Local authority web portals for the adoption of low-carbon technologies by homeowners Evaluation report Triple-A

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Publication date
2020

Document Version
Final published version

Citation (APA)
Kwon, M., & Mlecnik, E. (2020). *Local authority web portals for the adoption of low-carbon technologies by homeowners: Evaluation report Triple-A*. Interreg.

Interreg 2 Seas Mers Zeeën

Triple-A

Awareness + Access = Adoption

European Regional Development Fund

Local authority web portals for the adoption of low-carbon technologies by homeowners: evaluation report

Triple-A: Stimulating the Adoption of low-carbon technologies by homeowners through increased Awareness and easy Access

Deliverable 1.3.2

Public version, 15 December 2020

Project No. 2S02-029

With the financial support of

European Union
European Regional Development Fund

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Abstract

Through the Interreg2Seas Triple-A project, seven Local Authorities (LAs) identified and developed a set of modules for strengthening LA web portals for increasing awareness and easy access for housing retrofit, to encourage homeowners across four European Countries (Belgium, France, Netherlands and UK) to adopt different low-carbon technologies. This report evaluates this development.

First, literature research provides the role of local authorities on fostering home renovation as a trusted party and the importance of modular LA web portals. A home renovation journey model was applied to facilitate developing web modules and introducing a list of suitable web modules to support homeowners.

Secondly, the qualitative data, collected through LA experiences, are analysed based on strategic, technical, financial, and project management parameters. The results show the lessons learnt and practical challenges for developing modular web portals from the phase of planning and launching to sustaining.

Next, quantitative analysis results present the impact of newly launched web modules on web portal visits. The data, collected monthly from 2018 to 2020, were compared to the LAs' activities to promote the web portals.

Lastly, this research suggests lessons learnt, challenges, and recommendations for practitioners of LAs to strengthen local authorities' web portals for increasing awareness and easy access to low carbon technologies.

Keywords: modular web portal, home renovation, local authorities, low-carbon technologies, co-creation

Terminology

The following terms are regularly used in this report:

Effectiveness:

The capability of producing a desired result or the ability to produce desired output. In this report this is interpreted as whether a local authority achieved what it wanted through modular web portals.

Efficiency:

The ability to do things well, successfully, and without waste. In this report, this refers to the extent of outcome compared to investment and the justification of the resources spent for web module development.

Local Authority (LA):

Policy stakeholder on the local level. In this report this refers to municipalities, cities and policy actors serving one or more cities, who are implementing web modules and hosting web portals.

Low-carbon technology:

Technology facilitating low-carbon or carbon-free renovation measures.

Relevance:

Whether an action (in this report the implementation of web modules) addresses the real needs and problems.

Renovation journey:

The decision process a person passes through in various stages to assess and implement renovation measures.

Performance:

Process of performing a task or function, in this report related to modular web portals performing according to plan.

Sustaining:

Remaining in use after implementation. In this report referring to web modules keeping their performance regarding number of visitors and remaining actively used in collaboration with stakeholders after their implementation.

Web portal:

A web-based platform from a single operator; typically, it can bring together information and web modules from diverse sources.

Web module:

A web module is the smallest deployable and usable unit of web resources (e.g. components, content files, images); typically, it presents a web application.

Acknowledgements

This report was written in the framework of the Interreg 2 Seas project "Triple-A: stimulating the Adoption of low-carbon technologies by home-owners through Awareness and easy Access" (http://www.triple-a-interreg.eu/) funded by the European Fund for Regional Development (project number 2S02-029). The contribution of TU Delft in this project was co-financed by the Province of South Holland and supported by the Triple-A partners.

1. Introduction

Local authorities (LAs) are key actors for initiating and leading innovation and regional actor-networks (von Malmborg, 2003). They can play an essential role in achieving energy policy goals (Allman et al., 2004) and in facilitating household energy efficiency improvements. According to Dobers (1999), LAs and private companies have collaborated in the field of environmental policy and management since the 1990s. Sullivan et al. (2013) addressed the role of local authorities at different levels for low-carbon cities. Although LAs are well-positioned to support the adoption of low-carbon technologies, there are also limitations to their role. For example, the capacities of LAs are not well developed for LAs playing this role. They also can have little involvement, limited experience, or capacity in energy provision (Bale et al., 2012).

The internet has become an important platform to promote sustainable environmental ideas and actions due to the capacity of digital media (e.g., openness, easy accessibility, networking). Many studies have identified how the **digital and social media** can amplify the public perceptions towards a sustainable environment (Podkalicka et al., 2016, Podkalicka et al., 2019) and home renovation (Hunter, 2019). Melles et al. (2017) investigated the relationship between digital media and home renovation. Digital and social media appeal to homeowners who are seeking advice or recommendations for **home renovations** through trusted parties (Podkalicka et al., 2016). Early attempts to implement sustainable development were made by non-governmental organisations, aiming to modernise the local government agenda, as exemplified by Dyer (2002). Later, local governments developed websites or social media to disseminate sustainability policies and programmes to change awareness and to stimulate the engagement of citizens (Podkalicka et al., 2019). In this regard, LAs can facilitate digital communication channels as a means of **promoting energy-efficient and low-carbon** home renovations. In practice, LAs mainly rely on operating web portals to communicate with the public. A strategic plan can help to improve LAs' web portals in a way that a homeowner can collect reliable information and to get familiar with low-carbon technologies.

Homeowners use media across the renovation stages, from planning to adopting technologies, to find and validate reliable information, renovation measures, and products. Mediation in home renovation, however, raises an issue: **reliability** and **trust**. Homeowners are exposed to the enormous amount of information related to home renovation. However, it is difficult for homeowners to judge whether it is reliable information or not. According to Ebrahimigharehbaghi et al. (2019), homeowners tend to trust the information provided by non-profit organisations such as homeowner associations or governments. In addition, the information should be easily accessible, trustworthy, and specific, but the information is often generic (Risholt and Berker, 2013).

This report is written in the framework of the Interreg 2 Seas project "Triple-A: stimulating the Adoption of low-carbon technologies by homeowners through Awareness and easy Access" (http://www.triple-a-interreg.eu/) funded by the European Fund for Regional Development and the Provinces of South Holland and West Flanders. Triple-A aims to achieve an acceleration of the market in the owner-occupied single-family home renovation sector by **increasing Awareness** of – and **enabling Access** to – energy-saving technologies.

This report intends to explore the experiences of **introducing web modules** via web portals by local authorities, the contribution of web portals to the **adoption of low-carbon technologies** in practice, and evaluates the **functional and financial effectiveness** of prototype modular web portals. The main objective of this report is to ensure the increase of impact through modular web portals, aiming at

stimulating the adoption of low-carbon technologies by homeowners. Evaluation results will help to improve and optimise the quality of web portals. The research approach is to provide a detailed understanding of the role of web modules in home renovation processes by applying a home renovation journey model.

The main research question is *'What are key lessons from Local Authorities (LAs) fostering modular web portals for stimulating the adoption of low-carbon renovation measures by homeowners?'*

The following sub-questions are explored for evaluating on-going web module development.

- How can LAs develop useful web modules for stimulating the adoption of low-carbon renovation measures by homeowners?
- What are the lessons to be learnt from evaluating the impact of developed web modules and portals?
- How can LAs increase the impact of web modules?
- What can LAs do to sustain modular web portals?

Chapter 3 describes a home renovation journey model which has been applied to developing web modules and introduces a list of developed web modules. Evaluation methods and data collection are illustrated in this chapter. Chapter 4 unravels experiences of LAs based on strategic, technical, financial, and project management parameters. This chapter discusses the lessons learnt and practical challenges for sustaining web modules and portals. Chapter 5 shows available impact data and the results of data analysis. This chapter also includes the outcome of a limited web portal visitor survey. Chapter 6 suggests recommendations for practitioners of LAs.

2. Methodology

2.1. An integrated customer-oriented approach

A customer-oriented approach can help to understand homeowners' concerns when deciding for low-carbon technologies in a renovation. The '**customer journey**' (Følstad and Kvale, 2018, Rogers, 2010) is a useful concept developed in marketing to understand the **decision-making process** (Følstad and Kvale, 2018, Rogers, 2010), a consumer goes through before a customer decides to adopt a product or service. The customer journey can not only be applied to the rather straightforward buying of consumer products, but also to more complicated decision-making processes such as buying energy-saving measures by homeowners.

Exploring each step in a decision-making process may give innovative service ideas, contribute to organisations or LAs to better understand the affected processes, and explore and connect the roles of various types of stakeholders to support the homeowner in each decision step. In the first stages of the decision process, it is important that homeowners gain "neutral" information and access to solutions from highly trusted actors. Typically, "neutral" actors can be local authorities, architects, non-profit organisations, local energy distribution grid managers, and so on. Customer journeys or decision processes are usually described linearly in five or six stages, or decision steps. In general, the following stages are defined:

- Awareness raising/ information phase
- Considering options/ persuasion phase
- Purchase/ decision phase
- Use or service/ implementation phase
- Loyalty and advocacy/ confirmation phase

In practice, such processes are not often linear, and such a model certainly has shortcomings. For example, for stimulating market development, it is known that experienced homeowners are an important source of information for homeowners aspiring to renovate, which indicates that a circular model might be more effective (Mlecnik, 2013).

Based on the customer journey approach, we designed an adapted model for LAs and their local partners to understand better the position of web modules in the home renovation journey and the affected processes. Figure 1 shows a closed-loop home renovation journey that also targets using "experienced" homeowners to bring awareness to new homeowners by sharing their success stories. Also, experienced homeowners can act as an ambassador for their peers in the neighbourhood, which could result in shorter decisions processes. To combine the information from different sources, we have created a loop-like home renovation journey model specifically for understanding better the adoption of low-carbon technologies by homeowners during renovation processes. The figure illustrates how a homeowner passes through various stages before he or she implements low-carbon measures. The figure gives some examples of web module content that could support each phase.

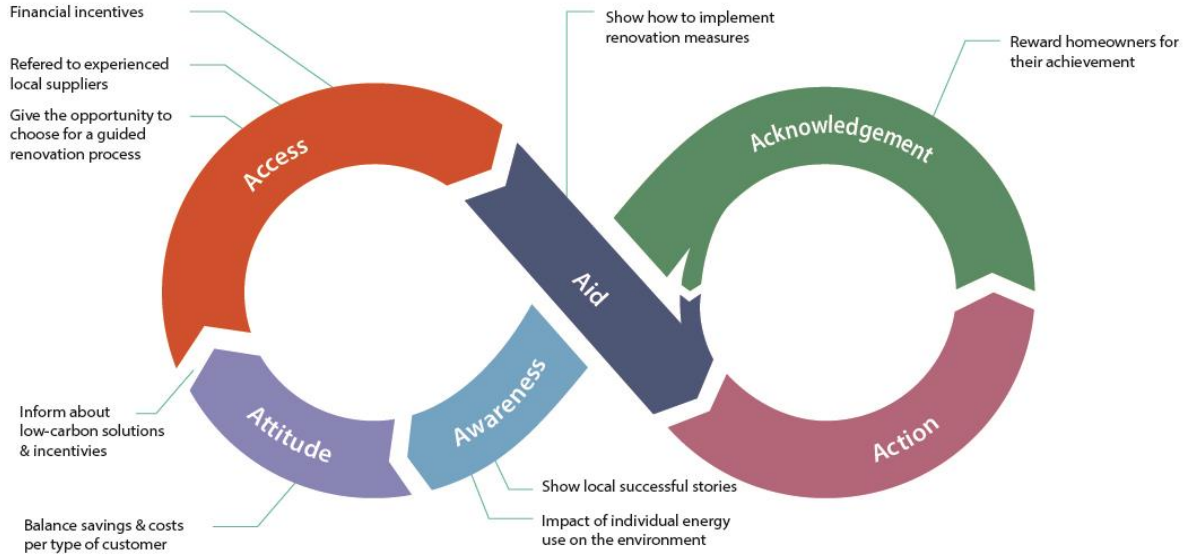

FIGURE 1 HOME RENOVATION JOURNEY MODEL IN THE TRIPLE-A PROJECT

The seven Triple-A LA partners (Antwerp, Breda, Hauts-de-France, Kent County, Mechelen, Ostend, Rotterdam) identified six stages for further development of web modules to support their communication strategies, and important issues per stage to improve their existing web portals.

The first stage of the home renovation journey is **Awareness**, where homeowners are becoming aware of a problem or a need to adopt low-carbon technologies. The stage introduces LA information about various low-carbon solutions and technologies for both integrated and step-by-step renovation processes. Also, homeowners actively search for information to find answers for their needs in this stage. When information is not available, the homeowner will not be attracted to adopt these options. Preferably for persuasion purposes, simplified knowledge is deepened and exemplified in the next search step, according to the specific situation of the owner-occupant.

There are particular challenges for LAs to make homeowners change their **Attitude** towards low-carbon solutions. For example, LAs can make sure that the homeowner gets personalised information with special tools, such as for the calculation of energy savings and financial savings. It also can be done by additionally showing the information that is relevant for the customer segment (based on homeowner profile, house type, investment capacity). Such 'personalised' service can also be referred to developing group activities or joining buying initiatives, neighbourhood initiatives and homeowner training.

There are particular challenges for LAs to make sure that the homeowner gets easier **Access** to advice and support from experts, such as helping to find trusted actors (consultants, auditors, contractors, architects) and financing (grants, loans, third party financing).

LAs providing **Aid** to homeowners reflects itself in transforming web portals, for example by putting special focus on the embedding of quality assurance in procurement (via standard contracts, use of certificates, financial warranties, performance guarantees) and by providing project management to unburden homeowners.

Action is the stage that the homeowner or its contracted party executes home renovation or retrofit after making a decision. Most LAs did not detect a specific role for them in this stage. However, it

was speculated they might, for example, play a role in providing standardised construction details, open door visits during construction, or providing a lead to instruction videos.

LAs also recognised the need for supporting **Acknowledgement** of adopted technologies by the homeowner: a satisfied homeowner is more likely to recommend other homeowners to do the same. Peer-to-peer communication was put forward as an effective way to convince homeowners to adopt low-carbon technologies.

LAs can perhaps find smart ways to engage satisfied customers to recommend certain technologies, solutions, or actors to future clients. Previously successful peer-to-peer communication activities include organising customer feedback forums, open door days in demonstration projects, testimonial videos, and actor rating schemes.

2.2. Development of web modules to improve local authority web portals

Literature suggests that the customer uses a growing number of different channels for making a decision (Wolny and Charoensuksai, 2014). The Triple-A was designed to integrate a number of selected physical and virtual communication channels. LAs centred their development around four specific channels: web portals, home energy management systems, pop-up consultancy centres, and demonstration exemplars. Thus, the project inherently recognises that homeowners continually shift between information channels. In this integrated context, web modules were developed to improve LA web portals.

