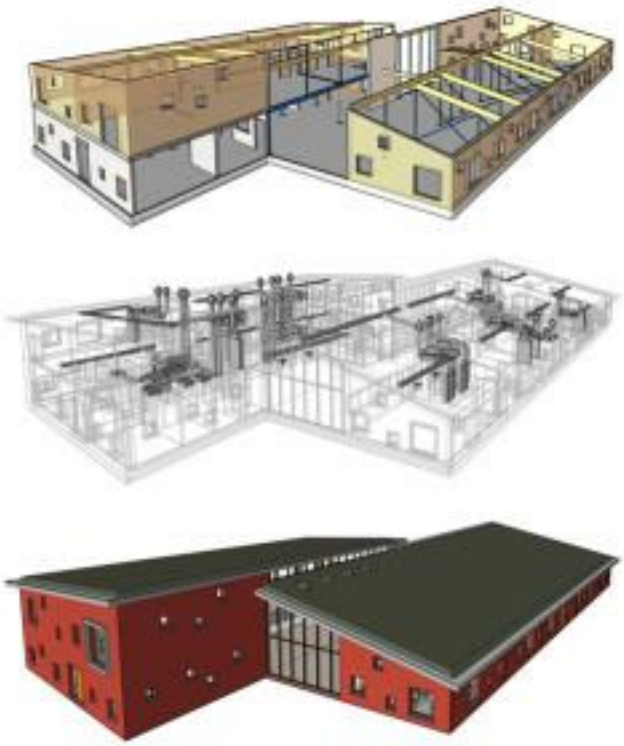
In cooperation with Woningborg, a national association for quality-assurance, and with the Passive House Institute, KERN aims to create a streamlined Building Certification, adapted to the Dutch building practices and with a high quality of the certification process.

5 SUCCESSFUL PRACTICES: BEACON PROJECTS

There are quite some beacon projects in the region of Arnhem Nijmegen by now. Mainly privately initiated. Some examples are shown in this chapter. For a more complete list one can turn to the passregsos. DNA in de Bouw lobbies for the government to do more of their own building projects, renovation and building of government buildings, according to passive house or NZEB principles. This could really be beneficial for forming public opinions. So far this has been slow to be picked up, even though the regional government has been a gooed partner otherwise in the PassReg project.

5.1 *Veldhuizer School in Ede*

One of the first schools in The Netherlands that is built in accordance with the Passive House standards and uses renewable energy source (heat-pump). Delivered in september 2011.



5.2 *Generation-living complex in Estate Oosterhout*

Three detached and three semi-detached houses were built with the purpose of having several different generations live with each other. The houses were built according to Passive House principles, and the three detached houses have been certified by PHI. Materials used were mainly biobased and energy is provided by a woodchip stove, solar panels and solar collectors. Delivered in 2014.

5.3 *Residential care complex in Vroomshoop*

Inhabitants of this complex are people with a mental or physical disability. It contains 21 appartments and several common facilities such as living rooms, a kitchen and an office space. The building has been built in accordance with Passive House principles. It's energy supply is largely renewable: solar panels and (air-) heat pumps. It was delivered in april 2014. Inhabitants pay only €6.50 per month on

heating. It has received a lot of media attention since then, which makes the building an important milestone in spreading the NZEB principles.

5.4 *Energy efficient renovation of a monumental bakehouse from 1700 in Erichem*

This project is a great example in The Netherlands that renovation according to passive house principles is possible even with very old, monumental buildings. This small bakehouse after renovation no longer had a gas supply, but takes its needed energy solely from the sun. It was delivered in 2014.

6 PUBLICITY AND PUBLIC SUPPORT

6.1 *Publicity in general*

In general it can be said that there is still a lot of improvement possible in The Netherlands, and in the region Arnhem-Nijmegen, when it comes to informing the public on Passive Houses with RES and NZEB in general.

Parties that could take initiative in this include the (national, regional or local) government, building professionals and organizations and all sorts of interest groups. During the PassReg project DNA in de Bouw has given a lot of attention to communication, as is described in paragraph 6.3. The regional government is still modest; even when they have a great project, they regularly “forget” to seek big publicity for it. For example the projects GWLO and De Groene Oever are quite ambitious in energy performance but somehow the large communication initiated by the government is not there. This is a missed opportunity and could be addressed in the coming period. The national government, especially with the program “Stroomversnelling”, does manage to gain a fair bit of media attention, which helps to get NZEB and RES on the radar with the general public as well as building professionals.

Commercial organisations in the building sector are historically deficient in marketing and communication. This also shows in the passive house domain. The sector is however waking up to the fact that marketing and communication should be a vital part of any commercial organization. More and more attention is given to this, but it is still in general only in the start-up phase and not matured yet.

