

Neighbourhood consultancy centres for the adoption of low-carbon technologies by homeowners: experiences from Dutch initiatives

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ABSTRACT

Frontrunner local authorities aim to achieve a market acceleration in the owner-occupied single-family home renovation sector by increasing awareness of – and enabling access to – low-carbon technologies in residential target areas. With their easy availability, adaptability, and possible mobility, pop-up consultancy desks can provide local outreach in target areas for achieving home renovation measures.

This research looks into the adoption, use and effectiveness of fixed or mobile energy consultancy desks in target areas organized by local authorities. Local authority initiatives are described, compared and evaluated regarding various parameters. For two local authorities in the Netherlands, Rotterdam and Breda, pop-up initiatives are elaborated upon, examining the number of visitors, needed resources and experienced barriers and opportunities.

The results show that both longer-term fixed and short-term mobile consultancy pop-ups can be suitable for providing energy awareness and consultancy in target areas, and for stimulating the local adoption of low carbon technologies. The results clarify pros and cons of both approaches and the elements of business models that can be used by other local authorities.

Recommendations for business models for self-supporting consultancy in target areas and guidelines for local authorities are planned. For sustaining the pop-ups, collaboration is recommended with other partners.

Keywords: Renovation; housing; low-carbon; energy consultancy; local authorities; policy instruments.

Introduction

One of the energy efficiency governance challenges for policy makers is to deploy a suitable mix of policy instruments to influence citizens' adoption of energy-saving measures. Previous research has been looking into this adoption problem from the viewpoint of changing energy behaviour of citizens. For example, Dahlbom et al. (2009) discuss a need and method to design policy programmes to raise citizens' awareness and understanding, reflecting a desire to win individuals' commitment and to engage individuals and small social groups. Abrahamse et al. (2005) also detected that only providing information to households does not necessarily result in behavioral changes or energy savings; there appears to be a need for feedback and social comparison.

Research also shows limitations of policy makers effectively using such behavioural research results. Multiple factors come into play, such as citizens' practical barriers, financial and environmental concerns, competition, collaboration, changing attitude, and so on (Rand Europe, 2012), creating the idea that policies need to be 'designed' for different target groups. This entails a design capacity that current policy administrators either do not master, don't have the data or the time for, or which is highly influenced by political preferences. Various European projects (One Stop Shop 2012; COHERENO 2016; Meijer et al. 2018b; Mlecnik et al. 2019;

STUNNING 2019) further pointed out that it is a major key challenge for policy actors to collaborate with civic and private actors and to design an approach that fits better with solving real problems that homeowners encounter in their customer journey, for example making it easier for homeowners to find trusted independent consultants and reliable and trusted local suppliers. At the same time, there is only scarce research that evaluates the applicability and effectiveness of related policy approaches, particularly when addressing the local governance level.

Local authorities respond to national policies, but they also want to achieve a market acceleration in the owner-occupied single-family home renovation sector by increasing awareness of – and enabling access to – energy saving technologies in their target areas. For example, local authorities are urged (or voluntarily agree) to set up a physical place to inform and consult citizens locally regarding for example: energy efficiency, renewable energies and sustainability measures for home renovation. Operational activities of such an energy or sustainability desk can be related to awareness raising, providing coaching and easy access, facilitating citizen initiatives, activating demonstration projects, assisting group purchases, supporting citizen contests to compete in saving energy, and so on.

Exemplifying this with the policy situation in the Netherlands, the Dutch National Energy Agreement (“Energieakkoord”, dated 2013)¹ urged local authorities to regionally install a physical or virtual energy consultancy desk for homeowners, supported with local alliances between for instance building and installation companies, energy cooperatives and local authorities (Meijer, Straub and Mlecnik 2018a). The main goal of these alliances would be to ‘unburden’ the homeowner as much as possible from information gathering to consulting, contracting and execution of measures. From 2015, the Dutch Association of Municipalities (VNG) supported the 29 Dutch regions (and 390 municipalities) realising these goals, involving actors in learning networks in order to gain knowledge and expertise and to get the policy on track. It was the intention that from 2016 every municipality or region would have their own energy desk. Despite this, not all Dutch municipalities currently have an energy desk and many are still searching for the right format regarding effective guidance for covering the whole home renovation journey.

For example, in the city of Rotterdam in the Netherlands there was already a business-to-business innovation centre for sustainable construction (ICDuBo) where citizens can see and experience retrofit solutions. In the adjacent business-to-customer “WoonWijzerWinkel”, supported by the city of Rotterdam, citizens can also get renovation advice. However, this centre is relatively far from the city in the harbour area and people have to go there intentionally to get detailed advice or see the technology exhibition. Rotterdam thus experienced a high need to also use temporary fixed or mobile consultancy centres to attract citizens in specific target areas to create awareness locally.

Various local authorities are considering using such pop-up consultancy centres as policy instruments to reach their CO₂ reduction goals and to create a stronger impact in specific target areas where homes are in great need of refurbishment or renovation. However, not much is known about the performance of such initiatives. This paper illustrates the start-up and use experiences and detected opportunities of some frontrunner models of pop-up consultancy centres in Rotterdam and Breda.