Triple-A proposed a prototype model web portal consisting of add-ons or separate modules which could be integrated into LA web portals (Mlecnik et al., 2018). The Triple-A prototype modular web portal was deployed as a possible structure of web modules for increasing awareness and easy access for the homeowner. Concerted modules aim to nudge the homeowner to subsequent stages in a home renovation journey until homeowners carry out energy-saving measures, in a way that fits their stage of the home renovation journey. In the process of scouting the possibilities to strengthen LA's web portals, web modules have been identified following the six stages of the home renovation journey. The implemented modules are briefly explained in Table 1.

TABLE 1 WEB MODULES IMPLEMENTED BY LOCAL AUTHORITIES

Project Partner	Web module	Description	Link
PSEE Hauts-de-France	Map search of renovation projects	The web module RENOMAP consists of an interactive map which shows the various renovations to their locations on the map.	https://www.pass-renovation.picardie.fr/projets/
City of Antwerp	Aerial thermography map	The web module 'Zoom in op uw dak' (Zoom in on your roof) provides information about subsidy, average costs, energy loan and a contact form for advice in the EcoHouse.	www.zoominopuwdak.be
City of Mechelen	Aerial thermography map	The aim is to help homeowners get better insight in energy loss through their roofs and to persuade them to take action.	https://klimaatneutraal.mechelen.be/warmtelu chtfoto-kaart
City of Rotterdam	Information on and registration to open home events	The web modules aim to trigger the interest of homeowners on renovation exemplars in Rotterdam by offering them the possibility to visit the retrofitted houses.	https://www.rotterdamenergiebesparing.nl/act ueel/nieuws/neem-een-kijkje-in-een-duurzame-woning
City of Breda	One stop shop	The web portal is set up as a modular platform, to support customers/inhabitants for the entire home renovation journey.	https://woonwijsbreda.nl/
City of Mechelen	Information desk	The aim of web module Bebouw is to provide information to support homeowners to improve their houses in their journey through the energy transition.	information desk on sustainable building/energy house Mechelen
City of Rotterdam	Cross-checked feedback	The aim of the web module is to give room for feedback to the visitors of the website. The functionality is already available on the website.	www.rotterdamenergiebesparing.nl/
Kent County Council	Finance and funding	The web page describes the various funding and finance mechanisms that residents can benefit from to help them with their energy bills and to improve their home environment.	https://www.kent.gov.uk/about-the-council/campaigns-and-events/warm-homes#tab-3
Kent County Council	Referral forms	The referral form allows residents to receive tailored information about funding and quotes for insulation or new boilers.	https://kentcc-self.achieveservice.com/en/AchieveForms/?form_uri=sandbox-publish://AF-Process-0024fa42-d856-4f6f-ae9e-f4530e9d7d56/AF-Stage8dc1358b-b975-4f39-83dd-
City of Rotterdam	Web-tool to calculate energy and cost savings	The web module provides calculations of energy and costs savings closer to reality. That database is filled with pre-calculated values using a building simulation model.	https://wwmo-accp.mendixcloud.com/p/informatieportaal/39340649673950185
City of Mechelen	Step-by-step energy advice	The Warmhuis is an energy assessment tool for homes and offers advice for a step-by-step approach	https://klimaatneutraal.mechelen.be/warm-huis
City of Rotterdam	Playlist of Do-It-Yourself films to inspire	The web module shows how people can renovate their house by themselves.	https://www.rotterdamenergiebesparing.nl/dev/uitgebreid-artikel/diy-filmpjes/diy-filmpjes?items_id=422
EOS - Ostend	How to find a craftsman?	Referral to a list of registered contractors, building partners and websites offering information for renovation projects.	http://www.eos-oostende.be/vind-een-vakman
City of Rotterdam	Handy tips when setting up contracts	The inform and provide tips for making contract with supply-sides.	https://www.rotterdamenergiebesparing.nl/act ueel/nieuws/laat-u-uw-huis-duurzaam-verbouwen-lees-eerst-deze-tips!
City of Breda	Appointment with a specialized advisor	Visitors of the web portal WoonWijs Breda can make an appointment with a professional energy advisor.	www.woonwijsbreda.nl/actiepagina/specialistisch-energie-advies/
City of Breda	Appointment with an energy coach	The volunteers of local energy cooperation Bres offer tips and tricks to inhabitants at home.	www.woonwijsbreda.nl/actiepagina/energiecoach-gesprek/
EOS - Ostend	Homeowners sharing experiences	The aim of the web module Energieke Buren is to offer a platform to homeowners to share experience with their neighbours.	www.energiekeburen.be
City of Rotterdam	Successful retrofits nearby	The web module shares the success stories of other homeowners.	https://www.rotterdamenergiebesparing.nl/succesverhalen

The development of these web modules took about one to three years, depending on the LA. The work started with local authorities assessing all web development opportunities in a scoping report (Mlecnik et al., 2018). Furthermore, in 2017, the seven LAs organized local scoping workshops to discuss possible improvements of LA web portals. During the workshops, LAs have identified potential ways to strengthen the LAs' web portals by integrating effective web modules. Particular web modules (see Table 1) were selected afterwards by the LAs to implement into their web portals from the end of 2018 until 2020. After implementation, further communication with observers, and stakeholders took place and a one year evaluation period was conducted.

It was experienced that the developed web modules can serve multiple steps in the home renovation journey. For example, homeowners being able to assess their own energy use can lead to awareness of a household's energy consumption, but can also be used for acknowledgement of choices. By providing insight into the ways the household consumes energy, a homeowner can also choose one or more options for energy saving with the best cost-benefit ratio for his/her particular situation. Modules about success stories serve both as an acknowledgement for homeowners who have already taken measures and can raise awareness and inspire other homeowners.

Although this was not an essential part of the development process, it is worth to think about how developed modules can relate better with each other to support a transition to each next step in the home renovation journey, to exploit the maximum potential of their modular nature.

2.3. Evaluation methodology

2.3.1. Aim and evaluation parameters

The aim of the evaluation of the developed web modules is to analyse their impact, to understand better if they can lead to speeding up the market uptake for retrofitting private homes. The web modules supporting the home renovation journey can be seen as part of a larger communication strategy of LAs, which in turn is part of a broader scope of communicative and organisational local policy instruments supporting energy action plans that support implementing local low-carbon strategies.

One might consider evaluating the home renovation journey itself or the (development/ management of a) specific policy instrument or local energy strategy. This was not the goal of this work, which solely focuses on evaluating the impact of web modules. The evaluation was done using two methods: self-reporting and monitoring (Halvorsrud et al., 2016). The self-reporting is considered as qualitative data and monitoring as quantitative data. Although some studies dealt with the evaluation of policy instruments, there are no clear evaluation criteria for the development of LA web portals based on theories (Shahab et al., 2019). Therefore, it is essential to set criteria and evaluation methods for further assessment.

Typical evaluation criteria used by policymakers and consultants for their policy instruments are effectiveness, efficiency, relevance, sustainability, performance- (Neij and Åstrand, 2006, Enzensberger et al., 2002, Shahab et al., 2019, Rondo-Brovetto and Saliterer, 2007). By reflecting the evaluation criteria by Neij and Åstrand (2006) and Vaz and Ribeiro (2001), five criteria were developed for the evaluation.

- ***Effectiveness*** – whether the LA achieved what they wanted to do through modular web portals.
- ***Efficiency*** - the extent of outcome compared to investment and the justification of the resources spent for web module development

- ***Sustentation*** - the extent of the expected contribution from stakeholders for maintaining or sustaining web modules
- ***Relevance*** - whether the web modules address the real needs and problems
- ***Perceived usefulness*** – whether the information in web modules is useful for homeowners.

This report covers these five criteria, but it mainly focuses on a management point of view by using data to assess effectiveness, challenges, and recommendation for other LAs.

2.3.2. Data collection

Figure 2 shows the method data framework. This research applied a mixed use method of both qualitative and quantitative data. We collected KPIs monitored by LAs and responses of a web portal visitor survey distributed by the LAs as quantitative data. The survey was distributed to a specific setting such as each LAs' web portals and modules by the different scale of local authorities. Therefore, the data are in the contextual section. Regarding qualitative data, self-reporting of LAs of their web portal development and related co-creation events was assessed using the evaluation parameters, and interviews with practitioners from the seven LAs were conducted to assess management activities. Open-ended questions were asked to evaluate information based on evaluation parameters to explore the different aspects of modular web portal implementation. The detailed process is described in section 3.4. For the assessment, we also looked at the relevance of LAs operating at different scales: small-scale LAs, medium-scale LAs, and regional-scale LAs.

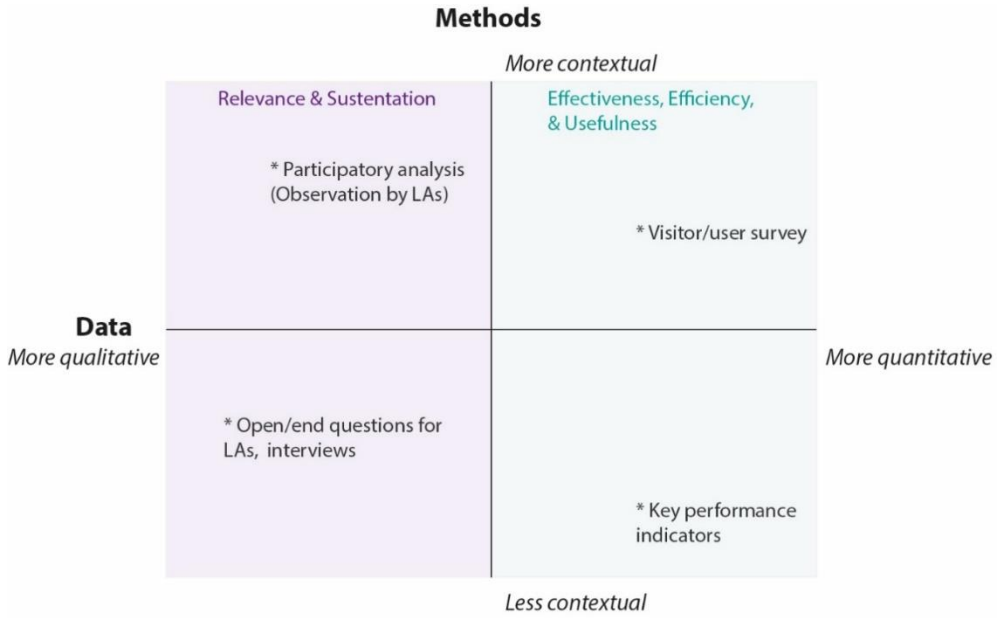

FIGURE 2 METHOD DATA FRAMEWORK, MODIFIED FROM HENTSCHEL (1999)

2.3.3. Qualitative data analysis

As part of management challenges, a thematic analysis was conducted to identify implicit and explicit ideas in the data from the self-reporting from LAs. The analysis aimed to identify key parameters as a basis of the assessment. Since the development of modular web portals for LAs has not been widely discussed, we explored the analytic framework from other relevant areas such as e-government and learning from case studies. Bale et al. (2012) identified four main areas to assess potential roles and functions of strategic energy planning within local authorities. Evaluation parameters from the previously developed scoping report (Mlecnik et al., 2018) were classified based on the four areas mentioned above.

- ***Strategic management***: Co-creation, developing web modules
- ***Technical management*** : IT development, Privacy/security, Application
- ***Financial management***: Cost information
- ***Project (web portal) management***: Quality, Maintenance, Marketing

After self-reporting of LAs of their web portal development, interviews with LAs (project partners) were conducted to assess management activities after running the web modules at least half a year.

Open-ended guiding questions were created based on the above evaluation parameters (See appendix A).

2.3.4. Quantitative data analysis

Number of visitors

The quantitative research is based on a web portal and modules data sets provided by Google Analytics in collaboration with local authorities. It may be difficult to compare the data within a goal-centred evaluation because there is no specific knowledge or standard of good user access performance. Therefore, comparative analysis can be an option to evaluate the relative success of web modules in terms of visitors.

We evaluated the impact of web modules for attracting visitors based on Google Analytics reports from January 2019 to May 2020 for different web modules of the web portal. Additionally, each LA aimed to collect the data of three key performance indicators:

- KPI 1: Number of unique visitors
- KPI 2: Number of requests for information about low-carbon technologies
- KPI 3: Number of financial measures made available through a web portal (or requested by homeowners)

The LAs also provided information about actions and events that they had promoted during the web module running period. These data are compared to the number of unique visitors of overarching web portals and web modules. This approach can show the impact of actions or events on advertising web portals and web modules. Later, the relative impact of the number of unique visitors of web modules on web portal is analysed. During the process, LAs found it unfeasible to collect KPI 2 and 3 data, which subsequently had to be excluded in the analysis since the data were not monitored.

Web portal visitor survey

Navigation data were not available from LAs but quick summaries. Therefore, visitors' behavioural patterns are not part of this research. Instead, we distributed a questionnaire to web portal visitors.

This visitor survey is used to evaluate the success of web portals by considering users' perceived impact and the perceived usefulness of the information of web modules. (see Appendix A).

- *Effectiveness* – whether the LA achieved what they want to do through modular web portals.
- *Efficiency* - the extent of outcome compare to investment and the justification of the resources spent
- *Perceived usefulness*: usefulness of web module information

To analyse the perceived usefulness of the contents of web modules, we have conducted an online visitor survey. Web portal visitors were targeted and approached by the LAs who developed them.

Since the visitors are not always homeowners, we classified the type of visitors and added a question based on the potential types to sort out the visitor types. The survey was distributed in three languages (English, Dutch, and French). Each LA distributed the survey via their web portal and regular newsletters.

The next chapter explains qualitative results, amongst others from the interviews with LAs. We subsequently discuss each of the four management parameters mentioned in section 3.3.2.

3. Experiences of seven local authorities

This chapter reports how the LAs have developed and managed new web modules in the aspects of strategic, technical, financial, and project management. The information has been collected through interviews with LAs (project partners for Triple-A) and analysing their self-reporting of the process. The content of the interviews focused on lessons learned, challenges, and recommendations. Self-reporting included LA reporting in four types of activities:

- Activity 1.1 **Scoping**: project partners made an analysis of their web portals to identify which steps in the home renovation journey were not yet addressed and made a selection of the web modules they wanted to integrate through consultation of stakeholders;
- Activity 1.2 **Design and development**: project partners acquired or developed the selected web modules;
- Activity 1.3 **Implementation, monitoring and evaluating the impact**: project partners implemented the web modules and monitored and evaluated their impact;
- Activity 1.4 **Sustaining** web modules: project partners developed a business model and guidance document for the development, implementation, and sustaining of web modules.

In this report project partners PSEE Hauts-de-France and Kent County Council are regarded as authorities that operate towards a collective of municipalities; Antwerpen and Rotterdam as larger cities; and Mechelen, Breda and Ostend as medium-sized municipalities. Besides covering various management issues, we discuss if the development and experiences differ according to the size and possible resources of the local authorities.

