Strengthening local authority web portals for the adoption of lowcarbon technologies by homeowners
Triple-A: Stimulating the Adoption of low-carbon technologies by homeowners through increased Awareness and easy Access

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1. Summary

Local authorities engaged in the Interreg 2 Seas project Triple-A want to achieve a market acceleration in the owner-occupied single-family home renovation sector by increasing awareness of - and enabling access to – energy saving technologies. Various local authorities are particularly looking for opportunities to improve their communication channels using novel web functions. This report looks into opportunities for stimulating homeowners to adopt energy-saving technologies by improving municipal communication channels, particularly web portals.

First, literature research reflects on the influence of communication channels on homeowner renovation decision-making processes. The research further provides an inventory of strengths and weaknesses of existing web portals aimed at awareness raising among homeowners and reflects on new web platform developments.

Secondly, data on current web portals of local authorities were collected from local authorities in four countries (Belgium, France, The Netherlands, UK). The qualitative analysis compares existing local authorities' web portals against key characteristics for providing homeowner support, to identify potential for improvement.

Thirdly, local scoping workshops were organized in seven local authorities to determine most effective modules to improve local authority web portals. A demo workshop resulted in a list of desired web functions for local authorities. Local discussion with stakeholders revealed the main opportunities and barriers for improving existing local authority web portals and a selection of at least five web functions for immediate development.

The research resulted in a long-term perspective on web portal development and a set of modules and recommendations for strengthening local authorities' web portals for increasing awareness and easy access to low carbon technologies. Based on this, seven local authorities identified the most effective modules to improve their web portals in the short term in co-creation with stakeholders.

2. Introduction

2.1.   The role of web portals in Triple-A

This report is 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 and the Provinces of South Holland and West Flanders. Through Work Package 1 of the Interreg2Seas Triple-A project, seven Local Authorities (LAs) identify and develop 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. With its 24/7 availability and large outreach, e-tools like web portals are expected to support and reinforce the actions of all work packages of the project, particularly LA actions for the promotion of home energy monitoring systems, pop-up centres and demonstration exemplars.
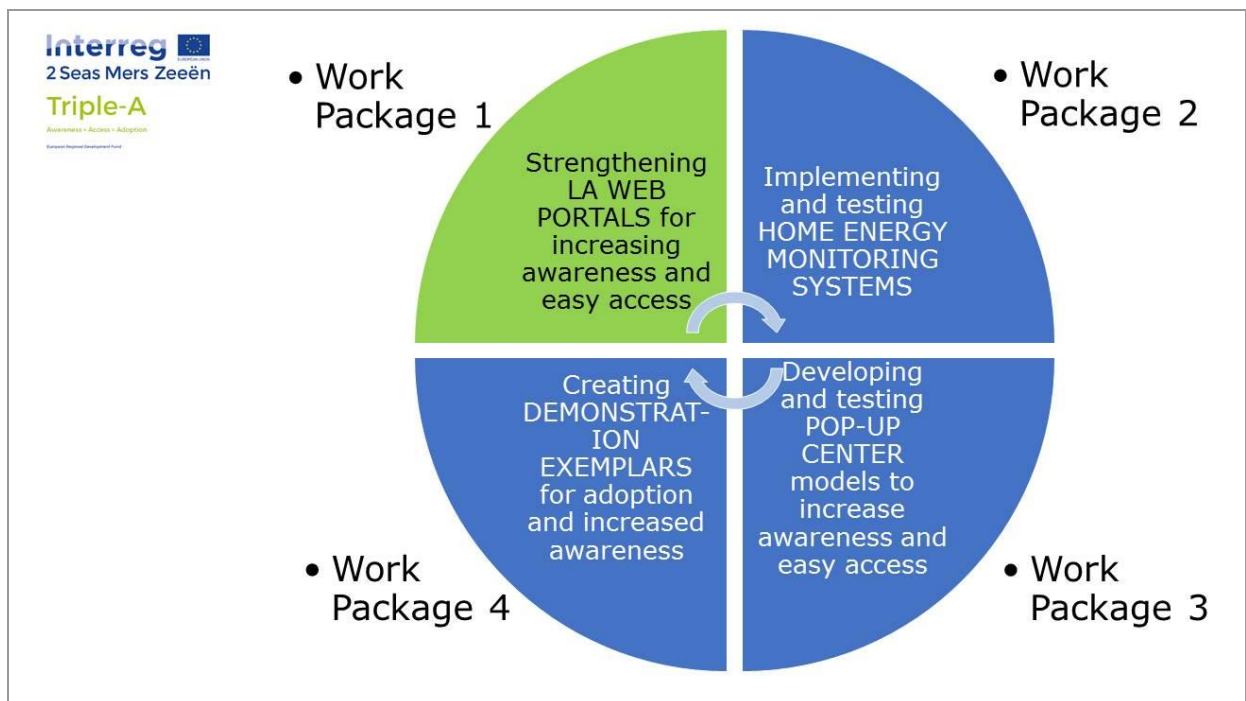
Figure 1 The position of web portals within Triple-A.

2.2.   Structure of this report

To prepare LA strengthening of web portals this report discusses the following activities that took place in the framework of the Triple-A project:

- Literature research (Chapter 3) resulting in general recommendations for strengthening local authorities' web portals.
- Results of a questionnaire to LA (Chapter 4) assessing current LA web portals using feedback of local actors.
- Results of LA workshops (Chapter 5) to jointly determine most effective modules to improve LA web portals.
- Additional information (Chapter 6) provides an inventory of low-carbon technologies and financial schemes that can be incorporated in LA web portals, detailed questionnaire results and workshop tools.
- A reference list (References) provides further sources and information.
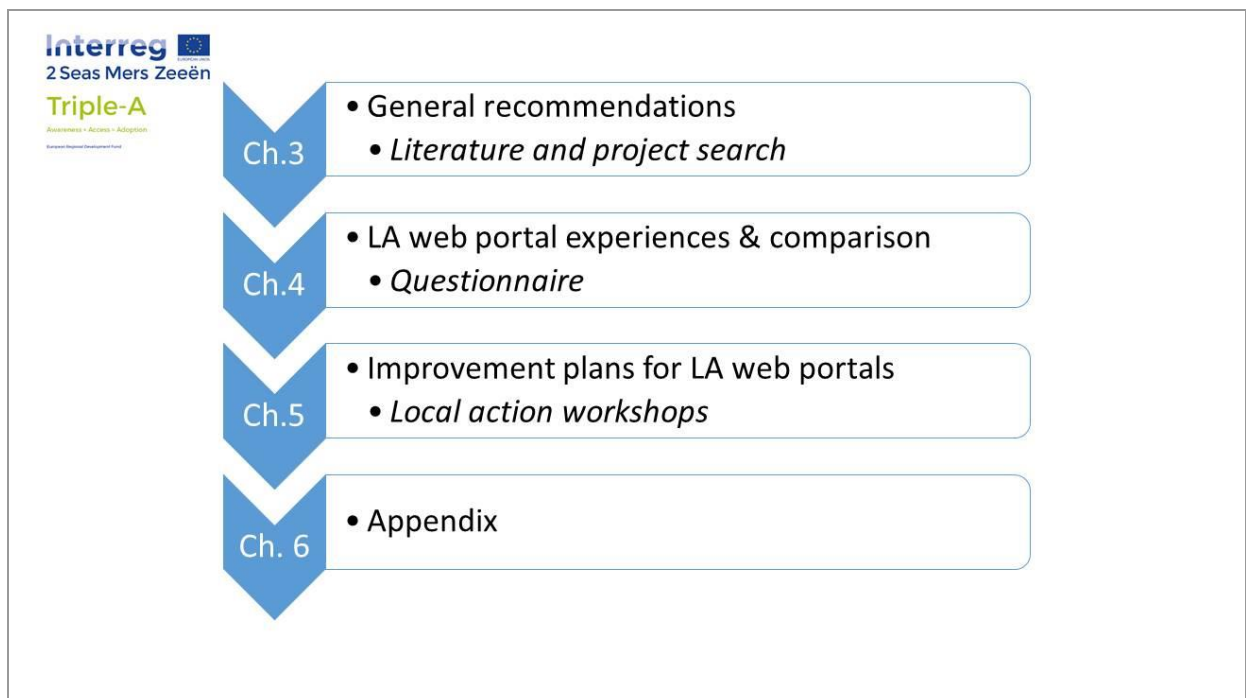
Figure 2 Main chapters of the scoping report.

3. Strengthening web portals for the adoption of low carbon technologies

Chapter 3 provides an inventory of issues - resulting from theoretical considerations and literature research - for strengthening existing web portals - ref. local authority (LA) web portals, aimed at stimulating the adoption of low-carbon technologies by homeowners.

3.1.   Introduction

The residential sector represents 17% of global CO_2 emissions (Nejat et al., 2015). The European Union identified the need to reduce carbon emissions in residential sectors by 88-91% in 2050 compared to emission levels in 1990, in order to transform the current economy into a competitive low carbon one (EU, 2011). Member States now need to establish long-term national renovation strategies with clear milestones by 2030 (EED, 2012). Currently only 0.4-1.2% of the stock is renovated each year (EC, 2016) and this needs to rise to about 3% by 2020 (Joyce, 2017).