Research approach

With increasing local awareness and easy access for housing retrofit, the local authorities want to encourage homeowners to adopt various low-carbon technologies to support energy saving. With their easy availability, adaptability, refurbishing and possible mobility, pop-up centres can be created and tested to provide an additional local outreach, particularly in neighbourhoods that are targeted for upgrading and renovation (Meijer et al., 20018a; Meijer et al., 2018b). That a mobile approach would have benefits regarding outreach to citizens was already previously confirmed with documented projects like for example the “Kyotomobiel” in the Flemish Pajottenland area (Meijer et al., 20018a; Meijer et al., 2018b), the “WoonWijzerWagen” in the

¹ For more information (in Dutch) see: <https://www.rvo.nl/onderwerpen/duurzaam-ondernemen/energieakkoord>.

Rotterdam-The Hague area (Meijer et al., 20018a; Meijer et al., 2018b) and the “EnergieKarawane” in the Rhein-Neckar region (BMUB, 2015).

To evaluate new “pop-up” initiatives in Rotterdam and Breda we assess the project developments – similar to the examples above - in terms of “effectiveness”. This means in our case: leading to households taking a next step in their renovation journey after visiting the pop-up. For example, for the German Energy Caravans initiative 24% of contacted household asked for a consultancy. In addition to assessing effectiveness based on number of visitors and project investment, other normative evaluation criteria can be relevant, such as: efficiency, equity, social and political acceptability, and institutional arrangements (Shahab et al., 2019). These criteria were assessed by the municipalities themselves using a SWOT-analysis questionnaire. Furthermore, participatory research was performed in key process meetings by TU Delft. In advance of the initiative the municipalities used target area analysis methods to assess suitable locations based on postal code, needs in specific areas and expected buildings and renovation phase of the visitor.

In the next section, Dutch examples of two main pop-up models (longer-term on fixed location and short-term mobile) are briefly introduced to illustrate two main approaches of possible pop-up concepts. Afterwards, specific parameters are assessed such as the effectiveness and the needed resources. Finally, the local authorities assessed barriers and opportunities related to the current and future use of the delivered consultation centres and pop-ups, taking into account the other criteria as well.

Pop-up centre initiatives

Short-term mobile or longer-term fixed pop-ups

Local authorities regard pop-up consultancy centres in target areas as an additional policy instrument that they can use for communicating their mix of incentives and organisational instruments. The pop-up centres allow to inform homeowners in specific target areas in combination with specific neighbourhood activities and campaigns. They are used for providing consultancy and for stimulating the local application of low carbon technologies, including renovation measures such as: thermal insulation, window replacement, better ventilation, improving building airtightness, placing renewable energy systems, adopting smart meters and related home energy monitoring systems, making homeowners more aware about their energy use. Energy consultancy in pop-up centres often does not stand on its own, it can be expected to support and reinforce virtual energy consultancy on the local authority web site, local area development, improving citizen participation and “ambassadorship”, implementation of other sustainability measures, facilitation of group buying initiatives, and so on. In the following sub sections the start-up and testing of pop-ups is described in two local authorities.

City of Rotterdam, the Netherlands

The City of Rotterdam has high ambitions regarding waste reduction, energy saving, reduction of CO₂ emissions, and climate change adaptation, and acknowledges the role that citizens play in meeting those ambitions. Therefore, they set up multiple pop-up experiments to try to engage homeowners to save energy with renovation measures.

After its experience of setting up a pop-up in an existing book shop in 2016 (“Donner”), Rotterdam experimented with a pop-up shop in 2016 in the city centre of Rotterdam. The idea was that a centrally located shop on a major city shopping axis (“Koopgoot”) would serve all homeowners in the city.

A further pop-up shop was opened in a neighbourhood shopping centre in the Ommoord area in 2017, closer to people’s homes. This shop was run by a private actor, WoonWijzerWinkel, whose consultants could help people to choose measures and materials.

Next, a more permanent pop-up was developed and opened as the “Duurzaamheidswinkel” (Sustainability Shop) in November 2018. The Sustainability Shop is situated in a shopping mall in the IJsselmonde district on Rotterdam’s south bank. Here the municipality played a larger role. The municipality opted for

broadening the scope of the shop beyond energy efficiency, as citizens tend to regard different issues regarding their living environment as closely interwoven. They reasoned that each measure can also be sparked by providing an entry for talking from a broader perspective.

Figure 1 shows the main appearance of three pop-up consultancy centres. Although visually and content-wise they do not differ a lot, the relative success depends on other factors.



Figure 1. Three pop-up consultancy centres in Rotterdam. From left to right: Koopgoot in 2016, Ommoord in 2017, IJsselmonde in 2019. *Source:* City of Rotterdam, Triple-A.

When open, there were always one or two people present. The shopkeeper attracted visitors and passers-by by discussing the subject of sustainability and advises them what they can do at home. Once citizens were inside, they were engaged to discuss measures they can implement in their home. As a follow-up, visitors were referred to go to WoonWijzerWinkel for specific advice.

City of Breda, the Netherlands

The city of Breda wants to be free of carbon emissions by the year 2044. One essential part to be able to achieve this goal is to renovate the majority of existing homes to be more energy efficient. For that purpose, they want to engage homeowners. The main idea of their pop-up was to create a mobile unit, to be able to get close to people's homes.

The ideas stem from previous experiences. In the past years, the city of Breda organized information nights in central locations and those were evaluated to be ineffective to reach enough people. Furthermore, Breda experimented with an information booth in a library, which didn't lead to traceable results. Therefore, the idea came up to temporarily place a staffed travelling pop-up during a few days or weeks on a central square or close to supermarkets in every neighbourhood.

