# An Energy Expedition

## Experiences of a Dutch collective of house owners aiming for energy neutrality

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## Abstract

The municipality of Apeldoorn had polled the interest among its private home-owners to turn their homes energy neutral. Based on the enthusiastic response, Apeldoorn saw the launch of the Energy Apeldoorn (#ENEXAP) in 2011. Its goal was to convert to it technically and financially possible for privately owned homes to be refurbished and to energy neutral, taking the residential needs and wishes from occupants as the starting point. The project was called an Expedition, because although the goal was clear, the road to get there wasn't. The Expedition team comprised businesses, civil-society organisations, the local university of applied sciences, the municipality of Apeldoorn, and of course, residents in a central role. The project was supported by Platform31, as part of the Dutch government's Energy Leap programme. The #ENEXAP involved 38 homes, spread out through Apeldoorn and surrounding villages. Even though the houses were very diverse, the group of residents was quite similar: mostly middle-aged, affluent people who highly value the environment and sustainability. An important aspect of the project was the independent and active role residents played. In collaboration with businesses and professionals, through meetings, excursions, workshops and by filling in a step-by-step plan on the website, the residents gathered information about their personal situation, the energy performance of their home and the possibilities available for them to save and generate energy themselves. Businesses were encouraged to develop an integrated approach for home-owners, and consortia were set up by businesses to develop the strategy, products and services needed to meet this demand. On top of making minimal twenty from the thirty-eight houses in the project energy neutral, the ultimate goal was to boost the local demand for energy-neutral refurbishment and encourage an appropriate supply of services, opening up the (local) market for energy neutral refurbishment. This paper will reflect on the outcomes of this collective in the period 2011-2015.

**Keywords:** Energiesprong, #ENEXAP, LALOG, energy efficiency, local energy initiative, co-design

# 1. Introduction

As a result of the ongoing trend of individualisation, people are eager to actively influence and shape their own environment (Oostra, 2013). This paper will describe a case study in which owner-occupants did just that, no longer waiting until professionals were ready to deliver the kind of services and offers they wanted. The case study described in this paper was a recent Dutch project, part of Energy Leap (Energiesprong), an innovation programme commissioned by the Dutch Ministry of the Interior and operated by Platform31. The programme ran until the end of 2014, although parts were later extended to the end of 2015. The aim was to make various types of buildings energy-neutral and to boost large-scale initiatives. In the sub-programme LALOG (Lokaal Alle Lichten Op Groen) the owner-occupants themselves were looking for ways to challenge professionals to make their homes energy-neutral. The LALOG sub-programme provided support to groups of owner-occupants in six municipalities: Apeldoorn, Wageningen, Den Bosch, Hoorn, Amsterdam and Amersfoort. Goal was to convert at least 20 homes in each of these municipalities to energy neutral. It was a process of learning by doing by residents, builders, municipal officers, installation contractors, appraisers and other professionals. In this paper we will focus on the experiences of the Energy Expedition in Apeldoorn, also known as #ENEXAP.

# 2. Theoretical framework

There are basically two main bodies of knowledge relevant as theoretical framework. One is the literature on innovation management in which innovation is seen as a combined technological and economical phenomenon looking at companies (e.g. Von Hippel 1986, Chesbrough, 2006), entire supply chains (e.g. Vrijhoef, 2011) or the industry as a whole (e.g. Lundvall, 2008). Most relevant in the context of the case study are the theories focussed at upscaling from an innovative technological niche towards uptaking in the current regime (Strategic Niche Management (SNM)). The other body of knowledge relevant for this paper is the world of grassroots innovations and community action directed at fundamentally rethinking all aspects of our current society in order to build an intrinsic sustainable way of living. These two knowledge domains not only represent two different scientific communities, they represent fundamentally different groups of people with distinct discourses and practices in real life as well.