To reduce carbon emissions, the widespread adoption of low-carbon technologies for renovation of homes is considered to be one the most important drivers. Besides the implementation of single technologies, integrate major renovations or deep retrofits to remain competitive with future new-build houses (Haavik, Mlecnik and Rødsjø, 2012; One Stop Shop, 2012; SuccessFamilies, 2012, COHERENO, 2015). The adoption of low-carbon technologies in owner-occupied single-family homes is constrained by various adoption barriers. One way of significantly reducing these obstacles and encouraging renovation of the building stock would be to support the homeowners in the decision-making process by making the support process more structured and holistic (Galiotto et al., 2016). Besides the existence of market and policy barriers, users also do not readily adopt or choose low-carbon technologies.

To implement renovation strategies on the local level it is important that local authorities facilitate local uptake of home renovation. Local authorities can facilitate the homeowner's renovation process by providing appropriate communication via their communication channels. For example they provide independent information, consultancy, or propose and subsidize the execution of low-carbon technologies. They have various tools at hand that can help lessen the burden for the homeowner.

Currently one of the main communication channels for LAs to reach homeowners is the internet. LA web portals appear to be key for the provision of information, consultancy tools, documents and financing. In their view of developing e-services, LAs are also keen to redevelop their LA web portals. This provides opportunities for strengthening LA web portals to support the adoption of low carbon technologies.

We discuss these opportunities by first presenting the (theoretical) adoption barriers for homeowners, related to communication channels' influence on homeowner decision processes. In the section thereafter, we discuss (practical) opportunities arising from evolutions in web platforms.

3.2.   Influencing homeowner's renovation decision with web portals

Various literature sources discuss how homeowners' decision processes can or cannot be influenced to secure the adoption of low-carbon technologies, using communication channels resulting from policy programmes. Most findings stem from applied behavioural research on energy efficiency – drawing on microeconomics, social psychology and technology adoption research - and from sociological research on renovation processes (Wilson et al., 2015). While the first body of research provides insights on communication drivers and barriers, the second focuses on relating communication to social practices.

Social research shows for example evidence that homeowners do not consistently make rational decisions, due to time inconsistency, influences by peers, varying or conflicting individual preferences, different 'mental' accounts (Wilson, 2008), self-deception (Cowen, 2007) and loss aversion (Prast, 2005). Adoption can also be constrained by situational factors such as lack of resources or access to technologies (Valente & Schuster, 2002). According to the theory of cognitive dissonance (Festinger et al., 1989), individuals strive for internal consistency between their knowledge, attitudes and actions. While some homeowners who claim to be environmentally responsible will likely act according to their beliefs - as inconsistency produces discomfort - other homeowners might filter information they receive according to what they already think and believe.

A repeated finding from applied behavioural research is the existence of an 'energy efficiency gap': although homeowners understand financial advantages and technical opportunities there is still a cognitive burden of making complex, irreversible and life-intruding decisions. In this framework, various sources (Wilson, 2008; Meer Met Minder, 2010) criticize communication approaches that focus solely on presenting the homeowner as a 'rational financial' decision maker. On the one hand, financial attributes appear to be dominant in policy communication, although the effects on homeowner's decision processes can be considered marginal (Wilson et al., 2015). On the other hand, market prices themselves influence what consumers want to spend (Ariely, 2009). Also, a small request from consumers can lead to strong commitment afterwards (McKenzie-Mohr and Smith, 1999).

All these findings show a need to change local authority marketing and communication approaches. Based on social marketing theories, the following can be advised for communication (Meer met Minder, 2010):

➢ Develop policies and communication from the perspective that money and environment are not always the deciding factor.

➢ To increase the success of communication focus on the personal gains instead of the common benefits. For this, abandon 'one-size-fits-all' communication and develop approaches based on target groups.

➢ Persistently use the fascinations of the homeowners as a basis for communication. Start with small requests to acquire interest for larger actions.

➢ Offer security of success to gain customer confidence. Offer choices and feasible deadlines.

➢ Simplify communication according to action. Allow communication with trusted parties.

Various authors (Michelsen and Madlener, 2013; Mlecnik, 2013; Wilson et al., 2015) reported on the need to stress other – besides financial and energy savings - relative advantages, such as comfort, health and convenience. For deep renovations, also unburdening (One Stop Shop, 2012) and coupling advice with quality assurance – are essential to improve customer confidence (COHERENO, 2015). From Rogers' (2003) research on communication channels it is also apparent that adoption can be increased when communication channels lower the complexity for the homeowner, and make low-carbon solutions visible and testable, and compatible with the homeowner's situation. This means that choices can for example also be influenced by showing low-carbon solutions adapted to specific homeowners' situation and the building's spatial characteristics. Also, Rogers (2003) stresses the importance of targeting adopters according to their perceived needs, experience, personality variables, social values, networks and economic status. This makes Rogers' framework an interesting model for further exploration on the role of communication channels for stimulating the adoption of low-carbon technologies.

According to Rogers' concept of innovation-decision processes (Rogers, 2003), communication channels can influence each step of the decision-process. These steps in the innovation-decision process were defined by Rogers in 5 levels: from first knowledge of a technology, to forming an attitude towards the technology, to a decision to adopt or reject, to implementation of the new idea, and to confirmation of this decision. In each step of the decision process potential adopters (in our case homeowners) can decide to quit adopting the technology, so communication channels (in our case web portals) need to provide the right information in each step and guide the potential adopter through the whole process.

This is illustrated in Figure 3. Following Rogers' model, the following clarifies what web portal aspects are relevant for adopting low carbon technologies:

➢ If knowledge about (certain) low carbon technologies is not available, the homeowner will not think about adopting these options.

> ➢ When the knowledge is not deepened, exemplified and simplified for the specific situation of the owner-occupant, the client will not be persuaded. Solutions addressing specific customer segments are a special challenge.
> ➢ If the client cannot find financing or actors to do the work, the adoption can be abandoned.
> ➢ Even when a contract is signed the homeowner can abandon its decision, for example when contractors don't show up or are unable to provide the expected solution.
> ➢ Finally, when the homeowner perceives that the actors did not provide the expected quality – for example when certain grants were not obtained because the energy performance is not reached in the end -, the homeowner will not recommend this type of technology or actor to other potential clients which might hinder future market development. Otherwise, a satisfied customer might also recommend certain technologies or actors to future clients.
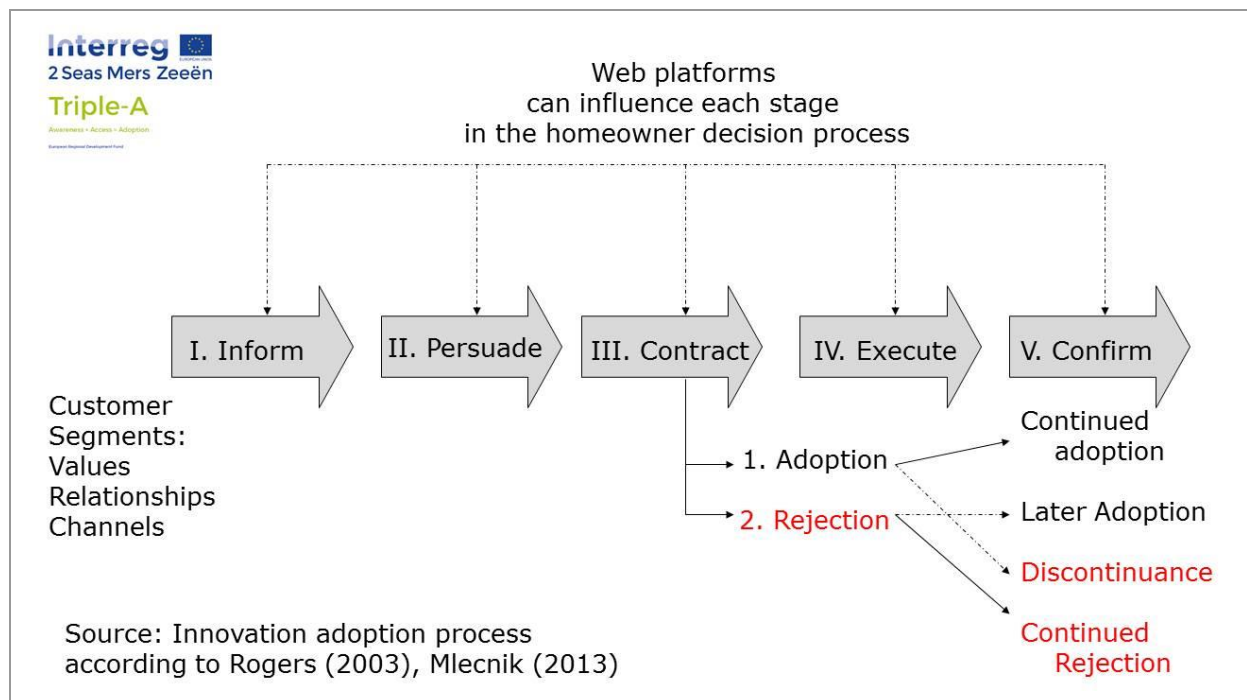
Figure 3 Position of web portals in Rogers' innovation adoption decision model.