3.1. Strategic management

3.1.1. Developing web modules

City of Antwerp

The city of Antwerp developed a web module which supports various stages in the home renovation journey. A web module entitled 'Zoom in op uw dak' (Zoom in on your roof; developed in a previous European project) consists of a thermographic map to check if the roof is well insulated or not, if it is suitable for solar panels and a green roof. This was coupled with information about subsidies, average costs, energy loans and a contact form for advice from the EcoHuis. Antwerp organised a big communication campaign to launch the web module.

City of Breda

The vision of the city of Breda was to reduce the amount of carbon usage with 50% by 2030 and to zero by 2044. The LA initially invited 25 inhabitants and several professionals for a small workshop, where they discussed inhabitants' needs to be able to reduce the CO_2 emissions. The city of Breda found that practical information was not available such as calculation, and diagnosing the current condition of homes. Therefore, the LA developed web modules that provide services such as getting energy coach, specialist advice by certificated advisors, calculating a payback report and diagnosing the energy condition of homes. In addition, the web portal now also gives information where and when the pop-up consultancy center will be located.

EOS Ostend

EOS was often asked by citizens who they should work with for home renovation. Therefore, EOS developed a web module named 'how to find a craftsman' to help people find a contractor and to give inspiration for the implementation of low-carbon measures. The web module is fully integrated into the existing Ostend website. The module 'Energetic neighbours' was subsequently developed for mapping and sharing success stories. As this module was launched only in April 2020 as an interactive web-page, it was difficult - also due to the COVID crisis - to reach people and collect their stories.

Kent County Council

The county council developed the 'Warm Homes' webpage within the existing KCC web portal. It includes information on available funding through the council or the government, and a referral form allowing residents to receive tailored advice and information about eligibility for funding a quote for insulation measures and new boilers. The purpose of developing web modules was to provide practical information such as funding and to inform whether they are eligible to apply national or local funding.

City of Mechelen

Mechelen already had a web portal offering technical and financial information for low-carbon technologies for citizens. However, the majority of available information was too technical and generic. New web modules were developed to provide different options to improve the energy performance and to show the associated costs and benefits. Modules were devised in such a way that information about regulation and incentives could be regularly updated. A challenge was to link the web modules with each other, to support feeding information into a Customer Relationship Manager system or similar. Now Mechelen has different modules that do not communicate with each other.

PSEE Hauts-de-France

PSEE's strategy is to help the homeowner in all the steps of the home renovation journey. PSEE identified some gaps in their website for optimizing this. RENOMAP was developed as a module which shows all sorts of renovation they did as renovation managers. It shows the renovation measures undertaken, the financial aid which the homeowner has got for that particular renovation project and the benefits of the renovation through showing actual energy savings. It took a lot of time to prepare launching the web module since PSEE renewed its entire web portal after a restructuring of the organisation.

City of Rotterdam

Rotterdam originally planned to cover all home renovation journey stages by launching various connected web modules. The LA organised workshops with stakeholders to discuss this. During consultation, a selection of priority topics was done. The main considerations were reasonable investment and maintenance costs, and providing various types of information such as nice tips for users, contracting, and do-it-yourself. The web module 'Success stories' is the most active developed web module. It offers diverse inspiring stories about homeowners implementing different energy saving options based on types of house and neighbourhoods. The city of Rotterdam looked for local citizens sharing their stories by engaging them in a dialogue. Rotterdam also engaged in the development of a web module for calculating energy and CO_2 savings, which needed a much longer development time and additional expertise.

FINDINGS

LAs, regardless of their size, organised communication with or feedback from stakeholders to decide the content of web modules. There are two patterns of how the LAs see the contents of web modules. Some LAs tried to develop web modules or platforms which cover all home renovation journey stages. Others focused on developing missing information, such as providing practical tips and information on financial incentives, events, advice for low-carbon techniques, and so on. The LAs tried to fit this development in ongoing local action plans and campaigns related to reducing carbon emissions and energy use.

3.1.2. Co-creation

City of Antwerp

For the thermographic map, the LA had two external contracts: one for the development of the map (by flying over the city by plane) and one for the development of the website. This ideas was also copied by other LAs as well as the grid operator Fluvius who is developing a thermographic map and website for all LAs in Flanders. More info: https://dakinzicht.fluvius.be/mijn-dak. For the additional modules, the city of Antwerp did not see a need for internal or external co-creation to develop its web modules.

City of Breda

The city of Breda has developed a new portal with a one-stop-shop, energy coach, and specialists' advice as web modules (Access and Aid).

The city of Breda did external co-creation with HOOM (a national energy cooperative) as the main contractor. HOOM was assisted by a software developer (Cronius) and a local energy cooperative (BRES) to develop the platform. The city of Breda organised multiple brainstorm sessions to develop appropriate features and useful contents for inhabitants. The selection of partners was made through the application of a grant for climate programmes. Local parties could apply for this grant project proposal, and the best application was selected.

However, internal co-creation was a challenge due to a change in local government structure and policy rules. The municipality opted to renew its website and left its initial track of developing web modules for low-carbon technologies. Although the process of launching a web portal took more time than expected, external co-creation was successfully achieved, due to the LA being proactive and giving a strict deadline. Moreover, contractors were committed, which alleviated difficulties in getting internal co-creation.

EOS Ostend

EOS wanted to collaborate with other LAs that already developed web-government tools. Due to the different ambition levels and necessary resources of administrators, this idea did not work in practice. For the development of the web module, EOS did not have enough IT knowledge, therefore EOS outsourced the work. In the end, there was no substantial internal or external co-creation during the development the Ostend modules.

Kent County Council

Kent County Council launched two web modules on the central government website. Kent County Council had internal co-creation with LAs from 12 districts and one unitary authority within Kent. Besides that, there was no external or specific internal co-creation.

City of Mechelen

The new web modules were developed in collaboration with the Province of Antwerp, Kamp C, and Duurzaam Bouwloket. The development was internally linked to actors promoting local incentives, regulation, and action plans.

PSEE Hauts-de-France

The PSEE modules required no internal or external co-creation as their platform already targeted a wider region. PSEE created web modules based on what information LAs already provide and have, instead of (re)developing new content.

Rotterdam

Internal co-creation occurred during the process of developing the Rotterdam web modules. Rotterdam created new web modules for integration into the existing Rotterdam web portal. For development, the IT department supported the technical issues. The content of the web modules was fully organised internally. External partners such as contractors contribute to making publishable text for the success stories.

FINDINGS

Although the modularity of web modules in principle can allow for multiple embedding in various web platforms, external and internal co-creations rarely happened to achieve such a goal. Smaller LAs needed external support even for basic IT development. Medium-scale LAs could manage the process internally. Actors targeting multiple LAs could invite multiple LAs to co-create modular web portals or deliver missing information.

3.2. Technical management

3.2.1. IT skills

City of Antwerp

Through E-tendering, the LA gave an assignment to an external company for IT development and application. Antwerp perceived it as difficult to do the technical management internally. The web module is now not very interactive due to its rigid IT structure, and technical changes are difficult to implement without having certain IT knowledge.

City of Breda

An external contractor manages the website. Breda needed to be strict regarding setting development deadlines and regularly explain what it wants. The external IT department needed to be committed to develop the web modules.

EOS Ostend

Technical management was considered easy since IT development was managed by an external agency. EOS observed the need to invest time in explaining the structure of the web portal or modules well at the first phase to save unexpected extra cost. They remarked that if LAs have their own IT experience, it is more cost-efficient to do the development by themselves.

Kent County Council

There were no specific challenges or difficulties to implement this relatively simple module. When visitors fill in the referral form, it is sent to the LA. The LA then contacts applicants. The internal IT department also had worked before on launching web modules.

City of Mechelen

Development was done outside the Triple-A project.

PSEE Hauts-de-France

An external IT developer created the web module, which was integrated into the existing web portal. After launching, the communication department of the LA managed and maintained the web module. The IT developers explained how to fill in the contents on the website. PSEE had sufficient IT knowledge to maintain the web modules, so that they did not need any extra contractor for IT maintenance. PSEE observed that it is essential to check whether the web portal can be self-sufficient for actual operation, and how much effort it needs for maintenance. In addition, it was recommended to have an internal IT developer so that communication can be easier and cheaper.

City of Rotterdam

IT experts recommended Rotterdam to switch to a modular web base structure using Mendix. This made it easier to develop web modules based on topics, as new developments could simply be moved to a new web portal. The internal IT department supported launching web modules. Externally a CRM system hosted by a collaborating actor - who also gave the advices for homeowners - allowed to trace adoption of measures by homeowners.

FINDINGS

Smaller LAs often had an external contract with IT companies, while some of the larger LAs and aggregators could get support from their internal IT department. In general, LAs do not have sufficient IT knowledge, so they always need IT experts to launch and to manage the web modules technically. If the LAs already have an existing web portal, it can be cheaper to integrate or link the web modules to the current web portals. However, this can also result in relatively static development and complex overview for the homeowner, as the existing web portal of LAs can already contain multiple tabs and themes so that it may be difficult for visitors to find the information that they are searching. To reduce needed effort from IT experts, the best option is to transfer the existing website to a modular web portal, where web modules can more easily be integrated. We also noticed that all LAs still lack a CRM system to follow up citizens' requests regarding low-carbon technologies.

3.2.2. Privacy/security

City of Antwerp

Similar to other Flemish cities, Antwerp follows GDPR regulation. The module allows for everyone to search thermographic information on the level of an individual house. However, visitors cannot easily get detailed information. They have to answer specific questions about the roof itself (does it has solar panels, what kind of material it is made of, and so on) and about their behaviour in colder periods (do they put the heating on in the rooms right under the roof or not). These questions are necessary to make a correct interpretation of the colour code used in the map. By doing this, building related information is only shared with the respective homeowners or building users, which protects privacy.

City of Breda

External contractors manage the IT development and storage of private information such as e-mail addresses and telephone number for energy coaching. They comply with Dutch AVG law for privacy and security of the web portal. In addition, the visitors can withdraw their data from a database at any time they want.

EOS Ostend

For the energy neighbours module, it was challenging to collect success cases. In theory, it is a nice idea, but people often did not want to share their story with the general public. The LA had to identify how much and which type of information people can share. People who could share less information were more keen to contribute to the web module.

Kent County Council

Privacy regulations are ensured through a firm step-by-step system. If users do not agree to the host's GDPR regulations then no data are retrieved or stored. For the web module referral form, the LAs followed this system to ensure GDPR was handled correctly. Sometimes, the LAs wanted to directly contact people they know would be eligible to receive funding, to persuade them to apply. However, this was not allowed due to the GDPR so the LAs had to rely on the residents approaching them.

City of Mechelen

The city of Mechelen has a data protection officer. The association of Flemish municipalities has developed a template for data processing agreements that Mechelen uses by default with their contractors.

PSEE Hauts-de-France

The entire web portal follows GDPR. PSEE provides a contract, so a PSEE user signs the contract in which users accept to use their renovation information as an example for the website or any other PSEE support (newsletters, video, or photo edits). Homeowners signing the contract agree with sharing information such as showing photos of their houses and renovation measures, energy-saving, financial aid. This contract is part of the PSEE integrated service to help homeowners. It is also an internal requirement for PSEE to have this information. In general, 80% of homeowners agreed with the condition. However, only 15-20% of homeowners agreed with participating in interviews and

recording a video. PSE observed it can be useful that the contract includes an agreement for sharing specific information of success cases for the web module.

City of Rotterdam

The web module 'success stories' requires personal information for the stories. The homeowner signed an agreement from the beginning which explains what the LA is going to do, and how long the information provided by the homeowner will be public. People who contributed with a success story can retrieve or change their story whenever they want; it needs permission from the LA to be published. The communication department is in charge of this privacy issue, and the IT department controls the security issue.

Privacy and data protection issues were significant obstacles during the development of this module. However, the LA made use of a template provided by VVSG (Association of Flemish Cities and Municipalities). Copyright was obtained to use images and video clips or documents from other sources.

FINDINGS

All websites and web modules of the LAs had to follow GDPR. Privacy and security issues were applied to specific modules, such as for sharing retrofit experiences. Due to privacy issues, people often do not want to participate in sharing their experiences, to be published on the websites. People who agreed with sharing their stories also requested a minimum way of exposing their information. LAs can counter this by delivering options to participants regarding what extent they want to expose their information.

3.3. Financial management

City of Antwerp

The cost for the web module was high due to the thermographic photos that had to be taken via airplane and because a new website was developed to host the web module. These were two external contracts. Antwerp recommends to ask other neighbouring LAs if they are interested in sharing the costs for flying over their territory as well.

City of Breda

Financial investment was done by the city of Breda. The plan was to try to get more local authorities interested as client for this web portal. As for all web modules in this report, the budget for development of web modules was covered by the Triple-A project. However, other smaller LAs found it difficult to get sufficient budget to contribute. The Woonwijsbreda concept can now be used by other LAs, under (free) license of Breda.

EOS Ostend

The investment for the web module ‘How to find craftsman’ was low as it used the existing website. Developing a new web portal or module would be costly without any funds. To save costs, smaller LAs can integrate web modules into the existing LA website.

Kent County Council

No specific financial challenges were reported.

City of Mechelen

The projected budget allowed the financing of the web modules.

PSEE Hauts-de-France

There were no financial challenges, and developing the web modules was supported by a regional council.

City of Rotterdam

Web module development was done internally by recruiting new people. However, the new people were not hired only for these web modules. IT and communication department

FINDINGS

The investment and exploitation costs varied based on how the LAs apply web modules. When the LAs developed only web modules, the cost was relatively low. On the other hand, the price of launching a whole website was significantly high. LAs internally recruited persons to maintain the web modules. However, a lack of technically trained persons and IT knowledge can be a problem. Since the Triple-A project hosted development costs, many LAs reported no financial challenges. However, smaller LAs mentioned that if they do not have any web portal, they have to start from scratch. Unexpected changes during the development of the web modules – such as organisational changes - can sometimes increase the needed budget. As a tip, the LAs suggest for smaller LAs to invite other district levels of LAs to develop web portals and modules together (co-creation and collaboration with other parties).

3.4. Project management

3.4.1. Quality control

City of Antwerp

Antwerp had a long testing phase for every development. They asked citizens to volunteer during the night when the plane would fly over. Citizens were asked to measure the temperature in a room situated under the roof and to fill in a questionnaire. Financial incentives were given by the Flemish government and LAs, therefore, the information offered by LA is considered trusted information. The plane had to fly over the area to make the thermographic photo. The photo can show degrees of roof insulation quality from as not being insulated at all to very good roof insulation. Due to technical reasons, the planes could only fly in strict conditions: in winter time; with clear skies; with an outdoor temperature of about 5 degrees C; and with no rain during a few days before the flight.

City of Breda

The city of Breda monitored the usage of the web portal and the feedback from visitors for further development of the web portal. Trusted suppliers were selected by BRES, who developed a set of quality criteria.