## 2.1 Innovation management

For innovation at the level of (a part of) an industry, the term transition is generally used. The perspective of social-technical transitions has emerged from evolutionary economics (Nelson & Winter, 1977; Dosi, 1982). From studies of former mayor changes in society e.g. the transition from horse carriage to rail and steam trains, from cottage industry to mass fabrication, insights have emerged regarding the importance of experimentation, multi stakeholder learning, coevolution of technologies, new ways of organisation, rules & regulations and financial systems. This resulted in theories of Strategic Niche Management and Multi Level Perspective (Geels & Kemp, 2007; Loorbach & Rotmans, 2006), which can be used to analyse current innovations. The rationale in these theories is that innovations start in specific niches, but their

further development is highly dependent on other changes in the different societal levels (micro, meso and macro). SNM describes emerging innovative niches becoming mainstream in combined dynamic social and technological systems.

The innovation management perspective focuses on the formation of niches in which innovations can flourish. In this perspective, residents would learn to use their purchasing power to get the innovations they want, in order to be able to improve the energy performance of their homes towards energy neutral. According to Strategic Niche Management, three additional processes are important when developing a successful technological niche (Kemp et al., 1998):

- The articulation of expectations and visions that would provide direction to the learning process of parties involved. The expression of visions and expectations would also help to attract attention from the necessary stakeholders and legitimate their involvement and support.
- Construction of social networks. Interaction between different stakeholders is needed to collect the required resources (time, expertise and money) and commitment.
- Learning on multiple aspects: (1) Technical aspects and design specifications, (2) Market and user preferences, (3) Cultural and symbolic meaning, (4) Infrastructure and maintenance networks, (5) Industry and production networks, (6) Regulations and government policy and (7) Societal and environmental effects.

## 2.2 Grassroots innovations & community action

Until recently, the attention for innovation from the voluntary sector and local communities was not really taken into consideration despite decades of initiatives at local level. As a result, little is known about the success factors and the way these grassroots innovations take place. The innovation in these bottom-up initiatives consists mainly of social innovation. Seyfang and Smith (2007) define grassroots innovation as follows:

> *"Grassroots innovations are networks of activists and organisations generating novel bottom-up solutions for sustainable development and sustainable consumption: solutions that respond to the local situation and the interests and values of the communities involved." (Seyfang & Smith, 2007, p.585)*

Local initiatives usually construct alternative systems in which production, distribution, marketing, retail and consumption are connected in a novel way. Since the publication of the Limits to Growth report (Meadows et al., 1972) environmental movements emerged that experimented with different ways to minimize their ecological footprint. Inspired by Schumacher's 'Small is Beautiful' (1973) pioneers also addressed housing with appropriate technology, i.e. adopting a scale and complexity of technology appropriate to its setting. Seyfang and others translated the conclusions of their academic work in ten important statements directed at policymakers in relation to local energy initiatives, aiming to support innovation from these local initiatives. Community Energy is (grassrootsinnovations.org):

1. Critically important for sustainable (energy) transitions (Hielscher et al., 2013)
2. A diverse, growing, grassroots-led movement (Seyfang et al., 2013b)
3. About more than just sustainable energy (Hargreaves, 2012)
4. Thrives on local enthusiasm, but can't rely on goodwill alone (Hielscher, 2013)
5. As much about soft skills as well as hard technology (Seyfang et al., 2013)
6. Not yet being taken seriously enough by government (Seyfang et al., 2013)
7. Connected to community and sustainability networks (Seyfang et al., 2013)
8. Benefits from strong support networks and organisations (Hargreaves et al., 2013)
9. Reaches parts of society the private sector alone cannot reach (Martiskainen et al., 2013)
10. Demands flexible and tailored policy support at all levels (Hargreaves et al., 2013)

### 2.3 Integrated framework for analysis

The two frameworks of innovation management and grassroots community action were integrated into one integrated framework to analyse #ENEXAP:

- Articulation of expectations and visions
- Construction of social networks: (1) Diversity of actors, institutional forms and activities (2) Social capital (networks of support), human capital (skills), organisational capital (know how), financial capital (3) Contacts on local, regional and national levels an (4) Sector support infrastructure
- Learning on multiple aspects: (1) Technical aspects and design specifications (2) Market and user preferences (3) Has different meaning to the people involved (4) Infrastructure and maintenance networks (5) Industry and production networks (6) Regulations and government policy, and (7) Learning by doing, face-to-face support and mentoring.