In the past authorities have put strong effort to support the first two adoption decision stages in Figure 3 by making homeowners aware of available solutions, subsidies, loans, and services such as energy audits and consultancy. Nowadays we know that the influence of subsidies, energy audits and certificates on adoption of low-carbon technologies is limited, as for example illustrated by Wilson et al. (2015) and Murphy (2016).

Some researchers already described homeowner renovation customer journeys as such linear decision processes. An example of such a study comes from the Dutch Association of Municipalities (VNG, 2015). VNG distinguishes various phases a homeowner goes through when adopting renovation technologies, from becoming aware and gaining interest, to becoming active and considering options and financing. VNG pays for example specific attention to selecting suppliers, the unburdening of installing, paying, and seeking service and the sharing of experiences. The linear representation of the innovation decision process – and the customer journey model – can be criticized. 'Closing the loop' is important for stimulating market development: experienced homeowners are an important source of information for homeowners aspiring to renovate (Mlecnik, 2013). Showing peer experience, social feedback and in situ trialled low-carbon technologies is important to reduce uncertainty, and visible interventions usually have greater normative appeal (Wilson, 2008). Despite its limitations we will use the model described in Figure 3 for further exploration.

Figure 4 illustrates how Triple-A work package actions (ref. Figure 1) are expected to lead to upscaling of neighbourhood renovations. Access to supply can be facilitated by LAs mainly by referring to trusted stakeholders, by upscaling group offers and by introducing quality requirements. For upscaling purposes it is also important that 'experienced' homeowners are engaged to act as an ambassador for their peers in the neighbourhood.
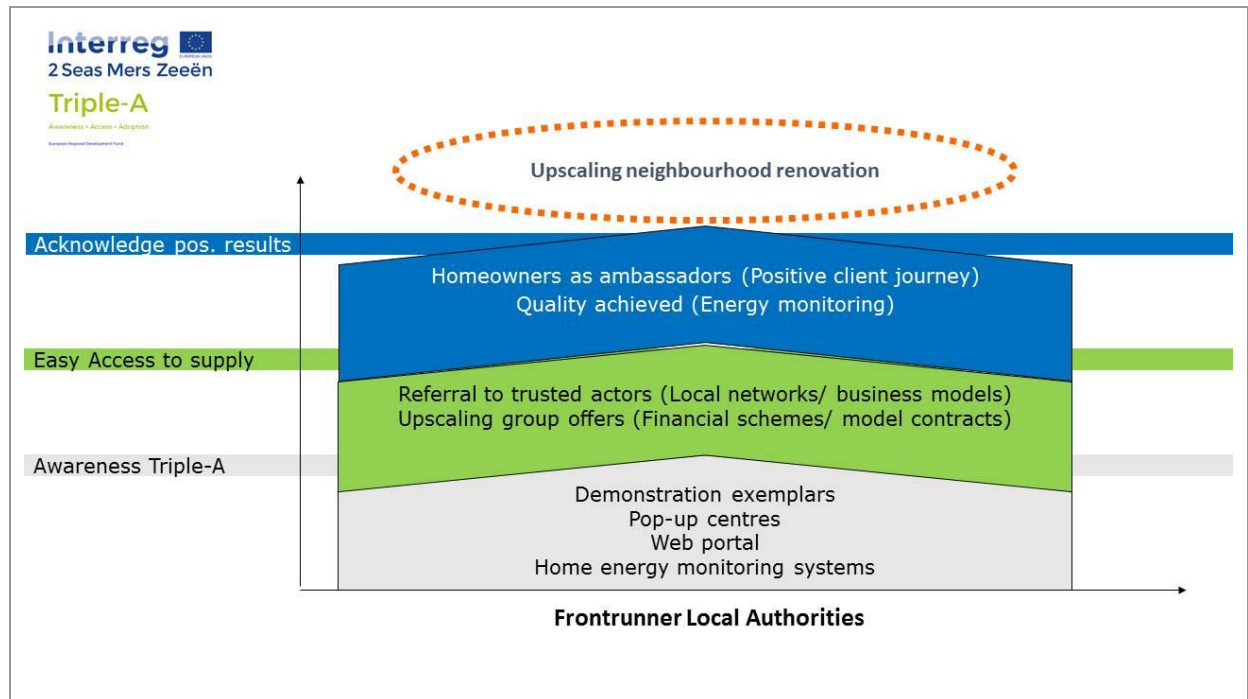
Figure 4 Possible actions to stimulate the adoption of low-carbon technologies by (groups of) homeowners.

3.3. Practical opportunities for web platforms

We discuss the practical opportunities for addressing possible changes in local authorities' web portals. First we show experiences from European projects to better support the homeowner during the renovation process. Secondly, we discuss some examples of websites. Thirdly, we address new opportunities from the viewpoint of web platform technical development.

3.3.1. Supporting the homeowner during the renovation process

A major obstacle for homeowners is the multitude of – sometimes conflicting - information sources homeowners can get from various actors in the renovation chain (SuccessFamilies, 2012) . This is illustrated for web portals in Figure 5. As there is no special concern to consult a local authority web portal, homeowners usually use search engines that can direct them to various web portals. Homeowners might thus be redirected immediately to supply or demand side portals. The only way to assure relative success of a local authority web portal will be its ranking in search engines and the provision of added value for the homeowner, for example services that lower the burden during the renovation process.
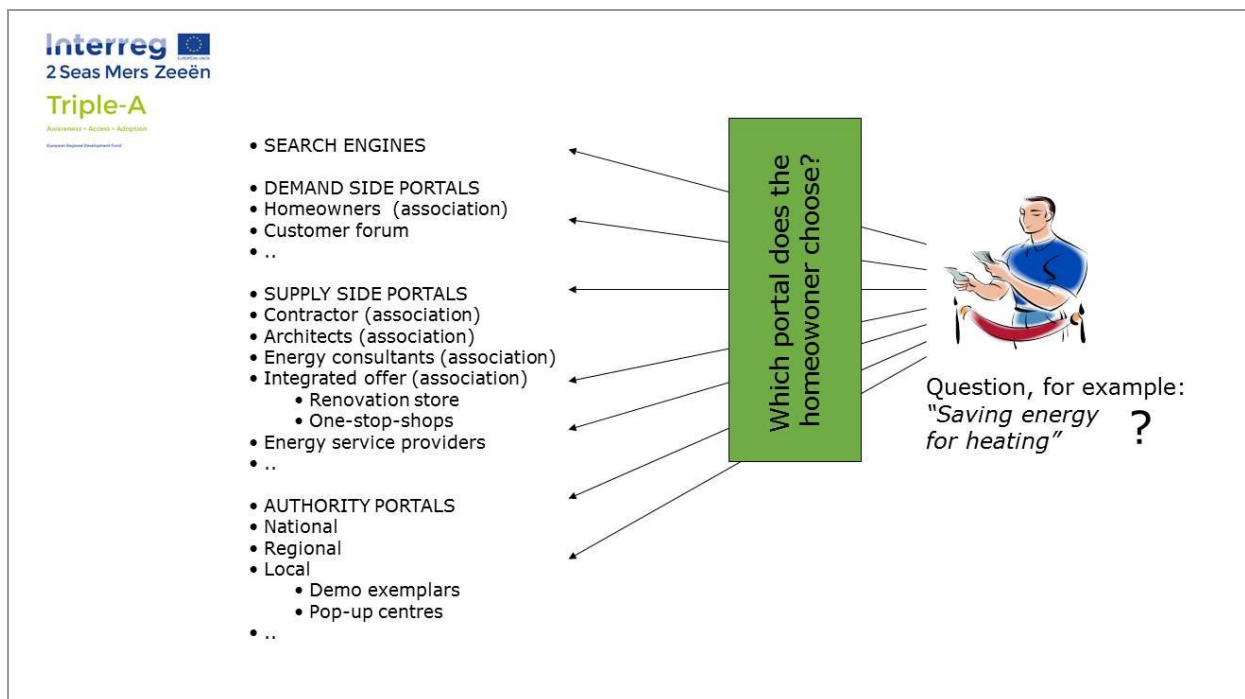
Figure 5 In practice the homeowner has many options to choose informing or consulting web portals, besides local authority portals.

Many European R&D projects have engaged on awareness raising and consultancy for the homeowners, often integrating the development of web portals and added tools, particularly as project partners reflected that web portals can provide awareness and understanding of low-carbon technologies and solutions. In these projects intermediaries such as authorities and non-profit organisations often contribute as 'trusted' communication channels for informing homeowners. Additionally various projects have developed methods for advice, documented demonstration projects and simulation tools for helping homeowners. Recent European projects focus on integrated communication approaches for home renovation, either for reaching a step-by-step renovation over a longer period, or by immediately renovating to a high energy-efficient standard with quality assurance.