The pop-up named "Greenhopper" was designed and produced in 2018 as an attractive mobile "tiny house" made of renewable and natural materials, to make citizens curious. The interior was furnished with circular and recyclable materials. The pop-up is not open all the time, but it is easily accessible (not surrounded by a fence). The windows are not blocked with curtains, so people can look inside if they want to, and come back when it is open. The pop-up displays different sustainable techniques, which can also be used in real homes, for example: infrared heat panels, LED-lighting, thermal insulation solutions, a demo heat pump, thermally insulated glass, and so on.

When open, there are always two people present: one coach from the local non-profit energy cooperative Bres, which is run by local citizens and staffed by trained volunteers acting as energy coaches, and one staff member from the city of Breda. They advise people on what to do at home. As a follow-up, visitors also have the opportunity for an energy coach to make a home visit for more specific advice. Greenhopper does not provide installation of measures.



Figure 2. Pop-up consultancy centre Greenhopper in Breda. *Source:* City of Breda, Triple-A.

Evaluation of parameters

Number of visitors

The following Table 1 gives an overview of the key performance indicators that were followed up in the previously introduced pop-up initiatives. Persons who visited the pop-up were given the opportunity to leave their contact details. In Rotterdam this was done by filling in an excel form while informing visitors about the privacy rules. The form was regularly analysed and reviewed based on monitoring results of other local initiatives. In Breda visitors could directly register for a follow-up “kitchen table” talk at home. Note that privacy rules did not allow municipalities to contact the visitors directly for feedback. From reporting of projects with supporting actors, the municipalities concluded that most of the “registered” visitors had the intention to execute at least one renovation measure.

Table 1. Key Performance Indicators of the Rotterdam fixed longer-term pop-up initiatives

Pop-up initiative and location	Testing period	Estimated total number of visitors	Average number of visitors per hour	Number of visitors registered for follow-up	Share of registered visitors per total number of visitors (%)
Book shop Donner, city center, Rotterdam	open February-June 2016, 43 hours/week	> 1000	1	150	15 %
Koopgoot, city center (Beurstraverse), Rotterdam	open October-November 2016, 55 hours/week	≥ 1000	2	75	7,5 %
Shopping center Binnenhof, Ommoord, Rotterdam	open March-June and September-December 2017, 12 hours/week	ca. 800	2	150	19 %
Sustainability Shop, Shopping center Keizerswaard, IJsselmonde, Rotterdam	From November 2018 – December 2019 (35 hours/week, later 20 hours/week)	ca. 1400	1	1200	86 %

Source: City of Rotterdam (Triple-A project).

The city of Rotterdam observed that few visitors came to the city centre initiatives: they didn’t go into the shop or often left when noticing the shop was about sustainability or only meant for citizens of Rotterdam. The pop-ups Donner and Koopgoot thus showed that ensuring a constant stream of passers-by is not necessarily helpful if the target group is not sensitive to the sustainability message, especially in a setting where citizens are focused on other activities and passers-by come from other regions. This led Rotterdam to conclude that an area-based approach focused on the qualities of a neighbourhood could be more effective.

Approximately 800 people visited the pop-up shop in Ommoord. Different activities needed to be organized to generate traffic to the shop. The most effective of these was an invitation sent to 3,500 homeowners to come and see an infrared photograph of their home, which attracted circa 550-600 visitors (Snoo et al., 2018). Meetings for residents' associations attracted 45 people and chance passers-by numbered about 100 (Snoo et al., 2018). In total Rotterdam's partner WoonWijzerWinkel had 470 citizen registrations from the Ommoord target area (Prins Alexander) in 2017. 150 of those were added in the period March 1 – December 31, 2017, of which 95 came through the pop-up shop Ommoord (Snoo et al., 2018). A low estimate calculates 197 out of 800 were provided an advice on thermal insulation and sustainable energy production (not necessarily linked to the specific target area) and 45 of the 197 implemented measures in this Rotterdam target area (Snoo et al., 2018). In the Ommoord case, Rotterdam thus learnt that they needed to organize events to attract people to the shop and that opening the shop for only a few months was too short to build a network in the neighbourhood and to obtain results and homeowner decisions. WoonWijzerWinkel focused mainly on easy access and adoption, whereas many people still needed to be convinced of the need for energy saving measures. Consequently, the shop in Ommoord was only partially successful.

At first sight, it appears the Sustainability Shop did not attract as many people per hour as the other shops. Compared to Ommoord, it is situated in a neighbourhood with residents that are less aware and informed about sustainability issues, and not that easily engaged. Secondly, the Sustainability Shop has a higher focus on building good relationships with the visitors and building a community around the shop, which is important to obtain lasting results and a self-supporting community of residents. In terms of number of registered visitors (which can be considered a measure of quality), the Sustainability Shop clearly surpasses the previous pop-up shops.

The impact of all the shops, in terms of CO₂-reduction, is not known for the shops. Homeowners also 'shop' elsewhere for renovation measures and, due to privacy regulations, the municipality is not allowed to re-contact citizens to be able to know the exact number and kind of energy efficiency improvements homeowners implement. An individual "home passport" that traces all building-related renovation measures is not yet available. Getting energy data of the contacted homeowners is also hindered by privacy rules. As asking for data permissions with complicated contracts would create an extra barrier for first-line consultancy, Rotterdam opted to do no before-and-after comparison.

Table 2 shows that although the city of Breda estimated to use the Greenhopper during 2 to 3 weeks, in practice the number of opening hours was limited to shorter time spans. Some events attracted many people but produced only a little share of visitors asking for a follow-up consultancy.