## 3. Purpose & methodology

This paper will reflect on the outcomes of the collective in Apeldoorn. The subsidized #ENEXAP project ran in the period 2012 - December 2014. The period that is described in the paper is October 2013 until June 2015. The description of #ENEXAP case is based on the authors' experience as part of the initiative. Oostra was member of the #ENEXAP board from November 2013 until April 2015, Been was secretary and resident advisor for #ENEXAP from March 2013 until June 2015. The material on which the analysis is based derives from action research, board meetings, occupant meetings, meetings with Energy Leap, study meetings for the companies and conversations with people related to #ENEXAP. First a general description of the case study will be made. The next sections will be dedicated to the description of the results and the analysis of the results before ending with the summary.

# 4. Case description of Energy Expedition Apeldoorn

In 2011, Apeldoorn saw the launch of the Energy Expedition Apeldoorn (#ENEXAP). The municipality of Apeldoorn was curious to find out how many of its residents were interested in making their homes energy neutral, and placed an announcement in the local newspaper, 'Stadsblad'. A large group of owner-occupants came to the meeting. This resulted in a group of 33 households that started as part of the Expedition in May 2011, growing to 38 households during the process. The Expedition was supported with a LALOG subsidy from 2012 until December 2014. LALOG's direct goal was to refurbish a minimum of 20 homes making them energy neutral, taking as starting point the input from occupants. The overall ambition was to make it technically and financially feasible for owner-occupants to retrofit their home, starting with this small group and from there on boosting the local demand for energy-neutral refurbishment and encourage an appropriate supply of services. The #ENEXAP team comprised of local residents, businesses, civil-society organizations, the municipality of Apeldoorn and the local University of Applied Sciences, Saxion. These different groups al played a constructive role in carrying out the Expedition. Owners fuelled professionals with their ideas and wishes; professionals helped owners to make their wishes achievable. In the next paragraphs, the roles of the key players in the Expedition are described.

*Table 1: Roles of the different stakeholders in #ENEXAP*

| **Stakeholder** | **Role** |
|---|---|
| *Owner-occupants* | *(1) The occupant-owners played an active and vital role in shaping the process. The board of #ENEXAP consisted merely of residents. After the founding of the Expedition, residents formed working groups, which were started to address different relevant issues. (2) Residents actively monitored the energy consumption in their own homes. They put a lot of effort in making their residential wishes explicit. They were guided in this by a course and a specially developed step-by-step plan. (3) Residents were actively involved in the development of solutions by professionals.* |
| *Advisers* | *(1) Several professionals brought in their knowledge on sustainability by presenting on one of the meetings for occupants or by giving a tour. Because of the innovative character of the initiative they were often willing to do so for free. (2) Additionally professional support was hired for organisational issues, but also for communication strategy and the development of a magazine. Professional support was also hired for executing three EPA Super Luxurious analyses, matching financial advice and support for the Board.* |
| *University of Applied Sciences* | *The university was asked to develop and organize two courses to the residents as well as the consortia. The first course was intended to help the occupants to articulate their requirements, how to formulate these to professionals and how to weigh different solutions e.g. financially with the principles of Total Cost of Ownership. During the course for professionals the focus was on how to deliver an integrated offer to this specific group of clients. A second course for professionals was directed at how to make an energy fingerprint of a dwelling, how to respond to a wide range of demands from clients by using principles of mass-customization and what is involved in providing a warranty on energy performance after a retrofit. The university was also part of the Board.* |
| *Companies & consortia* | *At first large contractors were linked to #ENEXAP. They dropped out because their primary interest in larger building assignments, e.g. block by block retrofitting of terraced houses with a high level of standardization. In the Expedition however, the houses are of varying types, spread around Apeldoorn. The companies that remained linked were local SME's. They made integral plans for energy neutral refurbishments, which was highly challenging for them, because of a lack of knowledge necessary for these assignments. #ENEXAP handed the SME's knowledge through courses and contact with a group of interested clients.* |
| *Energy coaches* | *The energy director helped residents to make a choice for the consortium that fitted their requirements best and helped owner-occupants in requesting quotes and the evaluations of these bids. The energy director was meant to be the intermediary between owner-occupant and companies. An auditor was appointed as supervisor to offer extra safety for the participants, by providing an extra check on the plans. In practice the roles of energy director and auditor were combined. For the residents group coached by a specific energy director the other functioned as auditor, and vice versa. Instead of 'energy director' and 'auditor' the name of 'energy coach' was therefore more appropriate.* |
| *Municipality* | *(1) The municipality proved to be an important party since they took the initiative for the start of the* |