An exemplary project for improvement of communication is the Horizon2020 project Refurb (2017), which addressed communication opportunities to eliminate specific barriers for deep energy renovation, such as the lack of data, inertia, lack of engagement and lack of trust. For example, the project clearly defined six homeowner segments for deep renovation: young families,

owners of houses in post-war suburbs with detached houses, empty-nesters, owners of terraced houses with a high energy bill, convinced energy savers, and owners of multi-apartment dwellings. Based on this segmentation different (non-technical) communication approaches were developed to support customer journey using gain creation and pain relief as value propositions and supporting digital tools. Suppliers were involved earlier in the process to offer innovative financial models and online tools for management, in some cases resulting in mixed public-private initiatives. To support public-private co-creation the customer journey was discussed in three steps: communication, coordination and actions, and follow-up. In this way partnerships developed country specific compelling renovation package offers for specific customer segments, such as a tart-up package, an indoor climate package, an energy package, a comfort package, and an à la carte package. Furthermore, consortia provided a renovation coach to develop and support the communication with groups of homeowners. Small communication actions such comparing consumption with neighbours and showing infrared thermal imaging of the own house resulted in increased uptake of renovation measures.

Experiences from other European projects (SuccessFamilies, 2012; One Stop Shop, 2012; COHERENO, 2015) also show that it makes sense to directly address the customer values and motives to capture the attention of the homeowner, such as financial savings and comfort and environmental reasons. Various customer segments appear to be more effectively triggered by different motives. For example, the need for more space might be an important argument for vulnerable target groups and people living in energy poverty. For example, the improvement of easy access, health and maintenance might be an important trigger for an older customer segment. Changes in family composition can trigger empty-nesters to think about a different use of spaces, and thus renovation. Other projects – such as the European project NZB2021 (2015) 'Doors Open Days' - also show the effectiveness of peer-to-peer communication: homeowners' communication about already implemented low carbon technologies towards other homeowners directly resulted in market uptake.

Many actors and web portals engage in awareness raising, but providing easy access to low carbon technologies appears to be more problematic. One of the major barriers is that the supply side for owner-occupied single-family houses in Europe is too fragmented, leaving the owner of a single-family home with a lot of burden to manage different actors for a renovation (One Stop Shop, 2012). A survey among homeowners conducted as part of the COHERENO project (2015) showed that customer trust is a major issue for choosing the right supplier. Particularly it appears to be problematic for the homeowner to find (experienced) contractors that offer more efficient construction processes, quality assurance and better communication with home-owners.

The contracting, execution and quality assurance phases are rarely addressed in web portals. For example, in Picardie, some model contracts are offered. In the Netherlands, zero-on-the-meter renovation contracts are emerging. In Flanders, the Renofase project (www.renofase.be) developed some supporting tools. When looking at integrated renovation of single-family homes the homeowner takes up the role of a project manager while often having only limited energy and project management competencies and knowledge (Haavik et al., 2012; Mlecnik et al., 2011). The projects One Stop Shop (2012) consequently suggested that web portals should make it easier to find local "trusted" suppliers that can deliver low carbon technologies with quality assurance. There are many protocols available for measurement and verification of energy performance, but these are rarely communicated by LAs.

The ERANET-ERACOBUILD project One Stop Shop (2012) aimed to develop a holistic view on needed functions in web portals for renovation of single-family homes. This project identified many functions that are still missing or not integrated in web portals. These functions are illustrated in Figure 6.
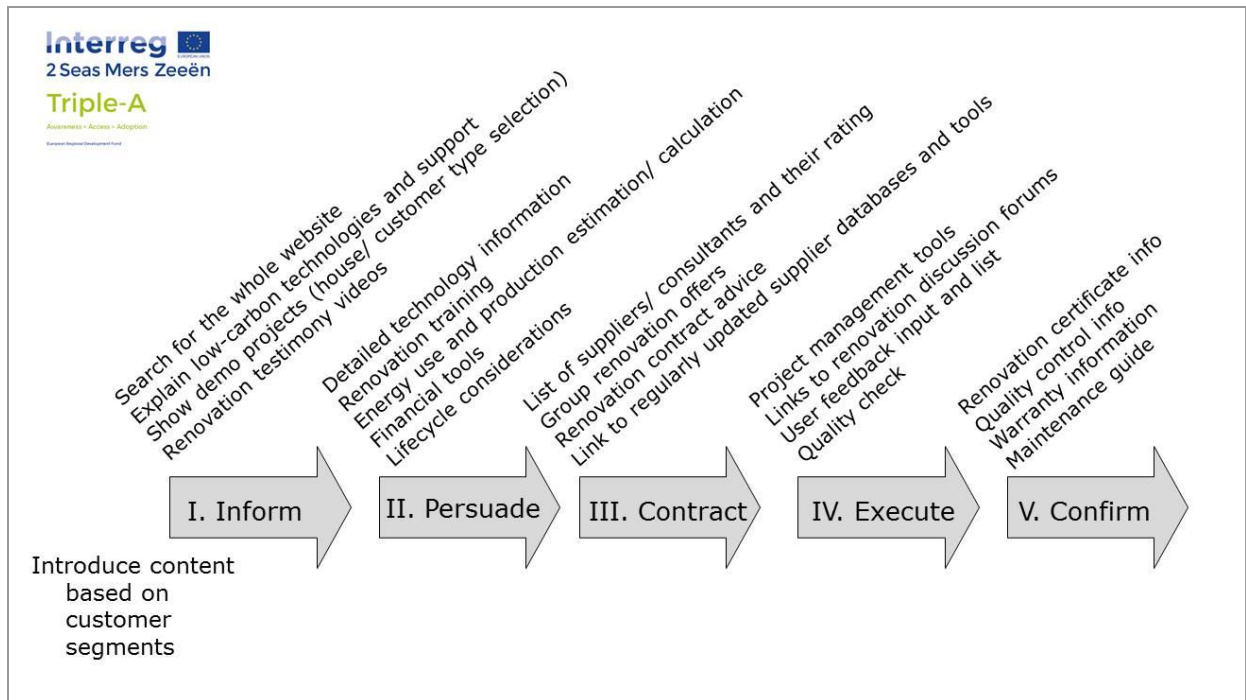
Figure 6 Possible communication concerns for the development of web portals for market stimulation of integrated renovations of single-family homes. Based on findings from One Stop Shop (2012).

3.3.2. Web platforms supporting the homeowner: examples

We discuss a few examples of websites which provides some ideas of how web portals could support each stage in the renovation decision process as expressed in Figure 3.

Table 1 gives an idea about the questions that homeowners would expect to be answered from a web platform in order to guide them from each level to the next.

Decision phase	Example questions to be answered by the web portal
I. Inform	Why should **I** apply low-carbon technologies for what I had in mind? (e.g. I am a young family that just purchased a home and had in mind a kitchen/bathroom renovation, an extension, new installations, regular maintenance,..) What are available solutions for me? (concepts, technologies, innovation)
II. Persuade	Why should I take a next step in applying more low-carbon technologies? (long-term saving, ecological motivation, energy saving, avoiding future works or long-term renovation, combining different grants and tax benefits, and so on) What will it cost/ save? What are experiences from other homeowners? (process, actors, cost-benefit, achieved quality)
III. Contract	Where can I ask for offers? (suppliers, financing, consultants) How can I compare, choose, reject offers? For example, what needs to be specified in a contract proposal?
IV. Execute	How should I plan the intervention of actors? What questions do I have to ask during the works to check the quality?
V. Confirm	How do I get a guarantee/ recognition/ label of good execution/ energy performance? How can I express positive/negative experiences?

TABLE 1 EXAMPLE QUESTIONS THAT HOMEOWNERS WOULD EXPECT TO BE SOLVED FROM A WEB PLATFORM, IN ORDER TO GUIDE THEM FROM EACH STEP OF THE INNOVATION-DECISION TO THE NEXT. BASED ON MLECNIK ET AL. (2011).

Following these questions, Table 2 gives an overview of detected exemplary strengths of some existing exemplary websites, as studied in the ERANET-ERACOBUILD project "From Demonstration Projects towards Volume Market: Innovations for One Stop Shop in Sustainable Renovation" (One Stop Shop, 2012).

Decision phase	Example website	Detected strength
Inform/ Persuade	www.verbouwkompas.nl	Energy information introduced based on consumer's idea of renovation (for example renewal of kitchen, extension of room,..)
	https://www.enova.no/privat/	Frontrunner social marketing local authority portal
	www.energiebesparingsverkenner.nl	Project simulation tool
	http://sparenergi.dk/	Independent public actor, calculation tool and technical information on renovation solutions, offers selection of suppliers
	www.modernus.de	Financial simulation tool based on consumer perspective (environmental, cost, energy)
	www.tzero.org.uk	Widely supported simulation tool allowing for different optimisations (cost in function of budget, CO2 savings, long term value, ...)
	www.ecobouwers.be	Consumer-to-consumer communication (forum)
Contract/ Execute/ Confirm	effizienzhaus.zukunft-haus.info	Public quality label connected to finding suppliers
	www.kuluttajavirasto.fi	Information on all sorts of consumer issues, one part dealing also housing renovations (choosing a renovation company and making renovation agreements)
	www.alttilbolig.no	Selecting all types of suppliers of products and services for homes
	www.zoekeenarchitect.be	Selecting an architect based on their project presentations
	www.ikzoekeenvakman.be	Selecting an acknowledged contractor (unfortunately no previous experiences are shown)
	www.ecobouwers.be	Selecting an experienced contractor recommended by homeowners who already renovated; Consumer-to-consumer communication (forum)

TABLE 2 EXAMPLE WEB SITES AND THEIR DETECTED MAIN STRENGTHS. BASED ON MLECNIK ET AL. (2011).