The mobile pop-up reached an average turnover of 13% of visitors (with extremes of 1% and 32%) asking for a follow-up of the initiative. The results vary a lot between different neighbourhoods. For example, the Kasteelplein area is not close to housing and attracted mainly coincidental passers-by, thus leading to low share of registered visitors. In the areas Ginneken and Ulvenhout the homeowners are generally more affluent and higher educated, thus reaching higher share. The Belcrum area was a higher success than expected: near the station there is an influx of new young homeowners who are usually more concerned with climate and greening initiatives. The energy cooperative Bres initiated two collective initiatives for buying and installing solar panels in 2019 (in Prinsenbeek and Brabantpark), following a visit from the Greenhopper, attracting around 75 homeowners.

In total, the City of Breda registered 266 homeowners from October 2018 to December 2020 who asked for a follow-up visit at home by one of the energy consultants. The 2020 campaign was stopped twice due to Covid-19 lockdowns. The energy cooperative Bres follows up each home visit by at least one telephone call after six months, in order to find out which actions have been taken by the homeowners. In 2019 the energy cooperative that followed up the second-line consultancy (Bres, 2020) has reported a total of 325 advices; 241 of which were performed as a kitchen table talk at home. Additionally, 114 heat scan with an infrared camera have been performed. The total number of registered measures in these homes is 84, ranging from roof, cavity

wall and floor insulation (28) to insulation glass (14), solar panelling (12) and other (11). It is estimated that 25-50% of the other homeowners that were visited also took measures but didn't report this back.

Table 2. Key Performance Indicators of the Breda short-term mobile pop-up initiatives

Pop-up initiative and location of the Greenhopper in Breda	Testing period	Estimated total number of visitors	Average number of visitors per hour	Number of visitors registered for follow-up	Share of registered visitors per total number of visitors (%)
Grote Markt	Opening 10/10/2018; 6,5 hours	131	20,15	2	2
Kasteelplein	2018; 14 hours	160	11,43	9	6
Ijpelaar	2018; 19 hours	127	6,68	15	12
Ulvenhout	2018; 22 hours	121	5,50	37	31
Boerderij Wolfslaar	2018; 18 hours	141	7,83	18	13
Teteringen	2019; 20 hours	83	4,15	7	8
Brabantpark	2019; 16 hours	60	3,75	7	12
Hoge Vught	2019; 18,5 hours	103	5,57	6	6
Prinsenbeek	2019; 18 hours	119	6,61	22	18
Koepelgevangenis	2019; 7 hours	25	3,57	2	8
Belcrum	2019; 17 hours	60	3,53	13	22
Centrum	2019; 17 hours	92	5,41	6	7
Wolfslaar	2019; 15 hours	78	5,20	8	10
Bavel	2019; 16,5 hours	57	3,45	7	12
Ginniken	2019; 19 hours	107	5,63	34	32
Kasteelplein	2019; 15,5 hours	113	7,29	1	1
Heksenwiel	2019; 16 hours	90	5,63	15	17
Boeimeer	2019; 16 hours	70	4,37	10	14
Tuinzicht	2020; 16 hours	52	3,25	5	10
Heusdenhout	2020; 16 hours	89	5,56	14	16
Princenhage	2020; 9,5 hours (stopped due to Covid-19)	84	8,84	17	20
Heuvel	Suspended due to Covid-19				
Zandberg	Suspended due to Covid-19				
Heuvel (restart)	2020; 16 hours	28	1,75	2	7
Blauwe Kei	2020; 16 hours	53	3,31	3	6
Zandberg	2020; 16 hours	49	3,06	6	12
Princenhage	Suspended due to Covid-19				
Breda: TOTAL 2018	2018; 79,5 hours	680	8,55	81	12
Breda: TOTAL 2019	2019; 211,5 hours	1057	5,05	138	13
Breda: TOTAL 2020	2020; 89,5 hours	355	3,97	47	13
Breda: TOTAL	2018-2020; 380,5 hours	2092	5,50	266	13

Source: City of Breda (Triple-A project).

Resource requirements

The estimated resources needed to establish and run the Rotterdam sustainability shop and the Breda mobile pop-up are given in Table 3. The costs for Rotterdam include 75% funding by the European Regional Development Fund in the framework of the Interreg 2 Seas Programme (60%) and the province of South-Holland (15%). For Breda, the costs include 60% funding by ERDF. The costs for Breda were also from the budget of Breda.

Table 3. Resources used for the Rotterdam fixed longer-term pop-up and the Breda mobile short-term pop-up.

Pop-up initiative and location	Sustainability Shop, Rotterdam (for a 1 year period)	Greenhopper, Breda
Staff (incl. municipal employees)	€ 120.000	€ 25.000 (Breda) + € 33.700 (municipality)
Facilities and exploitation	€ 50.000	€ 85.000 (including € 55.000 development costs)
Programming/activities and materials for specific activities	€ 12.000	€ 7.500
Interior material for the shop and communication	€ 10.000	€ 7.500
Training	€ 3.000	Not applicable
TOTAL	€ 195.000	€ 158.700

Sources: City of Rotterdam and City of Breda (Interreg 2 Seas “Triple-A” project).

In both cases, the staff costs are the main part of the required budget. The Rotterdam case needs a dedicated space in a good spot which increases the budget required for rent and facilities. The Breda case includes a higher facility development cost to produce the tiny house on wheels. Both pop-ups use resources to support storytelling (posters, leaflets, demos) and the organisation of events and specific activities. In the Rotterdam case staff training was needed.