EOS Ostend

For the energy neighbours web module, EOS linked third-party websites instead of bundling information in the own web portal. However, they integrated the web module 'how to find a

craftsman' within the existing website. EOS manages the web module. For quality control and for reasons of being impartial, EOS provides a link to third-party websites instead of hosting a list of contractors by themselves. The third-party websites hosted by a trusted organisation contain a list of certified contractors. This means that total quality control is not done. The web module 'Energy neighbours' is professionally organised. EOS adds many types of renovation cases not only for deep renovations but also lighter renovations with a small budget.

Kent County Council

Information about renovation incentives was received from the central and local governments. The web module ‘finance and funding’ focused this information on the county level.

City of Mechelen

Mechelen noticed that quality assurance is surely needed to guarantee that the technical information and/or information related to financial support are up to date. It proved to be a challenge, for instance with the tool WarmHuis, to correctly calculate energy savings. It is recommended that the quality control of such issues is done by a central organisation for example the Flemish Energy Agency, Fluvius or Kamp C in their case.

PSEE Hauts-de-France

PSEE is affiliated with institutions that can give trusted information, such as regional and national institutes that give financial aid and correct information. There is also one-to-one communication between PSEE and the homeowners, but not specifically about quality control. Although the information is trusted, updates can be irregular. In terms of finding contractors, SPEE cannot provide direct lists but it gave tips to find contractors with the right qualifications. PSEE is concerned that there is a need to consider the quality control more carefully and to check quality on a regular basis while managing the web modules.

The main challenge for PSEE was the placement of the web module. Visitors could not find the web module within the many tabs and other web modules. After redesigning the entire website, the most important web modules are now easier to find. PSEE tips to agree in advance upon a number of modules to be developed, which can be introduced later in the website.

City of Rotterdam

In the project team, various advisors are directly involved in the execution of the project. Among them, the quality of the work is provided by internal IT- and communication departments. The information in the web module was verified by energy experts checking the house condition, energy bills and calculating energy efficiency to have reliable information / data. Unsuccessful cases were also posted on the web module.

FINDINGS

LAs carefully selected reliable and trusted information sources. The information about financial incentives provided by the central government was published on the own web modules, and LAs had to update the information almost monthly. The modularity of existing central government web information was either not available or not directly hosted on LA web portals.
LAs cannot provide specific contractors and suppliers to homeowners. Instead of making lists by themselves, they can provide links to third parties (non-profit organisations) that host such lists.

3.4.2. Maintenance

City of Antwerp

The information on the web module is checked every month to see if updates are needed. The web module also provides a space to collect feedback from visitors by e-mail. It might be difficult to maintain the thermographic map because of the high maintenance cost. But now that Fluvius developed a thermographic map and website for all LA's, smaller LA's have the possibility to have a thermographic map as well.

City of Breda

For maintaining web development, Breda was concerned about being independent from the supply side. If supply organisations host important information, there is a risk of providing biased and untrustworthy information. That is why the city of Breda provided the funds for the web portal development, without interference of supply side actors. Breda evaluates the web portal once a year and updates the information regularly.

EOS Ostend

Third parties managed maintenance issues of web modules, but EOS kept the contents up-to-date.

Kent County

Both web modules were regularly updated to include new funding measures and changes in eligibility. Kent recommends using an own website to keep maintenance costs low. New funding measures need continuous updates.

City of Mechelen

Mechelen had a service contract for Warm Huis. The thermography-related information is maintained by the provider of the thermograph.

PSEE Hauts-de-France

The website is maintained by PSEE IT developers, so there are no special contracts regarding services. PSEE follows the number of visitors for the web module from time to time to see if it is still relevant. PSEE still searches for a way to improve quality control beyond visitor count. Renomap seems to be at a cost-efficient scale for affiliated local authorities to reduce maintenance costs. The web module can easily be recommended to affiliate LAs.

City of Rotterdam

Rotterdam posts new stories every month and checks new data via analytics to improve the web modules. However, it is not easy to search for people with new success stories and willing to cooperate. The pop-up consultancy centre was found to be an excellent place to collect new stories and to promote the web portal.

The web module 'Handy tips when setting up contracts' is a simple list. This web module does not require regular update or maintenance and neither contains dynamic information. The web module includes links of other useful websites that should be checked once in a while.

FINDINGS

LAs are in charge of maintaining the quality of contents and updates. Although most LAs update information monthly, smaller LA evaluate content about once a year. Regular evaluation sessions can be helpful to improve the quality with new web modules instead of only focusing on updating information. It is also recommended that LAs not only assess the web modules internally but also provide opportunities to collect feedback from visitors.
LAs should regularly check website capabilities and whether it is appropriate to host new information or new web modules. For example, a web module covering a whole region is maybe better positioned at a supra-local level with partial fill-in by the local authority.
Some high-cost modules might also be prone to high-cost maintenance. For example, the thermographic map requires a high cost to update the information so that co-creation is indispensable to maintain the web module.

3.4.3. Marketing

City of Antwerp

Antwerp organised a road show at the launch of the thermographic map and web module. During the road show, visitors could come and check their roof with the support of one of the advisors of the EcoHuis. The advisors also gave information about roof insulation and subsidies. The pop-up consultancy centre and events such as a road show proved more successful and efficient than advertising through digital newsletters, social media, and flyers. However, it is costly to hold these events, which require about 4-5 persons for setting up and hosting the stands.

City of Breda

The city of Breda conducted communication campaign to inform citizens about the web portal through a communication campaign using a pop-up consultancy centre, events, door-to-door letters and local newspapers and media. The civic-public intermediary organization HOOM was in charge of marketing and developing a communication strategy, together with BRES and the city of Breda.

EOS Ostend

Marketing was rarely planned and conducted. The LA promoted web modules through social media, an item published on their website, advertisement in the newsletter, and a pop-up consultancy centre. In the end it proved more effective to contact people directly and to speak to them in person.

Kent County Council

The 'Warm Homes' website was situated within the current Kent council website. Target groups were reached through advertising on the Energy Savings Trust (EST) website, mailing rounds and through the pop-ups.

City of Mechelen

Marketing and communication of the website is currently a shared responsibility of the department of Marketing and Communication and the sustainability department. A particular challenge is to translate technical and complex topics so it is easy-to-understand and accessible information. This is especially true for low-carbon technologies and home energy renovations. Mechelen also witnessed the importance of guiding people to the website: they needed to invest in communication and promotion for this. Their digital newsletter had an important contribution to attract the website visitors.

PSEE Hauts-de-France

The promotion was made using a newsletter, a pop-up consultancy centre, and their social network.

City of Rotterdam

Social media, a newsletter, a sustainability week in October and the pop-up consultancy centre were considered the best way to promote the web portal and modules.

FINDINGS

LAs carried out online and offline marketing. Smaller LAs limited their marketing effort or collaborated to develop a marketing and communication strategy. LAs mainly promoted their web portal and modules through online marketing such as social media, digital newsletters, newspapers, advertisements. However, this was not always considered as effective as physical interaction, such as observed during roadshows and interactions in pop-up consultancy centres. However, such interaction can only be organised for a certain period. It is considered needed because citizens can then easily ask questions directly to advisors and consultants, thereby offering more accurate guidance towards the specific kind of information they are seeking.

4. Cross comparison of initiatives

4.1. Effectiveness of web portals

The web modules developed within Triple-A were hosted within web portals owned by the LA. As we aimed to assess the relative importance of these web modules compared to their hosting portals, we also analysed the number of unique visitors of the web portals. Effectiveness of these web portals is analysed by comparing the KPI 1 (number of unique visitors of web portal) to events and actions performed by the seven local authorities from 2017 to 2020. The web modules developed for Triple-A project were launched from November 2018 onwards. We hypothesize that the following actions done in the framework of Triple-A can influence the number of unique visitors:

- ● Group purchase organized by the LA
- X Newsletters, newspapers sent by the LA
- □ AdWords campaign initiated by the LA
- ▲ Pop-up consultation service offered by the LA during a short period
- ○ Events organized by the LA
- ✱ Launch of web modules by the LA

We investigated this using Google Analytics information from the following web portals and web modules (See Table 2):

We note that we did not investigate such actions beyond what was done as actions within the Triple-A project. Therefore not all changes in number of unique visitors will be discussed in detail.

TABLE 2 INVESTIGATED WEB PORTALS

Local Authorities	Investigated web portal link
City of Antwerp	www.antwerpen.be/ecohuis
City of Breda	www.woonwijsbreda.nl
Kent County Council	www.kent.gov.uk/warmhomes
EOS Ostend	http://www.eos-oostende.be/
City of Mechelen	www.mechelenklimaatneutraal.be
PSEE Hauts-de-France	https://www.pass-renovation.picardie.fr/projets/
City of Rotterdam	www.duurzaam010.nl

The graphs per LA below present how the number of unique visitors (NUV) changed over time to investigate what events or actions contributed to increase the NUV of web portals.

4.1.1. City of Antwerp

Antwerp facilitated a group purchase for roof insulation, used AdWords, and published in 2017. Announcing events in the web portal affected the number of unique visitors, as shown in the following Figure 3 for October 2017. Antwerp also organised a roof festival, and held an information session every October. Antwerp assumes that distributing paper folders containing the web portal promotion led to the peak in September 2017.

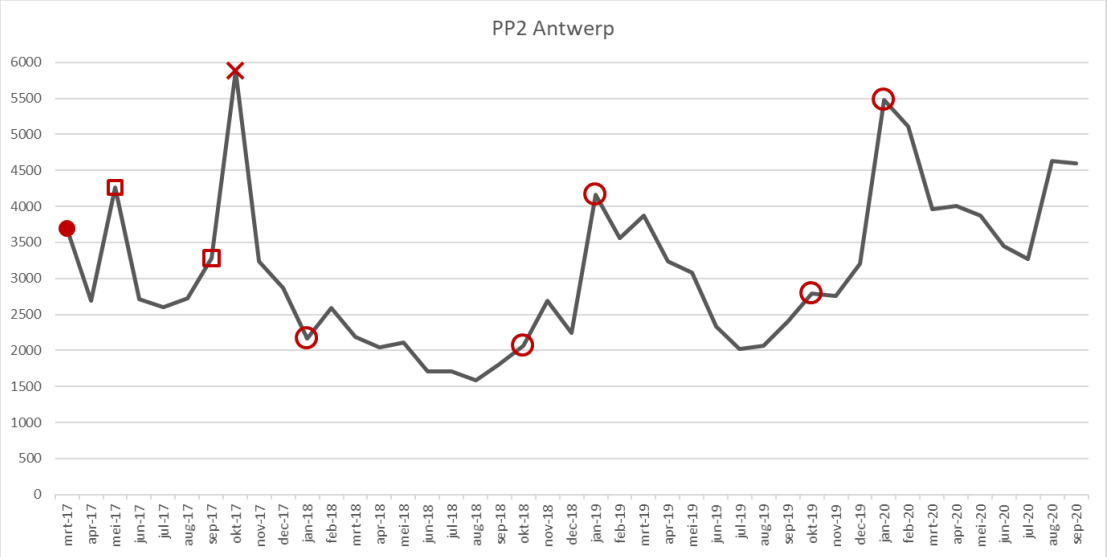

FIGURE 3 NUMBER OF UNIQUE VISITORS OF THE ANTWERP WEB PORTAL (ECOHUIS)

Antwerp further expects that the combination of (digital) communication and different events may cause peaks in the number of visitors to their website as shown in Figure 3.

Every year in January and September a brochure with information about their info sessions is distributed through different channels and is also announced through their newsletter, Facebook, and website. They also have a monthly newsletter (except in the Summer period) and a Facebook page and from 2020 also an Instagram page where they announce their events.

Every year in the beginning of October Antwerp participates in a sustainability event called Ecodroom. The EcoHuis has a stand there with information about their services, info sessions, advice, workshops, subsidies, and so on. From 2017 to 2020 they also participated in the building fair Bouw and Reno. This is an exhibition about renovation and low-carbon technologies. It is always organized in the second week of January. In 2019 they organized the roof festival in September for the first time. During this festival visitors can visit different innovative green roofs, roof gardens and can participate in workshops and info sessions.

Overall, there was a clear seasonal impact. During winter and cold weather, the number of unique visitors increased and showed a peak. This is probably because homeowners are then more aware of the cold and their energy consumption for heating.

4.1.2. City of Breda

Breda had four different web portals due to the technical and organizational issues during the study period. Breda launched two first pop-up consultations which are shown in Figure 4. Although the first pop-up launch did not highly impact the number of web portal visitors, the second pop-up consultation period in November 2018 shows a peak of the number of unique visitors. The peak in

October / November 2018 was caused by the launch of the then new mobile pop-up Greenhopper on 10th October as the opening hours were published in the web portal. Breda saw similar spikes in the first months of the new web portal (woonwijsbreda.nl), a peak immediately after the launch of the website and subsequent publicity. Also, a peak (end of April 2020) occurred when an article was published about solar panelling in a newspaper in one of the neighbourhoods. Moreover, it is assumed that more advertisement and webinar affected to the peak.

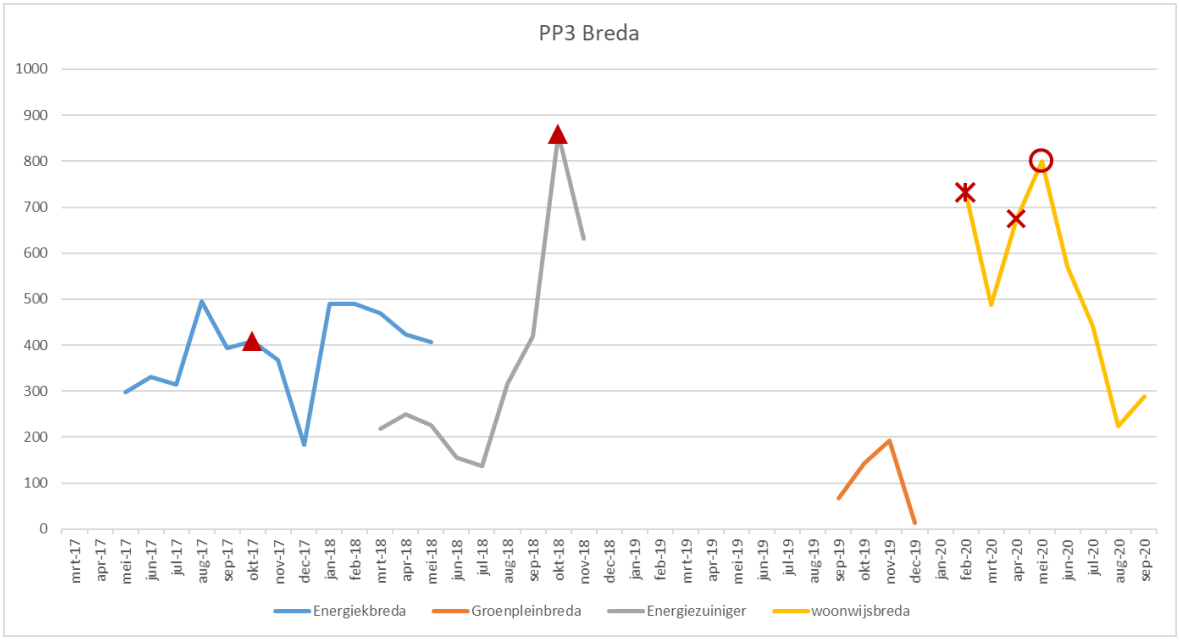

FIGURE 4 NUMBER OF UNIQUE VISITORS OF THE BREDA WEB PORTAL (WOONWIJSBREDA)

4.1.3. Kent County Council

The graph in Figure 5 shows the number of unique visitors during the time that Kent launched its web modules. Launching new web modules did not influence on increase the number of unique visitors of web portal. Interestingly, the peaks are always when the weather starts to get colder, and people start looking at ways to make their homes warmer. The weather in the winter of 2018 was milder than in 2019. Similarly, the graphs show there were more unique visitors and peaks in 2019. One can speculate that seasonal impact is important to gain more attention for home renovation. The peaks of visitors at the end of 2019 can be attributed to the launch of pop-up information stands in libraries. The spike in 2020 can be attributed to COVID-19.