In the search for a successmodel, the theory described in the next paragraph was discovered in the literature, and might be of help to any stakeholder seeking to improve the implementation of passive house (NZEB) with RES. It describes some drivers that can be important to integrate in a communications strategy for innovations.

6.2 *A little theory as a possible guide on the road to successful communication*

The adoption of an innovation, according to Rogers in his book “diffusion of innovations” (1962, 2003), happens after a so-called innovation-decision process. The consumer goes through these steps before deciding adoption of the innovation:

1. Experiencing a need that the innovation might fulfil

2. Knowledge of an Innovation
3. Forming an attitude towards the innovation (phase of persuasion)
4. Making a decision to adopt or reject the innovation
5. Implementing the decision to adopt or reject
6. Confirmation of the decision

In each step the consumer needs a specific type of information to be able to do the step.

Mlecnik (2013, p.113) gives some examples of that required information specifically for energy efficient building, based on research on web platforms providing a housing renovation portal:

Ad 1 (experiencing a need):

Without a need it is very difficult to sell anything, including an innovation. Regarding passive houses it could be a need for comfort, for financial savings, for contribution to the environment et cetera. The more urgent the need, the easier it is to get to step 2.

Ad 2 (knowledge of an innovation):

Example of questions to be answered in this phase: What counts as a deep renovation/integrated renovation? What solutions are available?

Ad 3 (forming an attitude):

Why should I do integrated/deep renovation? Why should I choose this compared to what I had in mind? What experiences do other home-owners have with these types of renovations?

Some characteristics of innovations that influence the adoption are:

- the relative advantage: compared to alternatives
- the compatibility: with existing values, norms, past experiences and needs
- the complexity: perception of how easy to understand or use
- the demonstrability: may it be experimented with on a limited basis?
- the visibility: the degree to which results are visible to the members in social system

Ad 4 (making a decision to adopt or reject):

Where can I ask for price quotations? How can I compare, choose, reject offers? What needs to be specified in a contract proposal?

Ad 5 (implementing a decision):

How should I plan the intervention of actors? What questions do I have to ask during the works to check the quality?

Ad 6 (confirming a decision):

How can I express positive or negative experiences?

Channels of communication should somehow address these factors for consumers and provide the information when they need it: price quotations and quality issues are not relevant yet for someone that has only just heard about the existence of the innovation. The regional events mentioned in the next paragraph, organized by DNA in de Bouw, are mainly

targeted for the first two phases of the decision process: gaining knowledge and forming an attitude. And a little for the decision of acceptance or rejection of the concept. Other communication efforts are needed to convince consumers to take further steps.

It would be beneficial to further develop the communications strategy within the roadmap incorporating some insights from the theory described above, for instance concerning the creation of a market of buyers for passive houses. With a little creativity in the exact information that should be offered, the model also seems applicable to convince other stakeholders like policy makers or suppliers, of the value of passive house technology with RES.

6.3 *DNA in de Bouw*

DNA in de Bouw plays an important role in communication and publicity about passive houses in the region. A communication expert is member of the board and of the PassReg team. Only during the project we discovered how fundamental such a specialism as communication was for overall success.

DNA regularly organizes several events to get more information to the public about passive houses with RES.

1. Once a year an “open house route” with passive houses opening their doors for people that are interested either privately or professionally, so they can experience passive houses and talk to the owners about their experiences.
2. Once or twice a year a fully organized excursion for professionals and government officials, where experts share in-depth knowledge about the passive buildings that are visited. Beside sharing and gaining knowledge these are good networking events and inspirational.
3. Free advise on sustainable renovations/building for private home owners, given by a multidisciplinary team of usually architect, contractor and installer. This has been organised for the first time in 2014. Many home-owners made use of this offer and it generated a few serious leads for the participating building parties. In general the home-owners were positively surprised by the value of such an integrated advice in sustainable building: it made them more conscious of possibilities and risks. DNA is planning to make this a returning service throughout the year, thereby enhancing public consciousness and at the same time generating leads for its members.
4. A regional conference on sustainable building and renovation, with specific attention for the passive house concept is being organised once a year. It has grown to 200 visitors in oktober 2014, a mix of private home owners and professionals in the building sector, varying from entrepreneurs to housing corporations to government officials. The event has a plenary programme, a business market and some high quality workshops on a range of subjects related to sustainable building. Some subjects were mainly interesting to professionals, others to home owners. At least two professional magazines paid serious attention to the last conference by publishing an article. A lot of networking happened and visitors evaluated the event in 2014 as informative, inspiring and already more professional than the first edition in 2013. The organizers talked about a vibe being felt, “something is moving in the region”.

5. In 2014 a 10-point manifest was developed by DNA in de Bouw on why energy neutral building is necessary NOW. It was officially presented at the conference and handed out to one of the important stimulating government officials in the region. It created another "official moment" to spread DNA's mission and vision towards the public and professionals. The manifest is something that can be used for PR activities more often and is intended to communicate social engagement as well as professionalism.