For the Sustainability Shop, the City of Rotterdam is in the lead and in charge to manage and organise activities. A full-time area manager for energy efficiency is also in charge of the Sustainability Shop. Most of the other staff are employees of the city, volunteering to combine their regular job with being on this location during an afternoon. The Shop was initially open during the opening hours of the shopping centre (Tuesday-Friday 9:30-16:30; Saturday 12:00-16:30), and available for gatherings on Saturdays, Mondays, and sometimes Fridays. In practice from June till December the shop was only kept open for the public in the afternoon – as most visitors came then - leaving room for other activities in the morning. In addition, parts of the shifts in the afternoons were only supported by one instead of two staff members. In the Rotterdam case material and staff collaboration was achieved with internal partners contributing in the framework of neighbourhood programs for phasing out natural gas or for management of public space. After the start-up, costs were covered by the municipality (until June 2019 partly through Triple-A), and the province of South-Holland.

Communication included the use of a newsletter, website, social media, flyers, emails, information in the shop, and word of mouth. An employee was able to get close to the local citizens, build up trust and become a member of their social networks. She noted that if a prominent resident with a large group of followers shared information on social media, this also had a large impact. Supporting activities included for example “energy breakfasts”, open house events, energy savings market, competitions, infrared scans of homes, workshops training sessions, a Santa Claus event, an action for people to get there a yes/no sticker for publicity in the post box, and so on.

For the Breda pop-up the building costs of the pop-up amounted to € 55.000 with an extra € 7.500 spent for the interior. The pop-up was especially designed in compliance with Breda’s specific needs and requests, within the size parameters for a trailer. The yearly exploitation is about € 30.000 including maintenance, communication, logistics and other costs. The local authority staff spent 650 hours. This includes coordination,

communication, transport and administration. For € 25.000 the energy cooperative Bres delivered energy coaches and professionals for coordination, administration and communication.

Breda used various media to attract visitors, such as two advertisements in a local newspaper, local Facebook push advertisement and door-to-door letters distributed by Bres to homeowners. An average of around 1.500 letters was reached per neighbourhood. The actions were not investigated methodologically but Breda observed from visitor comments that the door-to-door letters were by far the most effective. For some occasion synergies were found to place the Greenhopper at events or activities of other sections of the city of Breda, for example: the Kids Climate Conference, the winter market of Boerderij Wolfslaar, and so on.

Observed strengths, weaknesses, opportunities and threats

The cities of Rotterdam and Breda were asked to do a self-evaluation of what they considered to be the most important barriers and opportunities related to their pop-up development and how they perceived strengths and weaknesses of their organisation to manage the pop-up. The TU Delft, who was also leading the related European project and engaged in participatory research, prepared a specific set of questions for the lead partners to answer during interviews as well as a structure for self-reporting, which had to be done on a half-yearly basis for evidencing project funding. The municipalities also organized feedback and experience sharing sessions with their local co-workers and partners.

City of Rotterdam, the Netherlands

On the one hand, the city of Rotterdam considers its Sustainability Shop as the best pop-up despite its relatively lower number of visitors. While previous initiatives were also well-placed for providing easy access and adoption of renovation measures, Rotterdam observed that the municipality coaches in this case were more active in informing and directing the visitors. There was a more open attitude towards the consulting activity itself: the consultants listened carefully, assessed the knowledge and housing needs and then helped visitors by offering insights where they stand now and what they can do in the future in several steps. The local authority built up trust, not only as an independent and objective source of information, but also by providing a positive learning experience. The added embedding in social networks also led to (indirect) awareness raising in the neighbourhood and the development of an “anchor” of the municipality within a neighbourhood.

The Sustainability Shop thus integrated multiple objectives beyond energy while also developing a social anchor point and neighbourhood network in a specific target area where sustainability needs are present but homeowners are not yet engaged. From the previous pop-up shops they learnt that a tight interaction between the shop, neighbourhood campaigns, and general programs from the municipality is necessary. The Sustainability Shop also links with other activities in the neighbourhoods. In that sense Rotterdam is experimenting with the shop as a neighbourhood centre of actions towards energy efficiency.

During the development of the pop-ups Rotterdam learnt a lot about how to address the customer journey, using for example lifestyle segmentation. They realize now that it is important to not only focus on the typologies of the houses (technical and economic), but also on the characteristics of the residents (demographic and social), and their interrelations and interactions. In this framework it is important to gain insights regarding solving barriers to move residents. Customer segmentation in five archetypes based on available data and the Motivaction Mentality model² helped the municipality to identify barriers and drivers in a coherent way. It is also helpful for municipalities to assess visitors’ view towards sustainability during voluntary personal contacts in a “market” environment, as privacy regulations make it difficult for local authorities to contact citizens. Embedding presence within a neighbourhood allows to identify a best approach to inform and motivate local residents

² <https://www.motivaction.nl/en/mentality>

according to their means, values and beliefs. For example, financially vulnerable residents can be directed to special funding initiatives.

Short internships, work experience, and skills training aim to create ambassadors in the neighbourhood for the shop and for sustainability messages. Rotterdam also values the creation of learning and job opportunities by working together with schools and educational centres and activating residents to be active in those networks by offering support. The created tool kits around small subjects make knowledge easily transferable.