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|---|---|
| | *Expedition. They decided to make an inventory of residents interested in energy neutrality. (2) They were also the party that applied for a LALOG grant (€ 285.000) that was combined with money from SLOK (€ 33.265) and money from the municipality's budget (€ 6.000). Also money from the EU project ACE was available for product development and feasibility studies (€ 84.500) (Apeldoorn, 2012). (3) The municipality was part of the Board of #ENEXAP and (4) formed the link to the national energy programme.* |
| *Energy Leap* | *(1) Energy Leap organised several meetings to exchange information between the stakeholders in the municipalities involved in the LALOG programme. (2) Energy Leap also made links to other parts or parties in the Energy Leap programme that were of interest for #ENEXAP. For example the expertise was shared, that was being developed around the topic of energy performance guarantees (e.g. the standard contract) in Rapids, another sub-programme directed at dwellings. (3) Experts were invited to give presentations at either one of the occupants meetings, as part of the course made available to the local SME's or for special sessions. #ENEXAP was asked by Energy Leap to host one of the field trips for appraisers. In this field trip appraisers from around the country were asked to make an estimate of the dwelling before and after the retrofit in order to establish how an improvement in energy performance would translate in additional financial value of the dwelling.* |

# 5. Results

The overall result of the Apeldoorn Energy Expedition was that in June 2015, after being roughly four years en route, five houses were well on their way towards becoming energy neutral. Three consortia of local SME's were formed, and residents had started to save considerably on energy.

*Table 3: Goals of the LALOG program vs. results of #ENEXAP*

| **Goals of LALOG** | **Results of #ENEXAP** | **Remarks** |
|---|---|---|
| *To put owner-occupants central in the development program* | *Owner-occupants were in the lead.* | *This worked very well for focussing on the topics relevant for owner-occupants. It proved to be a hindrance for the continuation of the program after the end of the LALOG subsidy.* |
| *De-burden occupant-owners in their search of energy neutrality* | *The formation of a new consortium of companies focussed at the retrofitting of owner-occupant housing, training of 3 local consortia and the development of an approach that would fit both clients and entrepreneurs.* | *Proved to be difficult since the innovation leap required was very steep for the companies involved. These companies operated in a context were business and investment money was scarce. For them it proved to be very difficult to commit to the required product and process innovations.* |
| *20 dwellings energy neutral* | *June 2015 5 #ENEXAP houses were energy neutral or were in the process of becoming energy neutral.* | *It was not easy to reach this goal. There was only one other LALOG municipality that succeeded in realizing 5 energy neutral dwellings (Energiesprong, 2014).* |
| *Secondary – To integrate higher comfort level, healthier indoor climate and an increase of functionality with a considerable reduction of the energy bill* | *A combination with other requirements of the clients proved to be key during the program. Important additional requirements were: additional space, conversion of bathroom and/or kitchen and future proofing of the home.* | *It turned out, that the secondary goals of the LALOG program were essential to the occupant-owners. In case the consortia tried to eliminate an important secondary requirement of the client, the process came to a halt.* |
| *Secondary - Promote the use of environmentally friendly products* | *Attention was given to environmentally friendly products in presentations given at occupants meetings, in excursions and it was the expertise of one of the energy directors in #ENEXAP.* | *This was regarded as a matter of taste within #ENEXAP. To some of the occupant-owners this proved to be important, mainly because environmentally friendly products are associated with a healthy indoor environment.* |
| *Secondary - Increase of the value of the dwelling* | *This topic was not so much addressed in the sessions between occupants and companies since they themselves were not able to answer questions on this topic. Neither was the local broker.* | *This knowledge had to be developed. Energy Leap understood the importance of this question and organised two field trips of appraisers. One was hosted by #ENEXAP.* |
| *To draw a business case for the companies to allow for continuation of energy neutral retrofitting after the duration of* | *The following was developed in order to smoothen energy neutral retrofitting:*<br>• *Step-by-step plan for the occupant-owners as a* | *The companies were focussed on making money from the start, as this is the way they are used to do business. They were not accustomed to heavily invest in the* |