6. DNA has published the so called "Ontwerppakket Energetisch Renoveren" (Design package energy renovation") and sells this to building parties. It contains a complete set of materials for 5 sessions of morphological design in sustainable building or renovation. All materials are very nicely designed and produced in high quality. It is a tool that helps to make the integrated design process more efficient and it also helps the customer in decision making. Because of the professional look and feel it is also a little extra step in convincing the customer of the thoroughness of this approach.

Very important part of the communications plan of DNA are the use of social media. DNA in de Bouw has a big and still growing list of subscribers to their weekly newsletter, members and non-members. In this newsletter important news and events are published and subscribers are encouraged to join in. Also there are regular, good quality press releases for the local press. It keeps DNA on top of mind with them and events usually get good coverage in newspapers and/or magazines, varying from announcements of events, to background articles on projects or reports from events. When asked how they came about a certain event, visitors almost always reply it was through the newsletter.

7 ROADMAP

7.1 *The road ahead/main challenges*

Many challenges are still ahead of us. Maybe the most important one is the public and professional opinion or view of the concept of Passive House. There is still misunderstanding about what it is and about the reliability and performance of passive houses. Also there are still many people to whom the concept is unknown. In the near future a strong marketing and communication effort is crucial, based on experience and fact, and directed towards appropriate target audiences. For longterm success in the mainstream market, the public must embrace the concept as fulfilling their needs and being a competitive alternative to traditional and other sustainable concepts. Another challenge is the process management of all stakeholders in the region towards NZEB and uniting their interests towards a common goal. To name an example; energy companies are an important sparring partner for the regional governments in sustainable district development. Energy companies are privatised in The Netherlands, which means that for their success they are dependant on energy use: if nothing changes, large scale implementation of passive houses can be seen by them as a threat to their existence in the long term. Yet another challenge for successful

implementation of the passive house concept is the dutch building standard and culture amongst suppliers. Integrated design and building processes are not yet the norm in any building discipline and this requires different projectmanagement processes and a different culture from what suppliers are used to. Also suppliers in general have very little theoretical and practical knowledge of passive house design and building. Adoption of the passive house concept on the supplier side is crucial to deliver enough quantity and quality when demand rises. Marketing the concept towards suppliers and providing solid educational opportunities in the near future therefore is crucial.

7.2 *The road ahead/ main opportunities*

Fortunately there are quite a few opportunities along with the challenges. The political climate in The Netherlands is favorable because of the EPBD recast. Also sustainability has become fashionable in general: the passive house concept could benefit from this if we succeed in improving its image. Many national, regional and local governmental programmes and funds are being targeted towards innovation in energyneutral building practices. In The Arnhem Nijmegen Region a strong network has been formed from local suppliers in sustainable building: DNA in de Bouw. This network provides a platform for building professionals for sharing knowledge, can serve as an independant sparring partner for the government representing local SME's and can play an important role in informing the general public about NZEB and the passive house concept. More and more experience is being built in financial solutions for the higher initial investment costs of NZEB, for example in the form of ESCo's. On the other hand, because of strong national attention through the governmental program Energiesprong (and as a part of this: de Stroomversnelling), investment prices are being lowerd quickly, because building professionals are challenged to become more efficient in their process. An independant knowledge institute specifically for NZEB has been founded in 2014 in the Arnhem Nijmegen Region, to provide training for designers and builders. And a significant amount of beacon projects has been realized, which already serve as a basis for inspiration and education in the region. To conclude, we have an opportunity to share our lessons learned with other regions in The Netherlands and help them benefit from our journey.

With the strategic insights and experiences gained from the PassReg project, we are well equipped for the years to come to build on the results so far and to eventually reach the mainstream market with the passive house concept.

Summary of the issues (still) to be targeted in the years to come:

1. Marketing the Passive House concept towards specific target groups of buyers.
2. Marketing the Passive House concept towards suppliers.
3. Educating suppliers in applying Passive House principles and techniques.
4. Supporting entrepreneurs in sustainable building on the supply side, to increase their entrepreneurial skills and so become more competitive in the building market.

5. Marketing a PHPP-like tool, based on objective building physics, to become standard instead of the often opaque norms now in use.
6. Managing the process of uniting national and regional stakeholders towards the NZEB goal.
7. Uniting all Dutch Passive House organizations towards the goal of raising demand for PH / resolving current conflicts.
8. Experimenting with and promotion of viable methods of integrated, multidisciplinary processes for designing, building and maintaining NZEB's: this should become the new standard way of working
9. Transforming the existing building culture towards the level of craftsmanship and precision needed for creating qualitatively sound NZEB's.
10. Creating model contracts that are well suited for an interdisciplinary approach of designing and building.

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