The Sustainability Shop has succeeded to get support of various municipal programmes and departments. Working together better and collaborating more efficiently helped improve the service for the residents. The Sustainability Shop also fosters good collaboration with external partners and initiatives. In neighbourhood campaigns Rotterdam worked with private intermediaries that engage in civic awareness raising and activation. These include WoonWijzerWinkel for further consultancy and easy access; Klimaatroute for going door to door to offer free energy advice and referring to the Sustainability Shop and WoonWijzerWinkel; Buurkracht for engaging neighbours to do joint actions; and VVE010 for targeting assemblies of homeowners. Also for campaigns energy actors, like Stedin and NUON, were involved.

On the other hand, the City of Rotterdam experienced it to be difficult to staff the shop due to insufficient staff capacity of the municipality. The setting up of the shop requires a flexible and fast response, but the internal procedures sometimes hamper quick action and getting the desired results. For example, the City's procurement rules and strict privacy rule checks make quick action regarding hiring external people difficult, while this is necessary for flexibility and reliability. Motivated individuals have to do a lot themselves. Involving other people may also take some time as not all persons realize that working in the shop is much more encompassing than providing information to visitors. Accordingly, budgets need to be more flexible so the Shop can improvise more.

The staff are also sometimes insecure about having a good conversation – they are concerned that they don't know enough about all sustainability issues. Visitors expect staff to know about all municipal programs and projects in the neighbourhood – after all for them the 'municipality' is one entity. Next to providing basic information on possible solutions and local issues this asks for some training, particularly on storytelling (sharing own experiences), listening and giving feedback, and coaching. Rotterdam tries to connect with all other municipal activities in the same neighbourhood, but not everybody in the internal organization is open for collaboration (for different reasons).

The city of Rotterdam also finds it difficult to monitor the steps people take in their customer journey, because visitors do not always like to leave their contact details, and in the end not everybody tells about the outcomes of the visit. In essence, the municipality does not pursue the contact details due to privacy concerns, but likes to know the results. In practice Rotterdam has to rely on data they get from other projects that might cover multiple areas and citizen groups, such as the initiatives "Klimaatroute" and "WoonWijzerWinkel". Knowing whether the advice is transformed in action also depends on the availability of a CRM system, which is not present for the municipality but managed by private collaborators. They acknowledge that, especially in the neighbourhoods around the Sustainability Shop, it takes some time and effort to nudge citizens: the shop needs to be around for some more time before expected results in terms of concrete CO₂ reduction will be reached.

To sustain the concept of the Sustainability Shop, Rotterdam explores options with other organizations or local authorities. Rotterdam notices that it is important to relate to possibly changing expectations of the local residents. It is seeking for ways to get better feedback to evaluate the effectivity of the shop so that it can be optimized regarding use and effectiveness.

City of Breda, the Netherlands

On the one hand, the city of Breda is convinced that the mobile pop-up concept works well. People are interested in the concept of a tiny house and their curiosity drives them to go inside. The attractive appearance of the Greenhopper also attracts more diverse visitors compared to the previously organized neighbourhood information sessions. From the beginning Breda worked together with Bres. At first, they put them in the lead to create the pop-up, but this was not a success as "the cooperative was not able to organize the process

effectively". Afterwards, the city of Breda took the lead in finding a supplier for the mobile unit and contracting Bres. The construction of the mobile unit was considered relatively easy to obtain on demand. A constructor of tiny houses was found on the internet. No tendering was necessary, because the city of Breda has a framework agreement with a regional supplier for trailers, where the contract was placed.

On the other hand, the logistics of moving the pop-up around in the city and finding the correct spots was more challenging than expected. From Breda's experience the most successful spots were those with a lot of exposure and in sight of many pedestrians, such as near supermarkets and shopping centres. Mainly the size and weight of the unit made it complex to reach possible locations. In retrospect, Breda would consider downsizing the pop-up a little bit. An appropriate vehicle and licensed driver are needed to move the pop-up and the module is subject to taxation of mobile units, permits for installation, availability of electricity hook-ups and other material such as traffic signs. It also needs a location when the pop-up is not in use.

Furthermore, the energy coaches from Bres became more motivated since they are also present in the Greenhopper. Although it claims more of their time, Bres gave the City of Breda positive feedback about this experience: they are 'proud' to be part of the effort and enjoy being a host in the pop-up. The benefit of involving Bres was experienced positive as Bres could involve suppliers. They organized a meeting with a number of trusted local and regional players and invited them to supply their products. In return the city of Breda gave suppliers the opportunity to place a brochure in the pop-up (with a disclaimer from the city of Breda). Thus the pop-up was successful in getting 8-10 suppliers to demonstrate products in the pop-up, such as: infrared panels, a heat pump, a green roof model, a water saving toilet and shower heads, thermostatic radiator cranes, a low temperature radiator, insulation materials, an electric car share connection. The relative success has a downside: The capacity of Bres to join Breda every time the pop-up is opened was limited. Also, the energy coaches had difficulty to cope with all the requested house visits. Bres aims to recruit more coaches in 2020.

In November 2019, the Greenhopper was moved to the city of Eindhoven, where the Province of North Brabant organized a first Energy Festival. The city of Breda attracted a lot of attention there from other local authorities who are now also interested to use the Greenhopper.

Summary

Tables 4 and 5 provide an overview of the observed factors in both initiatives, including internal Strengths and Weaknesses, and external Opportunities and Threats (SWOT-analysis).

Table 4. Strengths and Weaknesses for the Rotterdam fixed longer-term pop-up and the Breda mobile short-term pop-up, as perceived by the municipalities. Source: City of Rotterdam and City of Breda (Triple-A project).