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|---|---|---|
| *#ENEXAP* | *means to aggregate all the information necessary about their homes and current energy consumption.*<br>• *A financial check and a website to structure and exchange of all the information gathered.*<br>• *Courses to help occupants to make their requirements explicit and for companies to be able to develop an integrated approach and matching offers.*<br>• *A one-stop-shopping approach towards clients, which includes scrum-sessions at the kitchen table with all disciplines present to draw up quickly a tailor-made solution.*<br>• *A coaching approach to support companies during their first assignments with clients.* | *development of a new (industrialised) market approach, while #ENEXAP was trying to focus on opening a bigger market on the long term for which new retrofitting concepts and approaches needed to be developed. For Energy Leap the experiences from the LALOG programme were a reason to design new subsidy programmes: Rapids Rental and Rapids Purchase.* |

# 6. Analysis & discussion

In this paragraph we analyse the case study by confronting process and results with the integrated framework introduced in paragraph 2.3.

## ARTICULATION OF EXPECTATIONS & VISIONS

The structure of the experiment was designed to support residents: the course, the interactions during kitchen table conversations, but also the discussions that emerged around presentations and excursions all helped to articulate expectations and visions. This stimulated the owners to aim high and ask for innovative solutions, be fitting their situation and demands, thereby stretching the abilities of the consortia. So the group of owners demanded innovation, but on the other hand they requested warranties on energy performance. This combination was hard on the consortia to achieve, however, the group would not let go of this high ambition.

## CONSTRUCTION OF SOCIAL NETWORKS

**Diversity of actors, institutional forms and activities** - In a period of three years, different groups of residents, professionals and intermediaries were brought together to work on the goals set: zero energy houses and fulfilled residents wishes, while at the same time paving the road for a widespread of retrofitting in the nearby future. This required bridging the gap between residents and professionals, which both speak a different language because of different knowledge levels, perspectives and goals. During the course of several meetings, workshops and excursions residents and professionals acquired knowledge, both technical and about the perspective of the other group, and learned how to fill in their role. In the mean time, several products were developed, from which the most important one is the step-by-step plan. In working groups, residents and professionals with different expertise worked together on specific themes. There were several working groups for technical issues, EPA Super Luxurious, finances and communication. The communication group made a website to monitor progress and to serve as a discussion platform. Courses were held to support both residents and professionals in finding their way. Outcomes were that residents could better articulate their wishes and needs, a new consortium was formed and approaches were developed for the professionals to be able to make multi-disciplinary offers.

**Social capital (networks of support), human capital (skills), organisational capital (know how), financial capital** - There was a network of similar initiatives like #ENEXAP with initiatives in Amsterdam, Amersfoort, Wageningen, Den Bosch and Hoorn, that met once in a while. Also there were discussions with the Energy Leap programme. This provided a network to exchange ideas and inspiration. It also helped to see that others were also struggling to meet the goals set at the beginning by the Energy Leap programme. Because of the diversity of actors involved, people willing to give lectures and advise, and money from the programme to hire missing expertise, knowledge and skills needed in development were available.