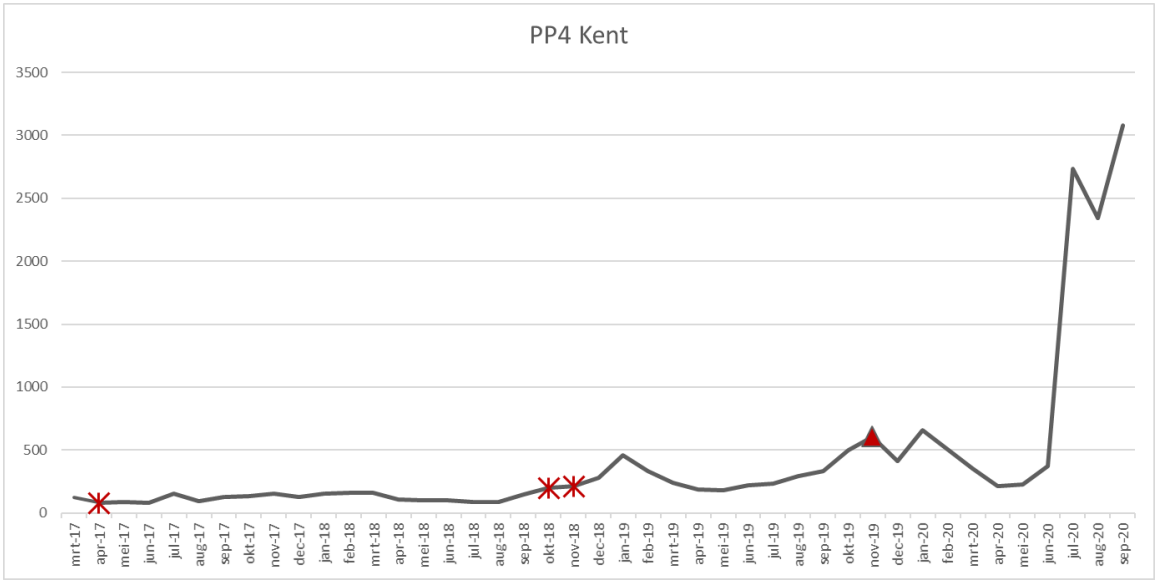

FIGURE 5 NUMBER OF UNIQUE VISITORS OF THE KENT WEB PORTAL (WARM HOMES)

4.1.4. City of Mechelen

Mechelen has done regular publications on their web portal, group purchases, and pop-up consultation. It is difficult to say the events and actions contribute to the success of the web portal.

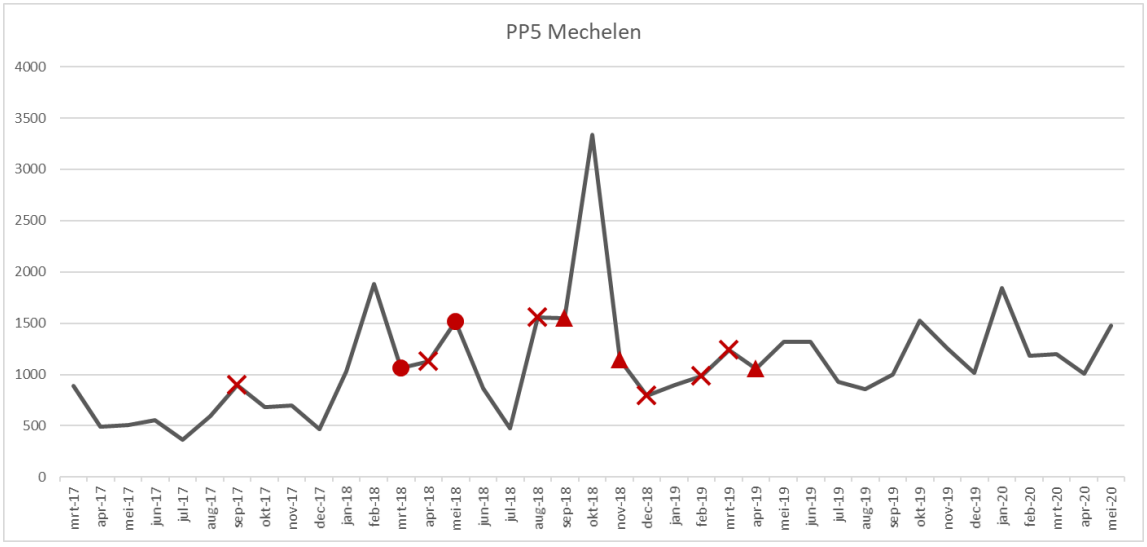

FIGURE 6 NUMBER OF UNIQUE VISITORS OF THE MECHELEN WEB PORTAL (MECHELENKLIMAATNEUTRAAL)

4.1.5. PSEE Hauts-de-France

During the period when PSEE Hauts-de-France conducted AdWords the number of web portal visitors increased. In contrast, launching the new web modules had little impact on the number of unique visitors. The events such as housing fairs and workshops led to an increase of visitors. In February, an large engagement workshop was held with LAs, contractor union, partners, and institutions. During the workshop, PSEE introduced the web modules. It is probable that the workshop affected the high number of web portal visitors until March 2019. In October in the same year, there was a fair about housing that might have had an impact.

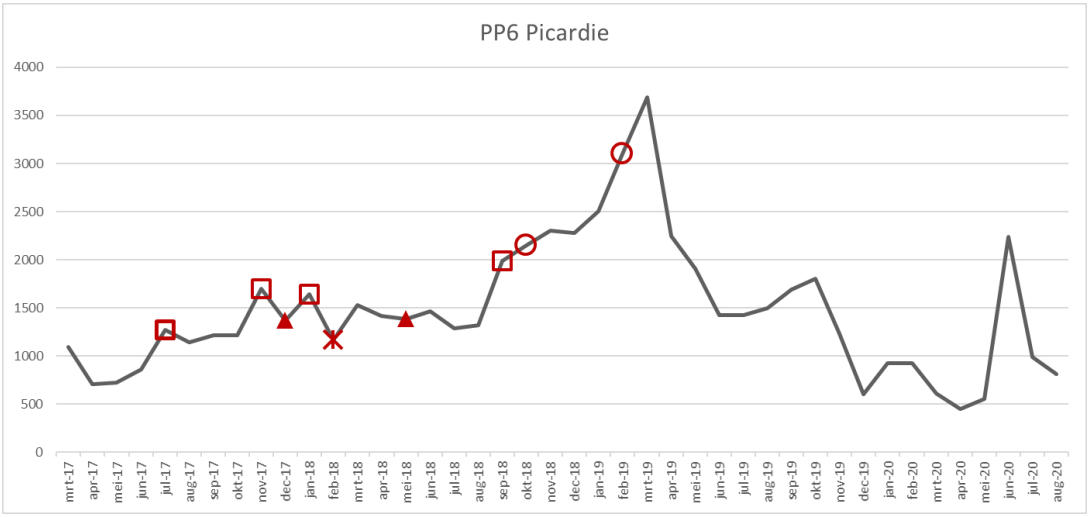

FIGURE 7 NUMBER OF UNIQUE VISITORS OF THE HAUTS-DE-FRANCE WEB PORTAL (RENOMAP)

4.1.6. City of Rotterdam

There was a significant relationship between launching web modules and the increase in the number of unique visitors. Interestingly, announcing local events such as annual sustainability event also had an effect to promote the web portal. Before launching the web module, the number of unique visitors highly relates to other actions and events performed by the city of Rotterdam. However, the number of web portal visitors was a bit more stable after implementation of the web modules. In April 2018, a new web portal (www.duurzaam010.nl) included information on events about getting disconnected from natural gas, the pop-up store launches, and this leads to a peak. In December, a newsletter about insulation subsidy coupons and a campaign for promoting Home Energy Monitoring Systems were published. Overall, there was a peak when the LA published newsletters particularly with the content related to helping people to get national or local subsidies for energy efficiency. When there was no such publication, for example between March and May, the number of unique visitors decreased.

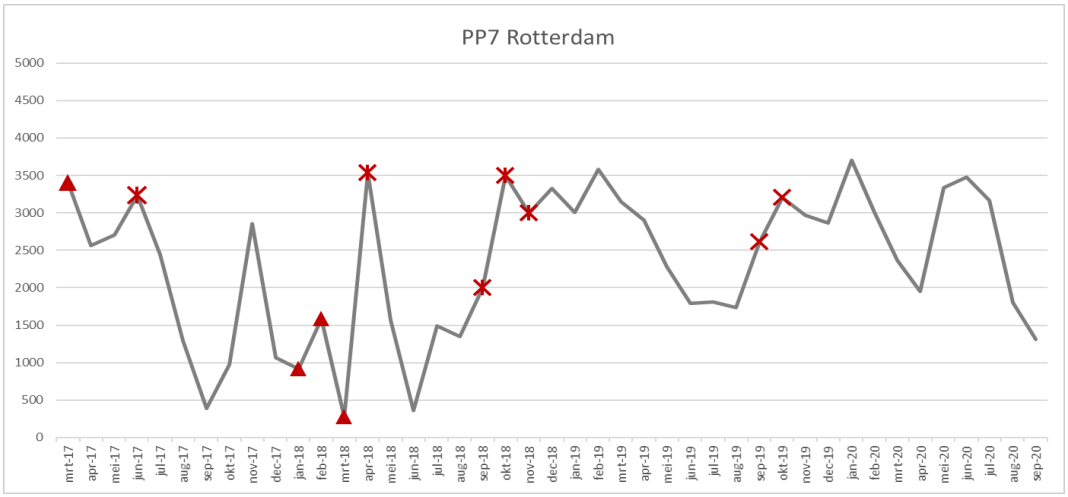

FIGURE 8 NUMBER OF UNIQUE VISITORS OF THE ROTTERDAM WEB PORTAL (ROTTERDAMENERGIEBESPARING)

4.1.7. EOS Ostend

Ostend has conducted various events and actions throughout the research period. Although there is no clear sign or pattern in the graph in Figure 9, the trend of the peak of the number of unique visitors is commonly matched to events and action moments. Mainly, launching new web modules, advertising through pop-up consultancy centre, and e-mailing to target groups contributed to increasing the number of visitors.

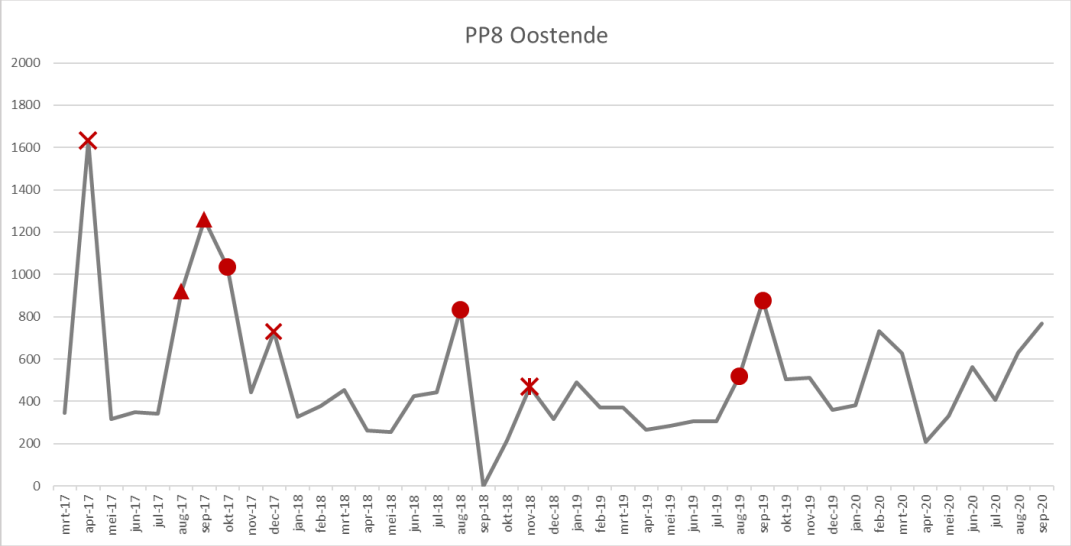

FIGURE 9 NUMBER OF UNIQUE VISITORS OF THE OSTEND WEB PORTAL (EOS-OOSTENDE)

FINDINGS

After changing the LAs' websites the minimum number of unique visitors increased in most websites.
Opening events, housing fairs or workshops can **contribute to increas**ing **the number of unique visitors.**
Face-to-face methods using the web platform as a tool on opening events, workshops, and when visiting citizens show effectiveness for visitor increase.
Using the web portals as supportive instruments in **pop-up consultancy centre**s increases the effectiveness of **the web portals.**
Information about **financial incentives or launching subsidy coupons** can effectively **attract homeowners** to visit web portals**.**
The launching of web modules does not always contribute to increasing the number of unique visitors of a supporting web portal.
During a **cold season, people** may **pay** more **attention to home renovation** in general, which might have an effect on web platform visits**.**

4.2. Effectiveness of web modules

The targeted number of unique visitors for all web modules developed within Triple-A was 48,000 persons until September 2020. We reached 38,117 unique visitors in total (see Table 3). Table 3 shows the impact of web modules on a number of unique visitors (NUV) of web portals.