According to the One Stop Shop project (2012), web portals still need to learn from each other and combine their strengths. Also, various ideas were introduced to consider during website development, such as:

➤ Integrate renovation testimonial videos of demo projects
➤ Show information about specific technology solutions
➤ Show only specific information based on house typology
➤ Integrate energy estimation and financial tools

> ➢ Show opportunities for group renovation and homeowner 'training'
> ➢ Refer to a list of supply side actors (both companies and consultants) and their rating
> ➢ Give advice regarding the contract, quality control and possible certificates and warranties
> ➢ Link to customer portals for peer-to-peer discussion and user feedback

These are all promising functions that still need further development, although some seeds have been planted. For example, the European project Conclips (http://conclip.eu/) provides education clips about low carbon technologies for integration in web portals - in various European languages. The Flemish project Renofase (www.renofase.be) identified tools for setting up and managing a step-by-step renovation plan (see also www.renovatiestarter.be). Various federations (Bouwunie, VCB, NAV, Pixii, Bouwend Nederland, UNETO-VNI,..) and institutes (VEA, dena,..) work on specific lists of contractors and consultants, either or not focusing on sustainable construction. See for example www.duurzameaanbieder.nl and www.vinduwaannemer.be.

As the Triple-A puts a special focus on the development of a cost calculation module for web portals, we discuss some relevant existing tools in web platforms that can help persuade the homeowners.

3.3.3. Cost and energy saving web tools

Triple-A aims to develop a cost and energy savings estimation method for the most common low carbon technologies for space heating, using pre-calculated energy use figures for large variations of building properties, user profiles and housing typologies present in the localities. Its implementation by each LA in its web portal, using their local energy and technology prices, will allow more accurate and tailored advice towards homeowners, including possible step-by-step renovation plans.

To define possible opportunities or threats for the cost and saving estimation methodology, Ghent University performed a study of existing online calculation tools.

In the countries of the Interreg2Seas area (United Kingdom, The Netherlands, Belgium and France), several online calculation tools are present on web portals of cities, utility companies or inter-communal associations and energy agencies. All tools allow users to input the properties of their existing home and return the most optimal renovation strategy. However, the level of detail varies greatly, both for the input parameters, as for the output.

Some interesting examples and their strengths and weaknesses are discussed below. Conclusions are drawn for the development of a calculation methodology within the Triple-A project.

- The Netherlands: "EnergieBesparingsVerkenner" (EnergySavingScout)

- The Netherlands: "VerbeterUwHuis" (ImproveYourHouse)

- Flemish Region/ Belgium: "CheckJeHuis" (CheckYourHouse)

- Flemish Region/ Belgium: "MijnEnergieKompas" (MyEnergyCompass)

- United Kingdom: HomeEnergyCheck

THE NETHERLANDS: "ENERGIEBESPARINGSVERKENNER" (ENERGYSAVINGSSCOUT)

https://energiebesparingsverkenner.rvo.nl/

The "EnergySavingsScouts" aims at professionals in The Netherlands, allowing them to make the most optimal decisions for their clients. Based on building typology and construction period, standard values for parameters such as floor area, building envelope insulation level and heating and ventilation system are assumed. These assumptions can be changed by the user, allowing a more precise start scenario. Renovation strategies are explored, returning the monthly energy cost and saving, total investment, return on investment compared to a bank account, total savings discounted for a 20 year period, energy label and comfort label.

Table 3 provides an overview of the strengths and weaknesses of this website.

Strengths	Weaknesses
Customer interface	
The interface has four functionalities ➢ Returns a renovation strategy for achieving an energy level ➢ Returns a renovation strategy for achieving a comfort level ➢ Returns a renovation strategy for a given budget ➢ Explore the impact of a self-defined renovation strategy The interface allows a definition of optimal strategy based on ➢ Lowest investment ➢ Lowest energy cost ➢ Highest financial return Multiple scenarios can be investigated, saved and compared next to each other	The interface is very functional for the advanced user, but not very attractive for the average home owner.
Input parameters/ energy use	
Well balanced amount of options for insulation level and technologies: enough choice, but not too much Allows different glazing in living spaces and bedrooms, indicating different set point temperatures are assumed in the building Extra information is available on the assumed parameters for the energy calculation (e.g. 'good wall insulation' equals xx cm insulation and a U-value of yy W/(m²K)	Limited amount of geometric parameters: only total usable floor area can be defined, no input for heat loss surfaces (floor area, wall area, roof area, window area) No user behaviour can be inputted, while set point temperatures and demand for domestic hot water is very imported for the profitability of energy saving investments No historic energy use can be inputted, e.g. based on utility bills Unclear how the energy use before/after renovation is calculated
Cost calculation	
Returns discounted financial savings, instead of a simple payback time, taking into account the time-value of money The discounted financial savings takes into account a future energy price increase Extra information is available on the cost calculation methodology	Cost calculation methodology for discounted cash flow does not follow the European guideline (COMMISSION DELEGATED REGULATION (EU) No 244/2012): uses 20 year period instead of 30 years, no rest value for the investment is taken into account

TABLE 3 STRENGTHS AND WEAKNESSES OF THE DUTCH WEBSITE "ENERGIEBESPARINGSVERKENNER" (ENERGYSAVINGSSCOUT).

THE NETHERLANDS: "VERBETERUWHUIS" (IMPROVEYOURHOUSE)

https://www.verbeteruwhuis.nl/

ImproveYourHouse aims at homeowners in The Netherlands. It uses the same database as the EnergySavingsScout, but offers a more user-friendly interface for the non-professional. The same inputs are required as in the EnergySavingsScout. Only total investment and yearly energy savings are returned as an output.

Table 4 provides an overview of the strengths and weaknesses of this website.

Strengths	Weaknesses
Customer interface	
User friendly interface: attractive pictures and symbols to choose instead of dropdown menus Returns general information about different renovation measures Refers to other websites for experiences of other users, subsidies and loans and contractors for specific renovation measures	Unclear how the energy use before/after renovation is calculated
Input parameters/ energy use	
Historic energy use can be inputted, e.g. based on utility bills Well balanced amount of options for insulation level and technologies: enough choice, but not too much Allows different glazing in living spaces and bedrooms, indicating different set point temperatures are assumed in the building Extra information is available on the assumed parameters for the energy calculation (e.g. 'good wall insulation' equals xx cm insulation and a U-value of yy W/(m²K)	Limited amount of geometric parameters: only total usable floor area can be defined, no input for heat loss surfaces (floor area, wall area, roof area, window area) No user behaviour can be inputted, while set point temperatures and demand for domestic hot water is very imported for the profitability of energy saving investments
Cost calculation	
Refers to personal guidance Extra information is available on the cost calculation methodology	Very basic: web tool only returns the most profitable investment, e.g. floor insulation, other interventions are to be explored by the user, no total cost-optimal renovation strategy is returned Only total investment and yearly energy saving are returned, no discounted cash flow calculation is performed

TABLE 4 STRENGTHS AND WEAKNESSES OF THE DUTCH WEBSITE "VERBETERUWHUIS" (IMPROVEYOURHOUSE).

FLANDERS: "CHECKJEHUIS" (CHECKYOURHOUSE)

https://klimaat.stad.gent/checkjehuis/

CheckYourHouse aims at homeowners in the city of Ghent, Belgium. Based on building typology and construction period, standard values for parameters such as floor area, building envelope insulation level and heating and ventilation system are assumed. These assumptions can be changed by the user, allowing a more precise start scenario. A yearly energy use is calculated, and the user can change building components one by one, to explore different renovation strategies. A total investment and yearly energy cost saving is calculated.

Table 5 provides an overview of the strengths and weaknesses of this website.

Strengths	Weaknesses
Customer interface	
User friendly interface: attractive pictures and symbols	Unclear how the energy use before/after renovation is calculated
Input parameters/ energy use	
A visual scale shows the energy performance of your house, which changes as you implement different renovation measures	No user behaviour can be inputted, while set point temperatures and demand for domestic hot water is very imported for the profitability of energy saving investments
Historic energy use can be inputted, e.g. based on utility bills	
Well balanced amount of options for insulation level and technologies: enough choice, but not too much	
Detailed geometric parameters: specific inputs for different heat loss surfaces (floor area, wall area, roof area, window area)	
Cost calculation	
Refers to personal guidance	No cost-optimal renovation strategy is returned, the user himself has to implement a strategy
	Only total investment and yearly energy saving are returned, no discounted cash flow simulation is performed

TABLE 5 STRENGTHS AND WEAKNESSES OF THE FLEMISH WEBSITE "CHECKJEHUIS" (CHECKYOURHOUSE).