Pop-up initiative	Strengths	Weaknesses
Fixed longer-term pop-up, particularly Sustainability Shop Rotterdam	<ul style="list-style-type: none"> * Pop-up provides learning and collaboration between internal municipal programmes and departments * Collaboration with private/public intermediaries achieved to cover detailed advice, implementation and customer relations * Development of communication skills * Anchor of the municipal neighbourhood for supporting the energy transition 	<ul style="list-style-type: none"> * Need for staffing by the municipality * Internal procedures can slow down needed fast response * Not all municipal neighbourhood activities join the initiative * Relatively high investment in staff and facilities * Scattered customer relationship management based on multiple projects
Mobile short-term pop-up, particularly Greenhopper Breda	<ul style="list-style-type: none"> * Appearance of the pop-up and concept of the tiny house attracts visitors * Collaboration with energy cooperative and suppliers achieved to cover detailed advice, implementation and customer relations 	<ul style="list-style-type: none"> * Need for extra energy coaches due to unexpected success * Success is highly related to supporting events

Table 5. Opportunities and Threats for fixed longer-term and mobile short-term pop-up, as perceived in Rotterdam and Breda. Source: City of Rotterdam and City of Breda (Triple-A project).

Pop-up initiative	Opportunities	Threats
Fixed longer-term pop-up ref. Sustainability Shop Rotterdam	<ul style="list-style-type: none"> * Approach sustainability from multiple angles using events * Develop a neighbourhood anchor and local network with social embedding * Toolkits can be used for specific customer segments and building typologies * Longer-term presence in the neighbourhood can lead to direct and indirect awareness raising, building networks and activating citizens * Spill-over effects: citizens becoming inspired to take up similar actions in other neighbourhoods 	<ul style="list-style-type: none"> * Relatively higher operational cost for staff and rent of a prime location * While a longer-term anchor is created it cannot be sustained indefinitely with local authority means * Local events and actions have to be carefully planned and communicated to regularly attract citizens
Mobile short-term pop-up ref. Greenhopper Breda	<ul style="list-style-type: none"> * Mobile concept allows the pop-up to be used in many locations, including other municipalities * Spill-over effects: possible partnerships with surrounding municipalities 	<ul style="list-style-type: none"> * Relatively higher development cost and extra costs for transport and on locations * While being a mobile unit, this doesn't imply a higher flexible use: it is still challenging and labour-intensive to move the pop-up, to speed up internal administration and to select suitable locations * Supporting actions or events are key for attracting citizens

Reflection and outlook

It appears to be problematic for the homeowner to find the right independent advice and (experienced) contractors that offer solutions based on this advice. Public-private and public-civic cooperation resulting from the development of consultancy centres and pop-ups can be a stimulus to improve communication, coordination, local actions, and integrated follow-up of each step of the customer journey.

Overall, both pop-up initiatives took off quickly. Rotterdam just started and took small steps at a time. Breda ordered a unit in a relatively short period. Both pop-ups improve constantly through a process of 'learning by doing'. The most important function of the pop-ups is to create attractive local triggers for the residents to start changing their lifestyle or their home. The ideal pop-up manager is both socially capable in order to connect with people and to build meaningful networks, and technically competent as a consultant or designer. While for both pop-ups the effectively executed measures were often 'quick wins', e.g. installing led bulbs, airtightness strips, and so on, the pop-ups reached their goals of creating awareness and easy access in target areas. Both initiatives also created replication by other actors in other neighbourhoods or municipalities. Both exemplified initiatives show possible public-private collaboration for running energy consultancy pop-ups. Suitable collaborators trigger citizens and the local area, providing information, consultancy, door to door actions, social collaboration, energy cooperation, special assistance for vulnerable people, and so on. It is this collaboration that makes it possible to guide homeowners in their customer journey from one step to the next; from awareness raising to providing easy access and resulting adoption. For example, for awareness raising in Rotterdam the Sustainability Shop provides general information and coaching, while Buurkracht helps set up community networks with residents who want to work together in creating a more sustainable environment in their neighbourhood. Both are actively nudging residents in the first steps of the customer journey. Next, Klimaatroute provides energy advice, thus contributing to the orientation phase. WoonWijzerWinkel helps in getting quotes, and in selecting suppliers and contractors. This collaboration for successive guidance in the renovation journey

needs to be nurtured to make sure that pop-up initiatives can also sustain once the initial funding is gone. In our cases, the development of the pop-ups was supported by the European Fund for Regional Development in the framework of the Interreg 2 Seas project 'Triple-A'.

For the next periods, the cities are developing business models to maintain the pop-ups, exploring possible public-private and public-civic collaborations. The Sustainability Shop will work more closely with schools and local organizations, such as: a civic-business intermediary that supports children in disadvantaged environments offering internships (JINC); an organization that trains volunteers to help low-income households to save energy costs (Energiebank); and an organization that supports mentally disadvantaged people with to find workspace learning jobs (Pameijer). By working together with these partners and investing in these connections, the Sustainability Shop also wants to become socially embedded in long-term networks. In addition, citizens groups might take over and open a Sustainability Shop in their own neighbourhoods.

An important characteristic of pop-up consultancy centres can be that they can function as an anchor point from where residents in the surrounding neighbourhoods are approached to start (thinking about) retrofitting their homes. The shop manager creates a local reciprocal network, addressing different topics and targeting specific customer segments with events and small incentives. Thus, besides showing information panels and handing out leaflets, a pop-up should offer a wide range of activities such as consultancy, meeting and campaigns, workshops, excursions, training, to help make it visible, shareable and replicable.