TABLE 3 NUMBER OF UNIQUE WEB MODULE VISITORS

Partners	Name of web module	NUV	Start of monitoring period
City of Antwerp	Zoom in on your roof (Zoom in op uw dak)	22402	01-2019
City of Breda	Energy coach	1126	02-2020
City of Breda	info on one-stop-shop (Greenhopper)	337	02-2020
EOS Ostend	How to find a craftsman?	186	01-2019
Kent County Council	Finance and funding	4340	01-2019
Kent County Council	Referral forms	1440	01-2019
City of Mechelen	Information desk	633	01-2019
City of Mechelen	Step-by-step energy advice	331	01-2019
City of Mechelen	Aerial thermography map	1594	01-2019
PSEE Hauts-de-France	Renomap	2313	01-2019
City of Rotterdam	Information on and Registration to open home events	14	01-2019
City of Rotterdam	Exemplars of retrofit in your neighbourhood	3187	01-2019
City of Rotterdam	Playlist of Do-It-Yourself films to inspire	196	01-2019
City of Rotterdam	Handy tips when setting up contracts	18	01-2019

Overall, there was a correlation between the number of unique visitors (NUV) of web modules and the NUV of web portals, but only for the modules Renomap, Finance and funding, and referral forms. These web modules were launched by PSEE and Kent within a portal that was also designed in such a way that it was easy for homeowners to find this specific information. These developed web modules can be reached with a small number of taps within the web portal. In addition, the existing web portal was renewed by adding new web modules and contents which the web portal did not provide before.

For other authorities, no direct relation between the NUV of web modules and the web portal could be detected. One can speculate that this is because the hosting web portals either had too many channels and modules, or because the newly developed web modules were less advertised.

Similar to observation in section 5.1, opening events, pop-up consultancy, and launching subsidy information contributed to increase the NUV of web modules. Although regular newsletters could get the attention of homeowners, face-to-face events and financial-related information were more

effective to increase the NUV. Launching subsidy coupons attracted homeowners. Similarly also, two seasonal impacts were detected. In winter, homeowners seem to be interested in energy-related home renovation. In the summer holiday period, it appears that people also start searching for home renovation information.