FLANDERS: "MIJNENERGIEKOMPAS" (MYENERGYCOMPASS)

https://www.mijnenergiekompas.be/

MyEnergyCompass aims at home owners in the South-West area of Flanders, Belgium and is developed by the inter-communal association "Leiedal". After inputting your address, an energy use is calculated based on the government-known properties of your house such as building typology, living area and construction period. These assumptions can be changed by the user, and more characteristics of the building can be specified, allowing a more precise start scenario. A yearly energy use is calculated, and a personal renovation plan can be downloaded, with the advised renovation measures.

Table 6 provides an overview of the strengths and weaknesses of this website.

Strengths	Weaknesses
Customer interface	
User friendly interface: attractive pictures and symbols Practical advice sent via mail, clear explanation	Asks for general state of the building: perfect, ok or bad shape -> large influence on whether some measures are applicable
Input parameters/ energy use	
Historic energy use can be inputted, e.g. based on utility bills Well balanced amount of options for insulation level and technologies: enough choice, but not too much User behaviour can be inputted, to a limited extent: dwelling heated at daytime? (never, always, weekend) An energy label is returned, which can be plotted on a map of the area, so you can compare (estimated) energy use to your neighbours Result also expressed in bad/average/good and percentage of worst performers	Dwelling size: small/middle/large, not possible to enter exact area No input for heat loss surfaces (floor area, wall area, roof area, window area) Unclear how the energy use before/after renovation is calculated
Cost calculation	
Refers to personal guidance	No information on energy cost savings or investment costs

TABLE 6 STRENGTHS AND WEAKNESSES OF THE FLEMISH WEBSITE "MIJNENERGIEKOMPAS" (MYENERGYCOMPASS).

UNITED KINGDOM: HOMEENERGYCHECK

http://www.energysavingtrust.org.uk/resources/tools-calculators/home-energy-check

HomeEnergyCheck aims at home owners in the United Kingdom and is developed by the Energy Saving Trust, a government and business sponsored not-for-profit organization. Based on a few questions such as typology, construction period and amount of bedrooms, an energy use is estimated. A lot of parameters can be specified in much more detail, allowing a more precise calculation. Based on a given budget, an energy saving plan is generated. Different renovation measures are proposed, with a given investment cost and potential energy cost saving. A total investment cost and yearly energy cost saving is calculated, as well as a simple payback time.

Table 7 provides an overview of the strengths and weaknesses of this website.

Strengths	Weaknesses
Customer interface	
The interface allows a definition of optimal strategy based on ➢ Lower energy cost ➢ Lowest environmental impact ➢ Lowest energy label Information on proposed measures ➢ Amount of work ➢ Impact on comfort ➢ Payback rating ➢ Contribution to energy saving Possibility to remove or add measures in your renovation plan	Not the most attractive user interface
Input parameters/ energy use	
A very short set of questions is asked, which can be specified more in a lot more detail later on User behaviour can be inputted: heating during daytime? Set point temperature in living area (22 – 21 – 19 – 17 °C)? Unheated rooms?	House geometry is purely based on building typology, year of construction and number of bedrooms, no geometric input parameters such as living area, floor area, wall area, roof area, window area can be specified Unclear how the energy use before/after renovation is calculated No historic energy use can be inputted, e.g. based on utility bills
Cost calculation	
Possibility to enter a maximum budget Returns energy costs for heating, domestic hot water & lighting/appliances Asks whether rooms are located under the roof: important for defining the payback time for roof insulation	No discounted cash flow calculation is performed

TABLE 7 STRENGTHS AND WEAKNESSES OF THE UK WEBSITE HOMEENERGYCHECK.

LESSONS FOR FURTHER DEVELOPMENT

Level of detail

An energy use calculation requires information about the building geometry, building components characteristics, heating and ventilation systems and user behaviour. An investment cost calculation requires information about the building geometry. Ideally, some information is available about future renovations, regardless of energy-saving investments.

The energy use, energy use savings, energy cost saving and investment cost can only be calculated correctly when these parameters are available on a detailed level. If this is not the case, non-cost-optimal or even non-cost-effective measures can be proposed by online tools.

Homeowners visiting the web portal of LAs, do not always have the knowledge, time or interest to specify every parameter in detail. Most existing tools assume characteristics of the building based on building typology and construction period. Ideally, they allow users to change the standard assumptions to more realistic inputs.

Tools such as ImproveYourHouse, CheckYourHouse and MyEnergyCompass are developed to trigger citizens to think about renovation, and guide them towards individual consulting services for their specific case. These tools allow a low detail level, possibly resulting in unrealistic results for energy calculations and proposed cost-optimal measures.

Other tools such as EnergySavingsScout, HomeEnergyCheck allow much more detail, and will result in much more reliable results. However, the user interface is more technical, and less attractive to non-professionals.

Ideally, an attractive interface is developed by the LAs, in which standard assumptions are used based on limited information. Every aspect to calculate energy use and costs (geometry, components, systems, user behaviour, ..) can be specified to a high-detail level, if the user is willing to.

It should be made clear to the user, that using standard assumptions can result in unrealistic results. The user should be encouraged to fill in more details, if more reliable results are desired.

Energy calculation methodology and assumptions

Most online tools do not expose which calculation methodology is used to calculate the energy use before and after renovation, while the choice of an energy model will have a very large influence on the results of the cost-optimal renovation measures.

In national building calculation guidelines, mostly single-zone models are used, where a single constant temperature is assumed in every room of the dwelling. While this methodology is sufficient for a regulatory framework, it doesn't necessarily result in the most realistic energy use. In reality, living areas are heated to a higher temperature than bedrooms, thermostats allow people to set lower temperatures during night time etc.

At least, the user should be informed what assumptions are used in the calculations: which temperatures are assumed in which parts of the house during which time of the day? Ideally, the web tool user is able to choose from different user profiles varying from low to high comfort level. Of course, energy saving investments will be more profitable when a higher comfort level is assumed.

Some of the studied web tools allow for some differentiation between comfort levels, living/sleeping areas and night time/daytime heating. Other tools allow to choose a different type of glazing between living areas and bedrooms, but it remains unclear whether different set points and heating times are used in these spaces.

Ideally, a web tool is developed which assumes an average, realistic user profile. The impact of the user profile on the cost-optimal calculation is clarified, and the more advanced/interested user has the possibility to choose the best fitting user profile. The interface should be kept attractive for the general public.

Cost calculation methodology and assumptions

The European Commission has developed a framework to calculate cost-optimal levels for energy-saving investments in the building sector. Using this methodology, a discounted cash flow is calculated for a 30-year period, taking into account investment costs, energy costs, replacement costs, maintenance costs and rest value of the investment. This methodology allows to make the

best decision from a financial point of view, assuming realistic values for parameters such as discount rate, energy price increases, investment costs, … are used.

In the studied tools, this approach is used by the EnergySavingsScout, unfortunately not using the complete procedure as proposed by the European Commission.

Most tools use the simple payback time as a financial output (for example: HomeEnergyCheck), or do so implicitly by showing the total investment cost and yearly energy savings (for example: ImproveYourHouse, CheckYourHouse), from which the user will automatically calculate the payback time. This methodology is a very simplified approach, not taking into account the time value of money, future energy price evolutions, rest values, … and will result in homeowners making non-optimal energy-saving investments.

Again, using the most correct methodology (discounted cash flow) will result in a more complex calculation. The web tools developed by the LAs should use default values of the different parameters for inexperienced users, while more advanced users can adapt certain values, e.g. future price evolutions. An attractive user interface should be developed, but all information about the cost-optimal calculation should be available.

As explained earlier, it is imperative to construct buildings according to sustainable principles regarding not only economic, but also environmental and social issues. A great number of studies have explored how to assess the energy consumption, presented simulation methods, and deployed life cycle assessment (LCA) processes (Bogenstätter, 2000). Most tools so far been developed from a utilitarian perspective, often seeking to find how to make the most economic construction decisions. Qualitative criteria are often disregarded in web-based decision tools.

3.3.4. Emerging opportunities for local authority web platform development

Current e-government environments are constantly changing in an attempt to satisfy the demand for better access to information, more advanced e-services, and more efficient management of the LA. Many LAs still carry the weight of previously developed one-directional web portals. The new challenge for LAs is to exploit their web site also as a channel for bidirectional information transfer, customer service and transactions, this means a network-based Customer Service System (CSS), which Piccoli et al. (2004) define as a computerized information system that delivers service to a customer either directly (e.g., via a browser, PDA, or cell phone) or indirectly (e.g., via a service representative or agent accessing the system). The rising importance of supplementary services (Lovelock, 1994) as a source of customer value and of competitive advantage is widely recognized (Bharadwaj, Varadarajan, & Fahy, 1993; Lovelock & Yip, 1996; Piccoli et al., 2004).