The Triple-A project offers many more examples of pop-up consultancy centres, also in Belgium, France and the UK. All experiences are currently being analysed. Also, a perspective is being elaborated on possible business models that can be used for the development and implementation of pop-up consultancy centres. Currently, tool kits and inspiration boxes are being developed to share the lessons learnt, and adapted business models are tested for sustaining consultancy pop-up models. The research will finally result in recommendations for business models for self-supporting consultancy in target areas and guidelines for local authorities.

Conclusion

This research looked into the adoption, use and effectiveness of fixed or mobile energy consultancy desks in target areas organized by local authorities. Local authority initiatives from the cities of Rotterdam and Breda were described, compared and evaluated regarding various parameters such as number of visitors, needed resources and experienced barriers and opportunities.

There is no "one size fits all". The results show that both longer-term fixed and short-term mobile consultancy pop-ups can be suitable for providing energy awareness and consultancy in target areas, and for stimulating the local adoption of low carbon technologies. The analysis shows that a neighborhood pop-up center can be a very effective communicative policy instrument to reach residents, particularly in housing areas matching the right customer segment. They allow visitors experiencing, seeing and freely asking about issues related to their renovation journey. Pop-ups can even be more successful if they combine their activity with neighborhood actions to attract people, for example using infrared photographs and collaborating with local 'ambassadors'. Pop-ups work best as a local node of awareness raising. The staff's task is to motivate and guide homeowners and citizens to adopt further consultancy or sustainable choices. Independent communication and personal coaching are needed, tailored to match personal values, to lead to effective adoption. Collaboration with local partners is recommended to address the next steps in the renovation journey.

The local authorities perceive positive effects and numerous opportunities to develop consultancy pop-ups and even to sustain them once they are developed. This sheds a new light on the need for local authority policy instruments to target specific residential areas using appropriate incentives, resources and partnerships. The results are useful for local authorities to identify (ingredients of) business models that can be translated locally in custom-made pop-up centre models fitting the own local strategies, goals and financial capabilities.

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References

- Abrahamse, W., L. Steg, C. Vlek and T. Rothengatter 2005. A review of intervention studies aimed at household energy conservation, *Journal of Environmental Psychology*, 25 (3), 273-291.
- BMUB 2015. Energiekarawane (Wohngebäude) Erhöhung der energetischen Sanierungsquote durch direkte, systematisch vorbereitete Ansprache von Hauseigentümern, Referat Öffentlichkeitsarbeit, Berlin: Bundesministerium für Umwelt, Naturschutz, Bau und Reaktorsicherheit (BMUB). Available on: <https://www.klimaschutz.de/projekt/energiekarawane-gegen-den-sanierungsstau>. Consulted: 9 December 2020.
- Bres 2020. “Verduurzaming bestand vastgoed – Woningaanpak Breda”, Final report UVK-project 2019, version februari 2020.
- COHERENO 2016. Final Report. Intelligent Energy Europe project COHERENO - Collaboration for Housing Nearly Zero-Energy Renovation. Delft, The Netherlands: TU Delft.
- Dahlbom, B., H. Greer, C. Egmond and R. Jonkers 2009. Changing Energy Behaviour - Guidelines for Behavioural Change Programmes, Madrid. Available on: https://ec.europa.eu/energy/intelligent/projects/sites/iee-projects/files/projects/documents/behave_guidelines_for_behavioural_change_programmes_en.pdf. Consulted: 9 December 2020.
- Meijer, F., A. Straub, and E. Mlecnik 2018a. Concepts for consultancy centres and pop-ups for the adoption of low-carbon technologies by homeowners. *Report Interreg2Seas project ‘Triple-A’*. Delft, The Netherlands: TU Delft. Available on: <http://www.triple-a-interreg.eu/project-reports>. Consulted: 10 February 2020.
- Meijer, F., A. Straub, and E. Mlecnik 2018b. Consultancy Centres and Pop-Ups as Local Authority Policy Instruments to Stimulate Adoption of Energy Efficiency by Homeowners. *Sustainability* 10: 2734. doi:10.3390/su10082734.
- Mlecnik, E., A. Straub, and T. Haavik 2019. Collaborative business model development for home energy renovations. *Energy Efficiency* 12: 123–138. <https://doi.org/10.1007/s12053-018-9663-3>.

- One Stop Shop 2012. From demonstration projects towards volume market: innovations for sustainable renovation. ERANET-ERACOBUILD project. Antwerpen, Belgium: PHP.
- Rand Europe 2012. What Works in Changing Energy - What Works in Changing Energy-Using Behaviours in the Home? London: Department of Energy & Climate.
- Shahab, S., Clinch, J. P. and E. O'Neill 2019. Impact-based planning evaluation: Advancing normative criteria for policy analysis. *Environment and Planning B: Urban Analytics and City Science*, 46, 534-550.
- Snoo, M. de, I. Arends, N. Eekman, A. Kellert, and O. Oung 2018. Evaluation of pop-up centres in Prins-Alexander, Rotterdam, Report 2017. 28 January 2018. Triple-A Deliverable 3.2.2. Rotterdam, the Netherlands: City of Rotterdam.
- STUNNING 2019. Sustainable business models for the deep renovation of buildings. Horizon 2020 project. Paris, France: CSTB. Available on: <https://www.stunning-project.eu>. Consulted: 10 February 2020.