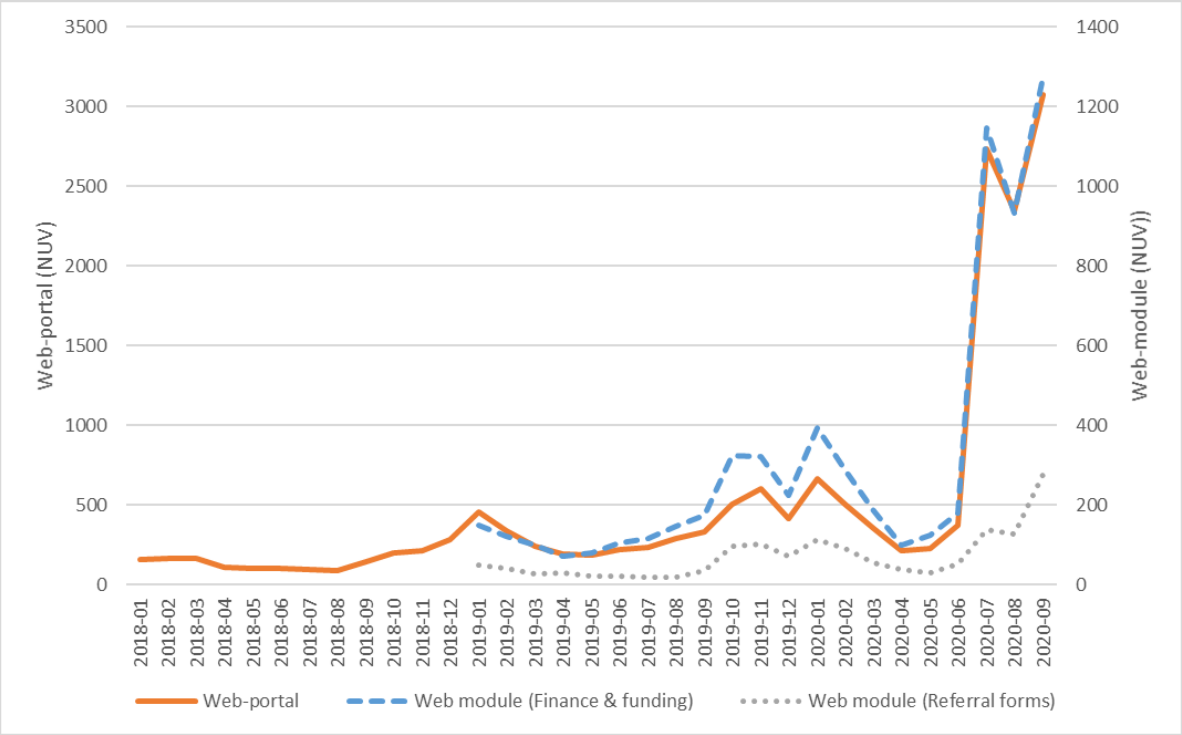

FIGURE 10 NUV OF WEB PORTAL AND WEB MODULES DEVELOPED BY KENT COUNTY COUNCIL

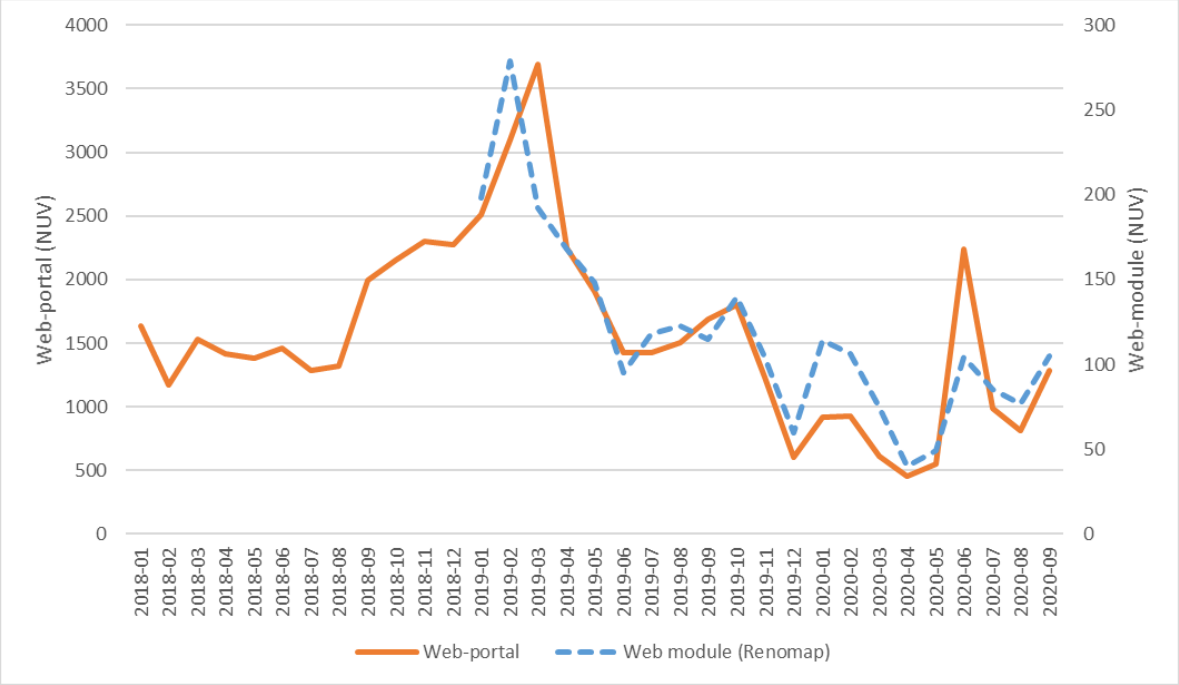

FIGURE 11 NUV OF WEB PORTAL AND WEB MODULES DEVELOPED BY PSEE HAUTS-DE-FRANCE

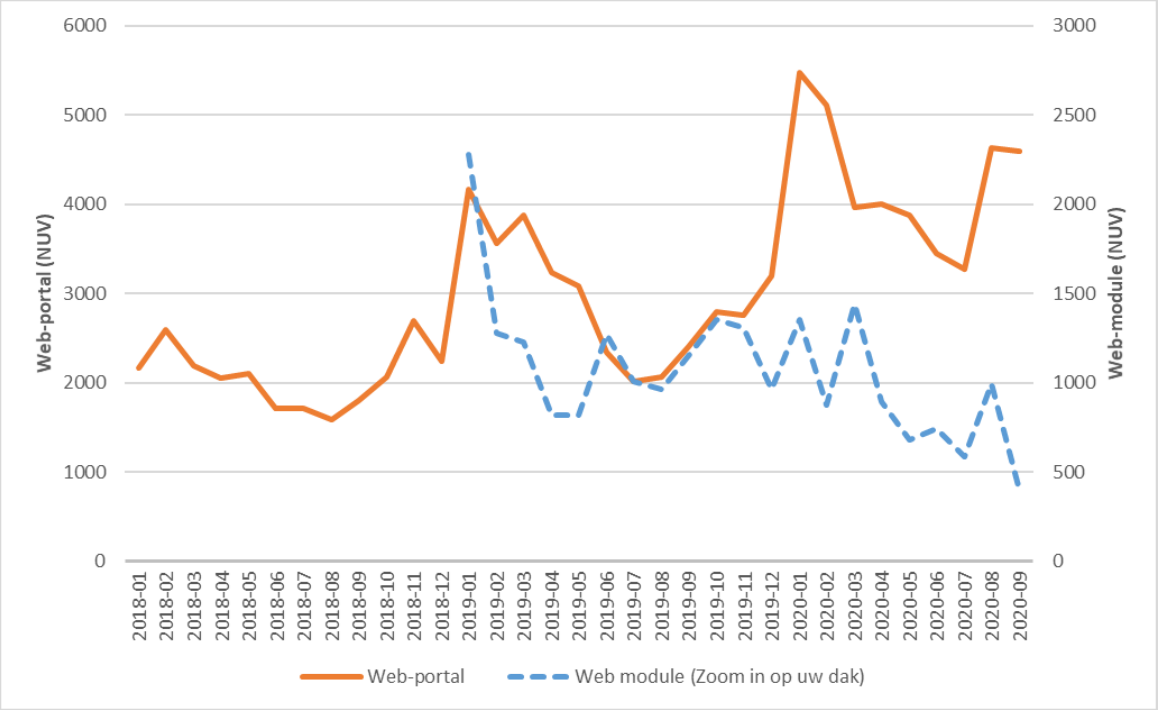

FIGURE 12 NUV OF WEB PORTAL AND WEB MODULES DEVELOPED BY CITY OF ANTWERP

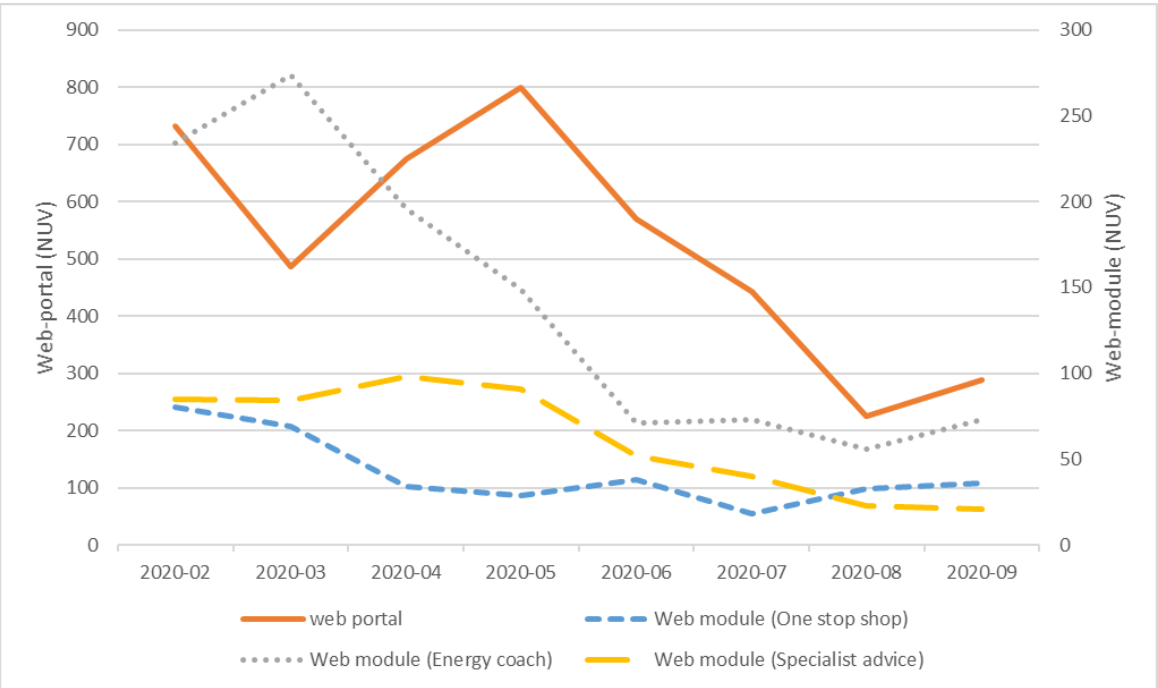

FIGURE 13 NUV OF WEB PORTAL AND WEB MODULES DEVELOPED BY CITY OF BREDA

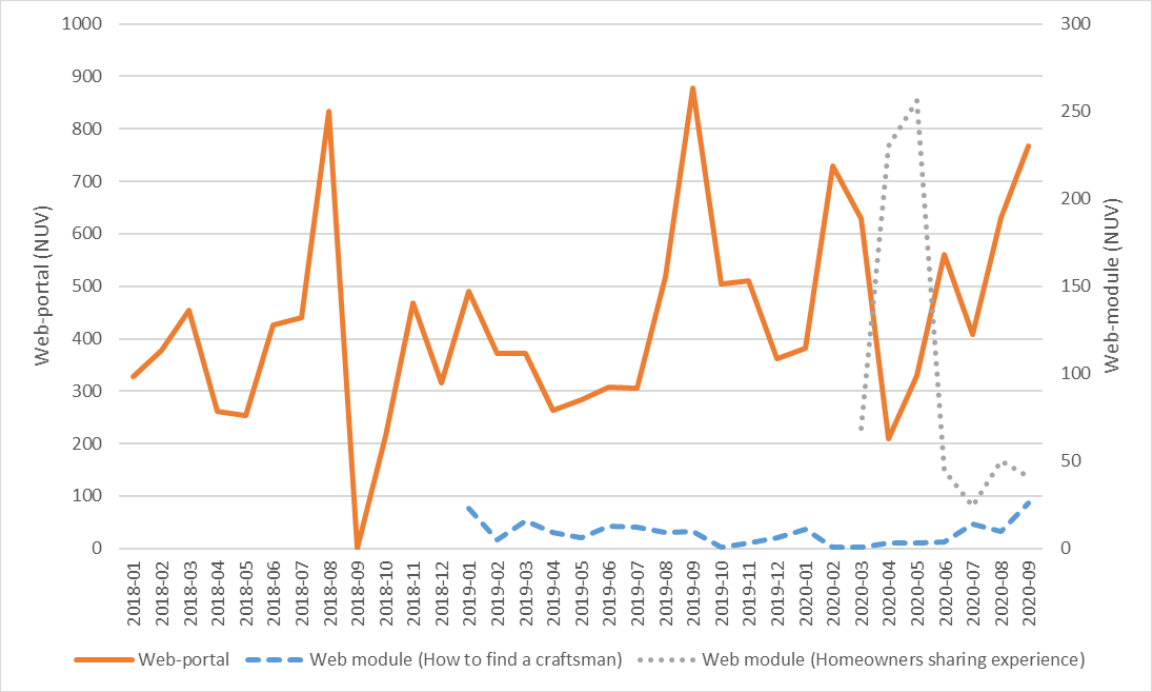

FIGURE 14 NUV OF WEB PORTAL AND WEB MODULES DEVELOPED BY EOS OSTEND

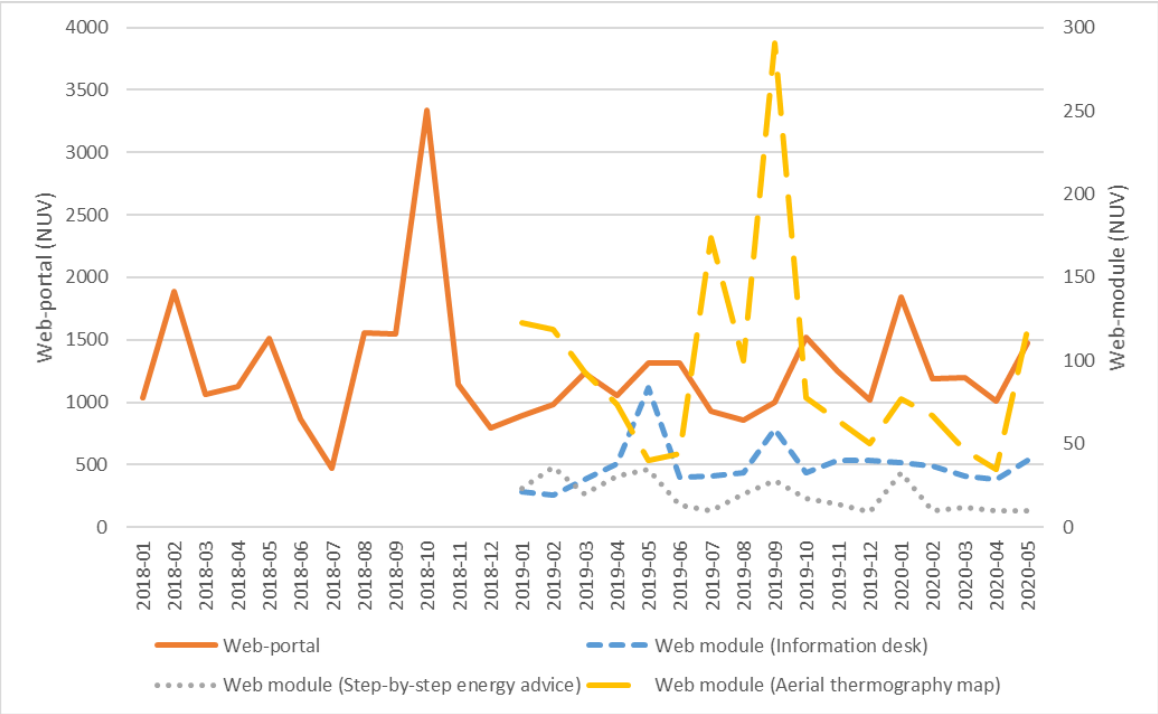

FIGURE 15 NUV OF WEB PORTAL AND WEB MODULES DEVELOPED BY CITY OF MECHELEN

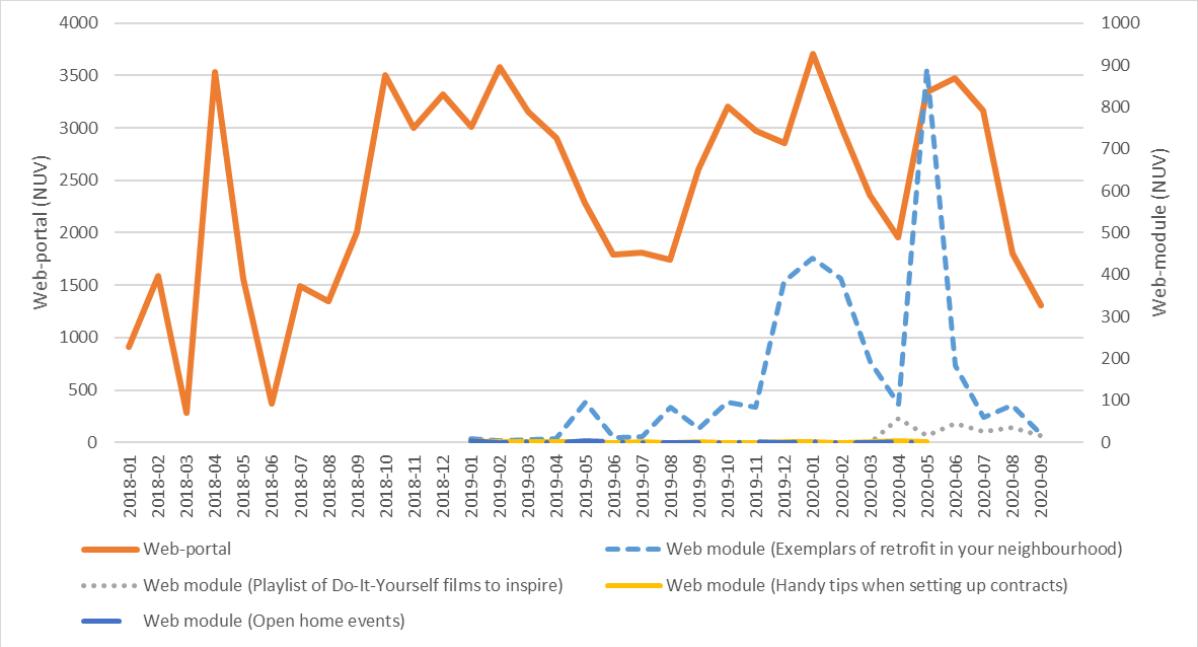

FIGURE 16 NUV OF WEB PORTAL AND WEB MODULES DEVELOPED BY CITY OF ROTTERDAM

FINDINGS

Although there are many visitors for LAs' web portals, in comparison the number of visitors to LAs' web modules can be low.
There was no strong correlation of the unique number of visitors between web modules and their hosting web portals**,** particularly **when the web portal** is already loaded with other modules**.**
Applying many web modules in one website makes **it difficult for visitors to find a specific web module which they are looking for.**
Web design should be as simple as possible to be able to attract visitors to a specific module**.**

4.3. Development cost of web modules and modular web portals

4.3.1. City of Antwerp

Antwerp launched the web module called "zoom in op uw dak" since 5th October 2016. It was developed by the external firm MapGear in collaboration with AGIV (for digital data sets) and Eurosense (for making the thermographic photo) and EcoHuis Antwerpen (development calculators) and communication office Volta. The city of Antwerp financed everything and did not receive subsidies for this project.

- Development cost:
  - MapGear nv: €40.000
  - Eurosense nv: €28.590 for a flight over the city and creation of thermographic photo
  - AGIV: €30.000 for the layout and delivery of underlying building data sets for the entire territory of the city
- Yearly cost for license and maintenance and so on: €7.500
- Communication cost:

Communication cost means the cost for advertising web modules such as sending letters to citizens, banners, posters, external media, flyers, and so on. It depends on how often the LA performs advertising. For Antwerp, it was around €10.000 to €16.000 per year.

Additionally, Antwerp scoped to offer citizens a private web module called 'EnergieID' for homeowners to be able to monitor and evaluate their own energy use. EnergieID costs €5.475 for a basic setup, a profile authentication, and configuration for 20 groups. The license cost is €948 per year for 100 groups. Additionally, a training for half of a day was offered at a cost of €400.

4.3.2. City of Breda

The initial investment cost for Woonwijs Breda was €23.800, and exploitation cost is about €16.080 per year. The web portal development was paid from the regular budget of the City of Breda. Exploitation in 2020 will be paid from the Triple-A budget, in the following years Breda will include it in the regular budget again. The staff costs are covered by the Triple-A project in 2019 and 2020. Breda expects that small LAs can use the similar concept from Breda to set up the web portal.

4.3.3. Kent County Council

As the two web modules are part of the existing KCC website, there were no costs associated with running the site until now, other than costs for existing staff. Staff costs were estimated to be 20-30 hours. This includes the redesign of the web platform to host the web module 'finance information' and for quality assurance and GDPR compliance for the web module 'referral model'. Weekly staff needs are about 2-3 hours to forward the referral form outputs to the relevant district council. Yearly staff needs are likely to be 2-3 hours to update information and process statistics on page views. The initiative and exploitation costs for the two web modules are as below:

- Referral form- £595.5 to design and implement, £59.55 staff costs for maintenance and £2135.64 a year for a staff member to forward referral outputs.
- Finance and funding information- £397 to design and implement, maintenance costs around £39.7 a year to update the information.

4.3.4. City of Mechelen

Since the development was an expansion of the current website, there was no initial investment cost. Exploitation costs included €10.000 staff costs to maintain the site and to do marketing campaigns and €5.000 marketing budget. Staff costs were calculated, assuming a workload of 1 day per week. Budget was foreseen for graphic design and media material (subscription fee for images, movie clips, copyrights).

4.3.5. PSEE Hauts-de-France

Supporting local authorities carry the project cost within their budget. The only associated cost is the website maintenance cost that each party will decide upon. The initial cost to develop the web module was €3.462. The maintenance cost was €6.000 and staff cost was around €1.900 for a year.

4.3.6. City of Rotterdam

Rotterdam launched multiple web modules. The initial investment costs varied from €350 to €900. Exploitation cost was €2.465 per year for the web module 'success story', and €3.530 for the cross-checked feedback tool.

4.3.7. EOS Ostend

For 'Energieke Buren', the initial investment cost was € 28.000 funded by EOS Ostend with support of Interreg Triple-A subsidies (60%). Yearly staff cost was around €4.000 to €5.000. The major tasks of staff were updating websites, collecting stories, promotion, and so on. Domain registration/web hosting costed around €350. For 'Vind een vakman', the initial investment cost was quite low with €562,50. Exploitation costs included €500 of staff cost and €350 yearly cost for domain registration/web-hosting. The domain registration cost is not only for web modules but for the full EOS Ostend web portal.

FINDINGS

Initial investment costs included the development and design costs to set up web modules. Most local authorities had web portals, so web portals were to be extended for integrating web modules. Therefore, the initial cost is either covered by the regular local authority budget, or substantially lower compared to developing a web portal. The cost to develop a web module can range from €300 to €4.000. When LAs need to develop an entire new web portal, costs can increase to about €20.000-30.000. Exceptionally, launching an individual website offering a specialized web-tool/platform for energy monitoring such as EnergieID can cost around €5.000-6.000.

Exploitation costs include staff costs to maintain and promote websites, and domain registration/web-hosting costs. These costs are often not separately calculated and paid for web modules, but included in the costs for an entire web portal, unless the web modules are hosted by third parties. The exploitation costs can vary depending on the exploitation effort. Simple updating and domain registration requires around €1.000 per year. If the web module needs collecting data for a regular update, and for developing contents the cost can easily increase to around €5.000. Exploitation costs can amount to about €20.000 for an entire web portal. Although these figures are just rough indications, they might be helpful for relative comparison. In practice costs can vary per procurement or project and according to ambition level, available budget, and market conditions. Furthermore modular developments are theoretically suitable for co-use and co-creation which can reduce costs by sharing costs and benefits between various stakeholders.

4.4. Feedback from visitors

We have distributed a web portal and web module visitor surveys to 7 partner cities from May to September 2020. The survey aimed to examine:

- Do the web modules provide useful information to visitors?;
- Is the information matched to the expectations of visitors?;
- Is it easy to find the information in LAs' web portals?
- Would the web modules be helpful for other LAs to develop the similar modules?;
- Do those web modules affect adoption of low-carbon measures for home renovation?

Unfortunately, this survey was not a success. In total, 58 visitor surveys were completed out of 146 persons responding from the target areas. More than 50 percent of replies was invalid.

Although it is not statistically significant data due to the limited number of responses, there are some indications that can be further explored in future. Visitors expected the following modules will be useful: financial incentives, information about home renovation events and workshop, guidance, and feedbacks from advisors, and getting assistance to find contractors or suppliers. On the other hand, respondents were less enthusiastic about a forum for sharing renovation experiences. This might be related to the previously discussed privacy issues. Respondents were also asked to freely list information that would be useful for them. This gives ideas for developing new modules such as on: green roofs; selling garden plants or exchanging seeds; referring to specialised links for renovation techniques; water saving measures; households' energy consumption overview via internet; new legislation; information on the regulations and new developments; and information on own obligations as a homeowner. This also confirms that homeowners expect from their LA to look beyond energy saving to help them with other sustainability topics.

FINDINGS

A heavily loaded **website** can **make** it **difficult** for **people** to **find** specific modules**.**
It is difficult to attract homeowners to evaluate LA web portals and modules.
It is crucial to promote the contents instead of the **web modules or web portal.**
Homeowners are also interested to learn from broader sustainability information and to better know their own obligations as a citizen.

4.5. Feedback from observer partners

Seven local workshops were held via webinars. LA project partners invited different stakeholders such as homeowners' representatives, experts and consultants, energy cooperatives, social housing companies, communication offices, other local authorities, and so on. During these events, the developed modules were presented and discussed. Here we highlight some of the key findings, particularly for sustaining web developments and for prospecting future modules.

City of Antwerp

Observer partners were positive to continue collaboration, particularly in the field of home energy monitoring systems, energy production and battery packs. Antwerp will attract further partners to continue accelerating installation of digital meters for electricity and gas use.

A possible coupling was found with a dashboard that was developed for another project ('Buurzame Stroom'). This is an open source platform especially developed for the monitoring and follow-up of projects with solar panels and battery packs.

Based on the results of the workshop, the city of Antwerp will have a meeting to discuss changes regarding the communication strategy, which they want to start as soon as possible. After this Antwerp can disseminate information to other LA's and show the possibilities of online monitoring platforms.

City of Breda

All LA's were interested in the way Breda co-created the portal together with their local energy cooperative (Bres) and the national energy cooperative (HOOM). After the presentation they were impressed with the way they organized it and with the end result.

LA's were especially enthusiastic about the hands-on set up of the portal, with practical tips and tricks. And also the easy way people can get in touch with an energy coach.

The modular approach appeals to all of them. Also the integration with the pop-up store makes them enthusiastic, especially Etten-Leur.

Because of three LA's are much smaller than Breda and their local energy cooperatives less professional than Bres, they are concerned if they would also be able to set their portals up in the same way. Especially the timely follow-up of customer requests worries them. Also they are not sure if they can allocate enough budget to set up and support their own web portal.