Many LAs still struggle how to make a better match between public services and citizens' expectations, to promote their online services and to manage their IT costs. Customer relationship management (CRM) systems are nowadays implemented to help manage e-services. Increasingly a web platform is regarded as a gateway for clients to (query) other database servers and file servers, which bring discussion about privacy issues of available data.

Obviously new uses of information, knowledge-sharing technologies and e-government strategies emerge with the application of Web 2.0 technologies (Boughzala et al., 2015). For example, it is nowadays more common for local authorities to make use of social networking portals and external databases. Also many local authorities stimulate external app development by providing open data. This can for example include geographical data from geographical information systems, and building, energy and cost data sourced from official registrations. City development and citizen discussion portals also increasingly use blogs and Wikis. Newsletters can nowadays easily be formatted with RSS feeds.

The growth of Web Applications requires a systemic development, which may be facilitated by following modular engineering practices and components that can fit multiple clients. Web Components and related software are recommended as a means to manage the development of Web Applications effectively (Repenning et al., 2001). A Web Component is a software part that can be deployed independently – subject to composition by third parties - by means of contractually specified interfaces and explicit context dependencies only (Szyperski, 1998). An existing Web Component can be used without writing code, simply by adding an import statement to an HTML page. Similarly, Portlets have been developed as a multi-step, user-facing application to be delivered through a Web Application (Diaz and Rodriguez, 2004). Think for example about the web platforms of various travel agents. They all have their own appearance but their source

conde incorporates simple common html-codes such as "searchFlight" and "bookFlight" to search and book flights.

For future development, one can also think of Web Components as reusable user interface widgets that are created using open Web technology (Google Developers, 2013). Currently browser and web portal capabilities are still under development to host Web Components. We can speculate that next generation web portals will probably not have the same look and feel as today. In the future an organisation's web portal will probably be only a visit page or app integrating existing Web Components offered on the market that can use information from existing secured databases.

Web searches and services are also likely to become highly individualized based on customer profiles. When searching information or services, the future chances are that the customer will use a personalized application instead of a specific web page owned by a specific actor. For this reason, it is also more important to focus on the development of (possibly shared) Web Components for LAs, instead of carrying on with the weight of old static web sites. Ideally, connecting all existing 'best' web functions would deliver the best way to provide a sufficient answer to homeowner's concerns in each decision phase.

To highlight the revolutions that lie ahead of local authorities Figures 7 and 8 respectively give an example of past and future network approaches for the development of web functions. In these figures we can define the relationships between various portals as 'Web Functions'. These are preferably bidirectional for optimal communication.
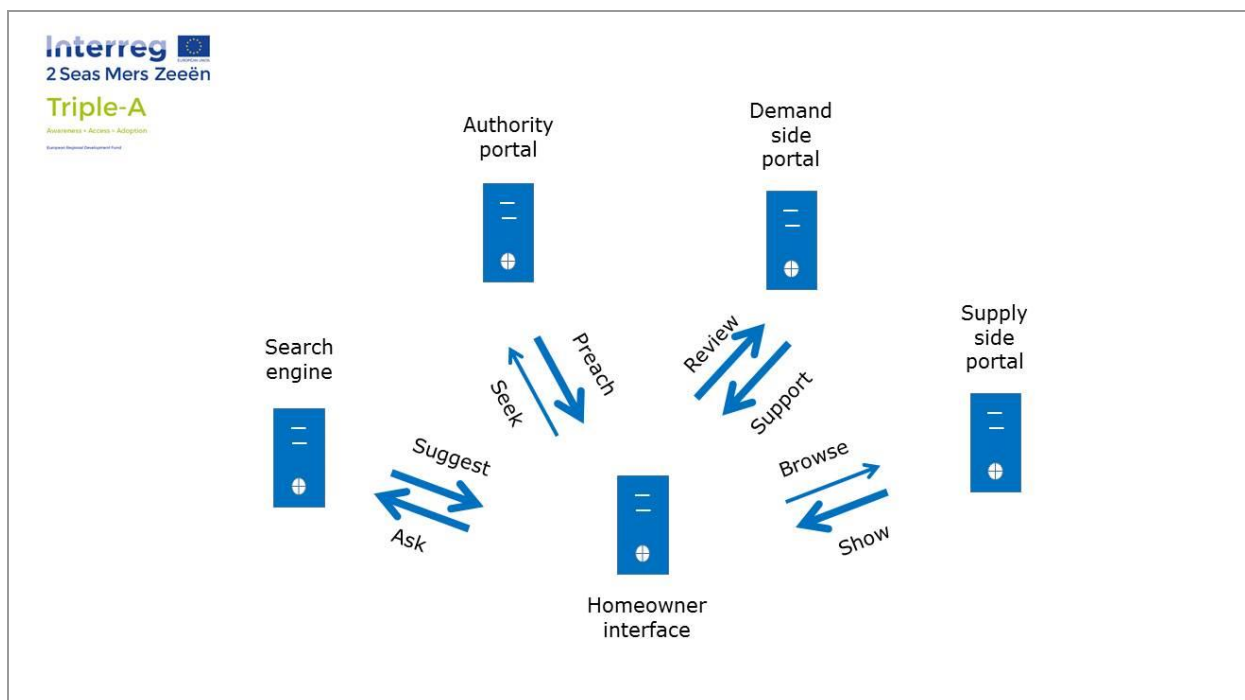
Figure 7 Example of how various portals were perceived in the past, for informing homeowners about possible renovation actions.
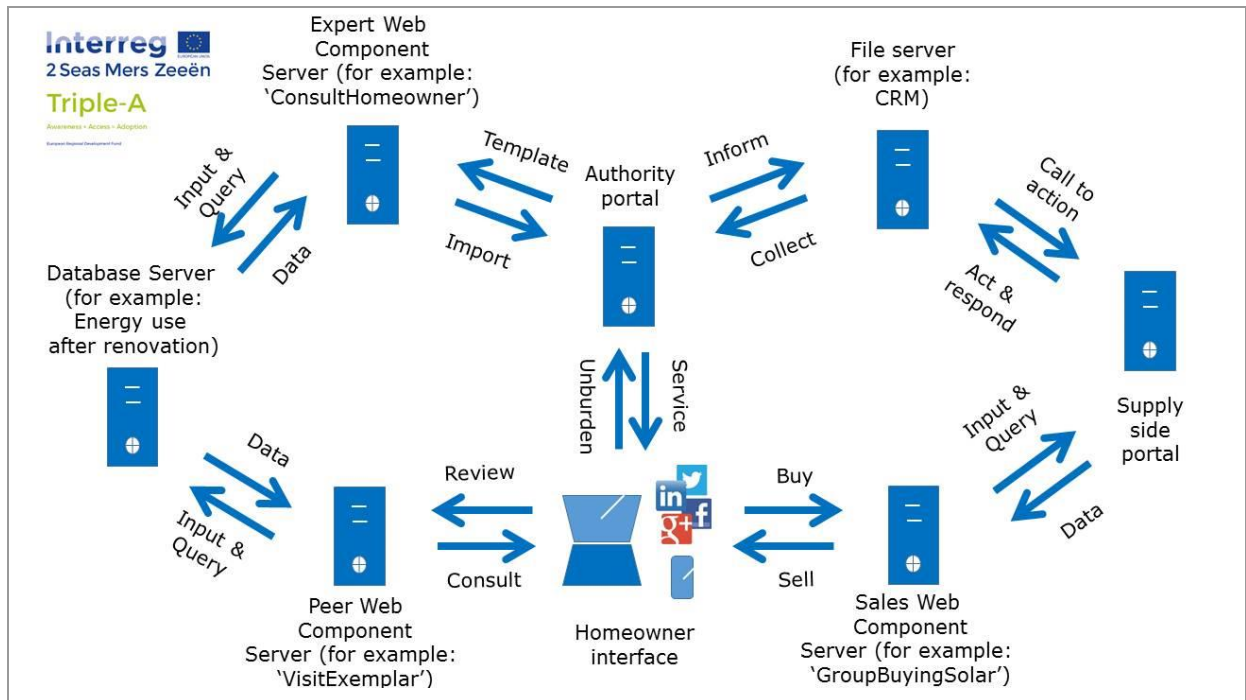
Figure 8 Possible future relations of various web portals to support market development of home renovations.

Figure 8 illustrates that it can become interesting for LA web portals to develop Web Functions related to Web Components, and to provide a coupling with improved homeowner, building, energy and cost databases. In theory such web functions, components and databases could be used by multiple local authorities (and other actors) at the same time.

In future web functions, components and databases also can form a basis for the development of decision-support tools to capture the knowledge of experts in code. Proper decision-support methods are still needed to support refurbishment (Ferreira et al., 2013). Decision-support tools should support homeowners to choose the best available low-carbon options for their renovation. A decision-support tool might for example be appropriate for helping renovation coaches to give the correct advice to homeowners for a step-by-step renovation plan, avoiding lock-in of proposed low-carbon measures. For the development of such decision-support tools it is very important that the expert data are high quality, that the tool can take into account personal planning processes and that a high user-friendliness of the system is foreseen.