**Learning by doing, face-to-face support and mentoring** - The goal was clear but the road to get there wasn't. This fostered learning by doing. The pilot EPA Super Luxurious e.g. turned out not to work as it was intended. The contractors did not directly translate the reports written by energy advisors into matching offers. Instead these companies either presented alternatives to the solutions proposed, or just started the work all over again. Because of the community feeling, people remained focused on the goals, although it was sometimes hard to find the right course. The social network helped to keep the parties involved on track when confronted with setbacks. The local setting, the organized activities and the energy coaches made regular face-to-face support available for both residents and companies. The energy coaches were mentoring both residents and companies on how to formulate interesting offers.

**Contacts on local, regional and national level** - Local contacts were organised within the Expedition and by reaching out to the expertise required. Energy Leap, the municipality, Saxion and professionals involved provided contacts on regional and national level when necessary.

**Sector support infrastructure** – Additionally, the municipality made hours available from a civil servant. And of course there were as well hours available from the different (professional) volunteers. This made it possible to erect an infrastructure to support interested owner-occupants in converting their own dwellings to energy neutral as well as to support local companies interested in exploring this new emerging market. Most of this supporting infrastructure is already described above.

## LEARNING AT MULTIPLE ASPECTS

**Technical aspects and design specifications** - Technical aspects received a lot of attention in presentations at meetings, excursions and kitchen table conservations between consortia and owner-occupants. The kitchen table conversations and the first course helped in making the requirements from the occupants explicit. This formed the basis for the design specifications.

The Plugwise system was used to measure the consumption of electricity. It helped to create awareness on energy consumption necessary to operate different appliances in the home. For most people it was a complete surprise to see what the usage of a specific appliance meant, e.g. the electric boiler in the kitchen, the tap with boiling water or the electrical floor heating. This insight was essential to take further steps, e.g. changing equipment or just switching devices off.

**Market and user preferences** - The experiment can be seen as a way of developing a new market. #ENEXAP was an experiment, a pioneer project. The market was, and still is, learning how to accommodate clients' wishes and requirements when retrofitting individual occupant-owned houses to energy neutral in an integral way. At the same time, user preferences within this project proved to be very specific, being influenced by specific housing types and lifestyles. Therefore, every solution had to be tailor-made. For the companies involved it proved to be very challenging to develop matching supply for energy neutrality in combination with the other requirements. In board meetings it was also discussed that the consortia should integrate the wish of several occupants to think about combinations of professional work and DIY. The majority of the board saw this as a risk to overburden the consortia and the idea was therefore put aside.

**The initiative has a different meaning to the people involved** - The Expedition was about being adventurous: developing unexpected roads together, while enhancing sustainability. Owner-occupants had various reasons to take part in #ENEXAP. During the experiment it became clear that the idea of a sustainable, environmental friendly home with a small ecological footprint was an important driving factor, but not for all. There were also people part of the programme that were technologically interested, or focussed at reducing operational costs of living. This underlines outcomes of other research about the profile of people interested in energy neutrality (e.g. Hensen & Westerhof, 2013). For a part of the group it became a sort of hobby: improving their house, replacing e.g. lighting and refrigerator or just switching off a close-in boiler or waterbed, and sharing experiences with co-participants. The financial investment made by occupant-owners didn't need to be earned back completely by lower monthly energy costs; also the feeling of being part of this new, sustainable movement and acquiring more comfort or other functionalities were rewarding for the people involved.

**Infrastructure and maintenance networks** – During the training attention was given to maintenance and performance guarantees. This appeared to be very challenging for the consortia. External expertise from the Energy Leap programme was made available. In the end this did not lead to concrete offerings including maintenance and performance guaranties.

**Industry and production networks** - The technical innovation expected from the Expedition did not materialize. The local SME's were not equipped to create specific innovative products or designs. The industry able to come up with innovative products was not part of the Expedition. LALOG turned out to be an important lesson for the Energy Leap programme that they needed to create a different framework in order to realise the change in industry required for cost effective implementation of retrofitting at a large scale. This finally resulted in a new sub-programme: Rapids.