Explaining the process for Breda, was very helpful for other LA's such as Moerdijk and Halderberge, because they are in the process of starting a tender for their own portal. The information about the Breda portal gave them a lot of insight. During the meeting, Halderberge and Moerdijk were also considering to start up a process for a web portal together, so the scale can be increased. They were also considering to approach HOOM for a quote for their own web portal, based on the concept woonwijsbreda.nl.

Hauts-de-France

Renomap was the first web module installed in the web portal (which existed in the last version of the website). The main goal is to discover some examples of current or completed projects. Project stages, visuals or even energy savings, we tell you everything to help people see themselves better in a future project. Even if the participants know PSEE for a long time, most of them did not know the web module existed until the new web portal had been made and so thought it was a brand new web module. Another prove that the website is better organised the way it is organised now. A web module is a useful tool. The problem is that the module gives you information about federal aid, and it can discourage people from making renovation, whereas local aids exist that can lower their remains to be financed.

City of Mechelen

The observers from Mechelen strongly confirmed the benefits of modularity and co-creation for having:

- A general framework for a web platform (in this case, Duurzaam Bouwloket NL)

- A third party that is responsible for the content (in this case, Kamp C)
- A possibility to add local information (for example a local webpage with local information or activities of the municipality)
- A module that connects demand-side with supply-side actors

EOS Ostende

The site 'Energetic neighbours' was confirmed as a very nice site with reproduction potential, it being very useful for citizens. There were concerns that promotion in order for the module to be found and used can be improved.

- The site 'Energetic neighbours' is now added to the new site 'Liveable Ostend' as part of the column 'What can you do as a resident of Ostend'.
- The Communication department will now develop a communication plan in co-creation with the local Energy House.
- An interview with an Energetic neighbour was included in the free City magazine 'De Grote Klok'
- It is intended to improve linking with social media, particularly when there is a specific theme with a link to the site (for example: construction event, group purchasing of solar panels, premiums that are in the picture, winter is coming, and so on).
- The urban planning department will be involved for support to refer citizens to the platform when they apply for a building permit.

City of Rotterdam

The observers confirmed possibilities that web modules can provide better flexibility in the development of web portals and confirmed there is indeed a need to co-develop with others partners. From the Triple-A development the observers particularly liked the modules: Success stories from Rotterdam, and check your roof from Antwerp and Mechelen.

FINDINGS

By connecting with stakeholders and presenting web developments, LAs got useful tips for maintenance and future developments
LA's explaining the process of web module developments can inspire other LA's and can kick-start development by smaller LA's joining their forces
Various stakeholders are much in favour of further co-creative development of web modules

5. Conclusion

We tried to evaluate the processes of Local Authorities developing web modules for creating Awareness and easy Access for homeowners, for them to adopt low-carbon technologies in home renovation. The main research question was 'What are key lessons from Local Authorities (LAs) fostering modular web portals for stimulating the adoption of low-carbon renovation measures by homeowners?'. The development pathways of web modules, the impact of web modules on web portals, and ways to increase the effectiveness and sustaining of the web modules are taken into account to answer the main question.

First, it is observed that LAs sometimes lack a long-term strategic management plan for web module development. On the one hand, from the qualitative research, we found that LAs can develop web modules for advice and information in different stages of the home renovation process by using the "homeowner renovation journey" as a development model. On the other hand, they tend to focus on developing modules that fit best the local needs and the local web platform at a given point in time. We observed risks that this way of working can lead to obsolete developments as local needs and platforms are ever changing. In the end the "modular" opportunities to reuse web modules in other platforms were not really exploited.

Second, an important lesson from this work is that LAs were not used to think about their web development from the homeowner perspective. For a homeowner, modules from various stakeholders can serve the homeowner renovation journey. It was also observed that a good coupling needs to be found with Customer Relationship Management systems to be able to support homeowners throughout the whole renovation journey.

Third, we noticed that LAs reach out to collaboration for web module development, but they do not often fully exploit co-creation opportunities. Organising workshops with stakeholders helps to understand better the stakeholders' needs and opinions as well as module solutions that are already available from supply, demand and policy actors. While integrating web modules into the existing LAs' web portal is ideal from both financial and management perspectives, this gives no guarantees that homeowners easily find the web modules and that the renovation journey is effectively supported. Although LAs encountered administrative barriers and sharing database with other organisations, co-creation and collaboration with diverse stakeholder groups are essential to succeed for sustaining web modules. Therefore multiple stakeholders need to be engaged during the development stage as well.

Furthermore, we also explored the impact of web modules which were developed. Although LAs planned and developed many web modules by themselves, some specific modules required extensive professional knowledge (for example energy calculation tools, IR-thermography) as well as a long-term plan and collaboration with third parties. It is found essential that LAs keep a close eye on how they can increase or maintain the impact of web modules. The design of the hosting web portal design can make it easier of more difficult for homeowners to find the web modules. According to our comparison between LAs' actions and the increase of the unique number of visitors, web portals also need specific promotion. This can be done through online communication, but the research indicates that impact can be extended if physical events support the promotion as well. For example, some LAs reached higher impact on the web portals through promotion and use of the portal in pop-up consultancy centres, than through newsletters. At the same time, promoting financial incentives or vouchers can also attract homeowners to specific modules.

Finally, it is recommended that LAs carefully manage their collaboration with IT professionals and with other LAs. Larger local authorities might have the opportunity to organise an internal group to develop modules in collaboration with an internal IT department. If smaller local authorities would also transfer to modular portals, they could directly profit from this development by sharing web modules.

All considered, monitoring and sustaining web portals and modules are essential to track if LAs succeed in getting and keeping the homeowners' attention. LAs should not overlook the necessity of promoting the renovation measures beyond giving information. For example, launching new web modules or portals in itself does not necessarily influence the number of visitors to these, unless communication is supported by other means such as organization of events, promotion of incentives and information about regulation.

Our results, thus, provide valuable insights for overall web module development by local authorities. Nevertheless, the research also had its limitations. The web module visitor survey for this project was difficult to do by local authorities and gave only limited results. Local authorities did not test to implement each other's web modules as basic web portal modularity was still unavailable. A few web modules could not be included in this report because the web modules were not yet successfully launched despite a long preparation or trial period. For example, an energy calculation tool was developed but it required more time and expertise from different fields such as energy consultants, programme developers, and academic experts.

We hope that these findings will help other LAs to increase the success of developing, testing, launching and maintaining web modules in their LAs' web platform to encourage low-carbon renovations by single-family homeowners. The modularity of hosting web portals is key for implementing web modules that can fit multiple actors. LAs need to engage in developing and co-creating the content, the supporting structure, and the needed collaborations to actively support homeowners beyond informing and giving advice.

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Annexes

Appendix A

TABLE 4 INTERVIEW QUESTIONS

Strategic	Co-creation	• Do you have a strategic plan for co-creation? Which partners, and in which way? • Barriers? Tips and recommendations?
	Developing web modules	• What aspect of home renovation journey did you have focussed? • Barriers? Tips and recommendations?
Technical	IT development	• Are there any difficulties? • Tips? Recommendations?
	Privacy/security	• How did you handle privacy and security issue? • Barriers? Tips and recommendations?
	Application	• How did you integrate the web module? Is it totally new web portal, or integrated into the existing LA web portal? • Was it difficult to apply web module? • Tips? Recommendations?
Financial	Cost information	• Investment and exploitation costs
		• Is there any Financial challenges? How did you cover the web module development cost? • Barriers? Tips and recommendations?
Management	Quality control	• How did you do quality control of web modules? • How can you decide the information is trustful? • Barriers? Tips and recommendations?
	Maintenance	• How did you maintain the web modules? • Barriers? Tips and recommendations?
	Marketing	• How did you do marketing to make the web modules be more active and successful web portal or web modules? (e.g., more visitors)? Examples can be using social media, sending letters, etc. • Barriers? Tips and recommendations?
	General questions	• Based on your experiences with the development of your web modules, what tips can you give to other LA's / regions that also like to develop your web module?
		• What problems or obstacles were you confronted with during the development of the modules? How did you deal with that?

Appendix B

Triple A_WP1_Questionnaire for visitors to web pages about home energy renovations

Start of Block: Introduction

Q1

You are being invited to participate in research titled "Triple-A EU INTERREG 2 seas Mers Zeeen". This study is being done by The Kent County Council and Delft University of Technology. We thank you for participating in our short survey.

*This survey is about our **WARM HOMES** website providing information about installing low-carbon technologies and home energy efficiency measures. Your feedback will help to improve the website, and it will take you approximately 5-10 minutes to complete. Your participation in this study is entirely voluntary and you can withdraw at any time. You are free to omit any questions. The data will be used for developing the website to provide better knowledge and information related to home energy renovation.*

Following the GDPR, TU Delft has a privacy policy [https://www.tudelft.nl/en/privacy-statement/], which applies to this survey. We believe there are no known risks associated with this research study; however, as with any online related activity, the risk of a breach is always possible. We protect your privacy to the best of our ability. These data will be no longer stored than two years.

- ○ I understand this and agree to participate in this survey (1)
- ○ I do not want to participate in this survey (2)

Skip To: End of Survey If You are being invited to participate in research titled "Triple-A EU INTERREG 2 seas Mers Zeeen... = I do not want to participate in this survey

Display This Question:

If You are being invited to participate in research titled "Triple-A EU INTERREG 2 seas Mers Zeeen... = I understand this and agree to participate in this survey

1. Have you visited the website WARM HOMES?

- ○ Yes (1)
- ○ No (2)

Display This Question:

If 1. Have you visited the website WARM HOMES? = No

Please check the link and return to this page to complete the survey. Have you visited the website WARM HOMES?

- ○ Yes (1)
- ○ No (2)

---

2. How often have you visited this website?

- ○ First time (1)
- ○ Rarely (2)
- ○ Sometimes (3)
- ○ Often (4)

---

3. Please rate on a scale of 1 (not useful at all) to 5 (extremely useful) how useful the following information would be for you.

	Not useful at all (1)	Slightly useful (2)	Moderately useful (3)	Very useful (4)	Extremely useful (5)
Technical information about energy saving measures (1)	○	○	○	○	○
Financial incentives and funding (2)	○	○	○	○	○
Retrofitted cases/examples (3)	○	○	○	○	○
Estimation of energy use and cost savings (4)	○	○	○	○	○
Assistance with finding contractors and suppliers/installers (5)	○	○	○	○	○
Information about events and workshops/ registration (6)	○	○	○	○	○
A forum sharing renovation experiences from other homeowners (7)	○	○	○	○	○
Do-It-Yourself videos to get inspired (8)	○	○	○	○	○
Access to guidance/ feedback from advisors (9)	○	○	○	○	○
Others (10)	○	○	○	○	○

Display This Question:

If 3. Please rate on a scale of 1 (not useful at all) to 5 (extremely useful) how useful the followi... [Others] (Recode) Is Not Empty

Please specify "others"

_____

4. What did you find on the web page(s) you visited? (you can choose multiple options)

- ☐ Technical information about energy saving measures (1)
- ☐ Financial incentives and funding (2)
- ☐ Retrofitted cases/examples (3)
- ☐ Estimation of energy use and cost savings (4)
- ☐ Assistance with finding contractors and suppliers/installers (5)
- ☐ Information about events and workshops/ registration (6)
- ☐ A forum sharing renovation experiences from other homeowners (7)
- ☐ Do-It-Yourself videos to get inspired (8)
- ☐ Access to guidance/ feedback from advisors (9)
- ☐ Others (10)

Display This Question:

If 4. What did you find on the web page(s) you visited? (you can choose multiple options) = Others

Please specify "others"

_____

5. You have visited the website. Please rate on a scale of 1 (not useful at all) to 5 (extremely useful) how useful this information was for you.

	Not useful at all (1)	Slightly useful (2)	Moderately useful (3)	Very useful (4)	Extremely useful (5)	I cannot find it (6)
Technical information about energy saving measures (1)	○	○	○	○	○	○
Financial incentives and funding (2)	○	○	○	○	○	○
Retrofitted cases/examples (3)	○	○	○	○	○	○
Estimation of energy use and cost savings (4)	○	○	○	○	○	○
Assistance with finding contractors and suppliers/installers (5)	○	○	○	○	○	○
Information about events and workshops/ registration (6)	○	○	○	○	○	○
A forum sharing renovation experiences from other homeowners (7)	○	○	○	○	○	○
Do-It-Yourself videos to get inspired (8)	○	○	○	○	○	○
Access to guidance/ feedback from advisors (9)	○	○	○	○	○	○
Others (10)	○	○	○	○	○	○

Display This Question:

If 5. You have visited the website. Please rate on a scale of 1 (not useful at all) to 5 (extremely... [Others] (Recode) Is Not Empty

Please specify "others"

_____

6. How easy was it to find the information you need from the website?

- Very difficult (1)
- Difficult (2)
- Neither easy nor difficult (3)
- Easy (4)
- Very easy (5)

7. From what perspective did you fill in this questionnaire?

- Homeowner (1)
- Small to medium-sized enterprise (2)
- Consultant (3)
- Local authority (4)
- Other (5)

Skip To: Q14 If 7. From what perspective did you fill in this questionnaire? = Homeowner

Display This Question:

If 7. From what perspective did you fill in this questionnaire? = Other

Please specify "Other"

_____

Skip To: Q14 If Condition: Please specify "Other" Is Not Empty. Skip To: 10. Has the web content inspired you ....

8. Do you think the content of the website you visited can be useful for consulting homeowners wanting to renovate their house?

- ○ Yes (1)
- ○ Maybe (2)
- ○ No (3)
- ○ I do not know (4)

9. Do you want to reference/use or develop similar web content after having visited this one?

- ○ Yes (1)
- ○ Maybe (2)
- ○ No (3)
- ○ I do not know (4)

Skip To: Q16 If 9. Do you want to reference/use or develop similar web content after having visited this one? = Yes

Skip To: Q16 If 9. Do you want to reference/use or develop similar web content after having visited this one? = Maybe

Skip To: Q16 If 9. Do you want to reference/use or develop similar web content after having visited this one? = No

Skip To: Q16 If 9. Do you want to reference/use or develop similar web content after having visited this one? = I do not know

10. Has the web content inspired you to take energy renovation measures?

- ○ Yes (1)
- ○ Maybe (2)
- ○ No (3)
- ○ I do not know (4)

11. Do you plan to make some investments to save energy in your house after reading the content of the website?

- ○ Yes (1)
- ○ Maybe (2)
- ○ No (3)
- ○ I do not know (4)
- ○ I already had a plan to make some investments (5)

12. Overall, how satisfied are you with the presented web content?

- ○ Very dissatisfied (1)
- ○ Dissatisfied (2)
- ○ Neither satisfied nor dissatisfied (3)
- ○ Satisfied (4)
- ○ Very satisfied (5)

13. Do you have any additional comments or questions you would like to share with us?

_____

_____

_____

Personal information

Region/ City

_____

Country

_____