**Regulations and government policy** - The local government took their citizens seriously, since they initiated the #ENEXAP in order to reach governmental goals. Nevertheless, policies on for example permits for refurbishing were not able to provide the flexibility required right away. The local government tried to work with the occupant-owners to make the process of permit acquisition as smooth as possible. And discussions were started around topics like whether trees

should be taken down in neighbourhood streets that would be blocking sunrays to reach solar panels and about the conditions necessary to meet flora & fauna legislation.

**Societal and environmental effects** - In the Netherlands there are approximately 7.2 million dwellings, among which a lot of terraced houses build between 1946 and 1991. The municipality of Apeldoorn has 156.960 inhabitants and consist of 67.780 households (Stadindex, 2015). To give an indication of the amount of energy that can be saved: 1.04 PJ per year by retrofitting 10 % of the Dutch housing stock to zero-on-the-meter in a period of 10 years. The average energy consumption per dwelling in the Netherlands is 1440 M3 natural gas and 3440 kWh of electricity (Nibud, 2015). This is 53 GJ per dwelling. When 10 % of housing stock will be retrofitted to zero-on-the-meter in 10 years (19,650 a year) it will represent a saving of 1.04 PJ of fossil energy per year. In the Netherlands, the gross revenue per employee per year was 310,000 Euro in 2013 (EIB, 2013). By linking the above gross turnover of 8.8 billion per year and the gross turnover per employee in the Netherlands, it will result in 28,000 jobs per year. For Apeldoorn only, the effects will be scaled to ratio of course.

**Is as much about soft skills as well as hard technology** - This experiment shows that technical knowledge alone was not enough to reach the goals of this experiment. The courses and the energy coaches had to guide the process and translate between both clients and companies. The road to success was not easy, mainly because next to goodwill, also knowledge both technical and process related, was needed to guide all the parties in the right direction. Also the process by which the clients were approached by the consortia, the so-called customer journey, had to be addressed by the energy coaches. Scrum sessions were introduced to speed up the process and to diminish the time needed by the companies to formulate a tailor made offer.

# 7. Summary & concluding remarks

The developments in the Energy Expedition addressed aspects of both views mentioned in the theoretical framework: innovation management and grass roots innovations. Both emphasize the construction of a new community, or niche, focussed at a mutual goal and room for learning. In the integrated framework this was translated in the backbone of the three pillars of the integrated framework constructed in section 2.3: goal articulation, social networks and learning. All three have played an important role in the functioning and results of the Expedition.

Starting point was the articulation of the ambition of energy neutrality. The Expedition stimulated owner-occupants to articulate their specific expectations and demands. Their high ambition level stimulated the consortia to give their best. They started developing one-stop-shop formulas and integrating existing products into customized solutions.

The programme in itself formed a coalition of occupant-owners, companies and facilitating parties. This coalition shared experiences and expectations for a period of three years e.g. during meetings, excursions and courses. This social network was the carrier and basis for the meetings, working groups and other interactions. Furthermore, the network helped to survive setbacks and to maintain drive and enthusiasm.

The new and dynamic network that was constructed around #ENEXAP provided the necessary conditions for learning. Learning was not so much on technical aspects as on social innovation, like market and user preferences, speeding up of the offer preparation process and soft skills. In relation to market preferences, it was learned that owner-occupants demanded tailor-made solutions based on their specific situation. An important lesson from this initiative is that for consortia focussing on the market of retrofitting owner-occupant owned dwellings it is essential to look at all requirements: energy performance, comfort level, future proofing of the home and other additional requirements, and to do this in an integrated way. Moreover, the owner-occupants want a warranty on energy performance. Soft skills proved to be key to bridge different knowledge levels, perspectives and goals. Finally, it can be concluded that the combination of expertise and roles necessary to upscale the retrofitting of occupant-owned dwellings requires even more integrated value chains. It also became clear in #ENEXAP, as in LALOG that disruptive product innovations are key to arrive at affordable energy retrofitting solutions necessary to realise large scale retrofitting of owner-occupant owned dwellings. New sub-programmes, Rapids Rental and Rapids Purchase were initiated to accomplish just that.

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