Some developments of decision-support systems can already be observed in the fields of finance and accounting, project planning and human resources, with recently more interest in quality assurance (QA) systems and document control, e.g. material procurement, computer aided decision (CAD) systems and communications systems (Hassan and McCaffer, 2002; Kaklauskas et al., 2007). For example, Husin and Rafi (2003) developed a computerized quality assessment decision tool that uses digital cameras, optical scanners, gyroscopic technology, machine learning, pattern recognition, and image processing to reduce the time needed to interpret the results. More recent studies also look at decision-support tools for an early planning stage, or web-based multi-criteria optimization methods (Zavadskas et al., 2004).

With the advent of e-commerce, co-creation of Web Components and Functions is also an important task at hand for the local authorities. The web has increasing become an e-trading marketplace for manufacturers and their stakeholders for buying and selling construction materials. Owners of these e-commerce systems vary from manufacturers, suppliers, agent companies, or even application service providers (Kong et al., 2004). Construction material information in current e-commerce systems is often still isolated without interaction (Kong et al., 2004): it is difficult to find information on products and stakeholders, and market information such as customer reviews and the amount of sales of different materials. Kong et al. (2004) expect that by enabling information sharing between different parties in the procurement process one can facilitate improved information communication and coordination, have better strategic planning and decision making, and faster flexible supply chain management (Kaklauskas et al., 2007).

3.4. Conclusions

Although there is a lot of literature on homeowner decision processes and underlying theories, there are only limited studies and projects on how these experiences can be used for the development of local authority web portals as communication channels. The Triple-A project started from the premise that increased Awareness and easier Access will lead to increased adoption of low-carbon technologies. The literature suggests that Adoption is not merely a result of Awareness and Access. It is also influenced by Attitudes, Aid and Acknowledgement.

Based on the experiences from the previously described literature we suggest that LAs reflect on how their web portal can influence the homeowner renovation decision process as a communication channel. Some of the most important recommendations resulting from the above theoretical considerations are listed in Figure 9. We will use this model for reflection in the remaining chapters.
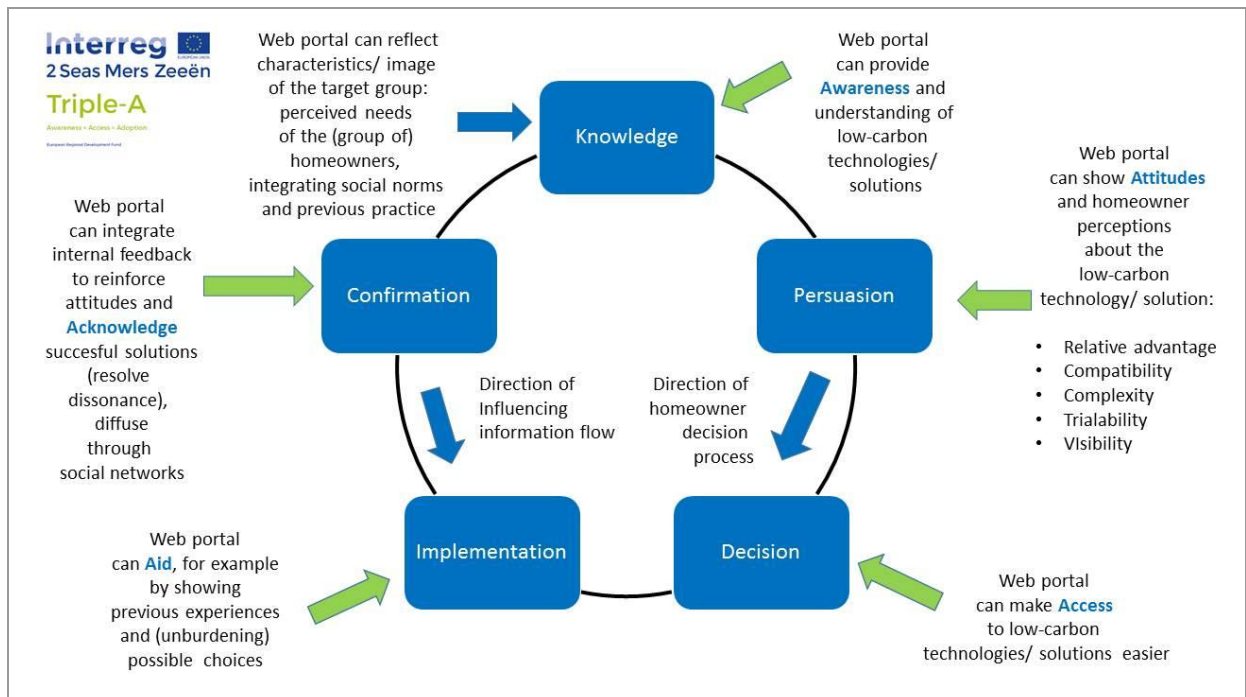
Figure 9 Recommendations from theory for web portal development to aid homeowners' adoption of low-carbon technologies.

A LA web portal has the potential to be more than just a static web server to store, process and deliver web pages to clients using the HTTP protocol. It makes no sense to present all information in a random order. Information has to be presented so that it attracts the attention of the customer profile. A customer segment and decision process oriented approach can be recommended as defined in Table 1 and Figure 6. As such, web portals have the potential to unburden the customer journey and to help the homeowner in each step of the adoption decision.

In practice, new web functions, components and databases can be developed for various LAs at the same time. For developing such, it is important to combine strengths from existing web platforms and to avoid their weaknesses. An energy and cost calculation tool – to be developed within the Triple-A project - can provide further ideas for future web development. However, local authorities should always keep in mind than homeowners are largely triggered by non-energy benefits, supported by sometimes irrational financial decision-making. It is therefore important to beyond such tools towards supporting the whole decision process. In the next chapter we will assess current local authority web portals and in the chapter thereafter Triple-A LAs will identify web functions for immediate further development.

4. Assessment of current local authority web portals

4.1.   Introduction

To better understand the needs for developing local authority (LA) web portals, a preliminary research was done using the Triple-A LA partners and observers as key experts. A questionnaire was developed by TU Delft using open and closed questions to explore the current LA web portals and the needs observed by LAs. The questionnaire was specifically designed to better understand how LAs web portals support homeowners who want to renovate their homes, and to understand if their web portal already takes into account the items presented in Figure 9.

The questionnaire was distributed in April 2017 by e-mail to 31 known main representatives of LAs in the 2 Seas Region: France (FR), United Kingdom (UK), Belgium (BE), The Netherlands (NL). We received 26 responses to the questionnaire, of which 22 were considered valid and 19 complete. Main contributions were received from 16 LAs in the 2 Seas Region: Picardie (FR, 1 reply), Kent (UK, 2), Southend-on-Sea (UK, 1), Essex (UK, 2), Dover (UK, 1), Gravesham (UK, 1), Antwerpen (BE, 3), Bonheiden (BE, 1), Ghent (BE, 1), Sint-Niklaas (BE, 1), Hove (BE, 1), Mechelen (BE, 1), Oostende (BE, 2), Breda (NL, 3), Rotterdam (NL, 1) and Heerlen (NL, 1) – and one response from another region (excluded in the results). This is a good response rate of more than 50%, but the number of results is too small and biased for relevant statistical analysis. Therefore the results are represented as information to and from Triple-A partners and observers, for them to draw lessons about each other's experiences and insights.

The following section 4.2 analyses the overall results of the questionnaire. Section 4.3 discusses the results specifically for the seven Triple-A partners (Antwerpen, Mechelen, EOS Oostende, Rotterdam, Breda, Kent County Council and SPEE Picardie). Data on current low carbon technologies, financial schemes and (questions and answers about the) web portals of the seven Triple-A partners are also shown in more detail in the Appendix.

4.2.   Analysis of overall questionnaire results

4.2.1. Communication strategies

Most respondents (91%, 20 of 22 replies) state that their LAs own or co-own web portals for the promotion of energy efficient renovations. 73% of the respondents (16 of 22 replies) additionally state that their LA also uses social media to promote energy efficient renovations.

Figure 10 shows an overview of the main channels LAs use to promote energy efficient renovations, compared to how important the LAs think these channels are for promotion of energy efficient renovations. The Figure shows that the LAs regard their web portal as the most important communication channel. 95% of the respondents find the web portals important or extremely important (respectively 5 and 14 of 20 respondents).

Next to web portals and social media, most LAs also use local newspapers (17 of 22 respondents) and LA service desks (16 of 22 respondents) to inform homeowners. Furthermore many LAs use personal letters to citizens (13 of 22 replies), local information centres (12 of 22 respondents), neighbourhood events (11 of 22 respondents) and local marketing campaigns (11 of 22 respondents).

A few LAs use own road shows (6 of 22 respondents), demonstration houses (6 of 22 respondents) and pop-up centres (5 of 22 respondents). Some frontrunners also mention monthly digital newsletters and collaboration with media outside the LA, workshops, and internal communication management and strategies.

Figure 10 also shows that a majority of the respondents intends to further develop the currently underrepresented communication channels.
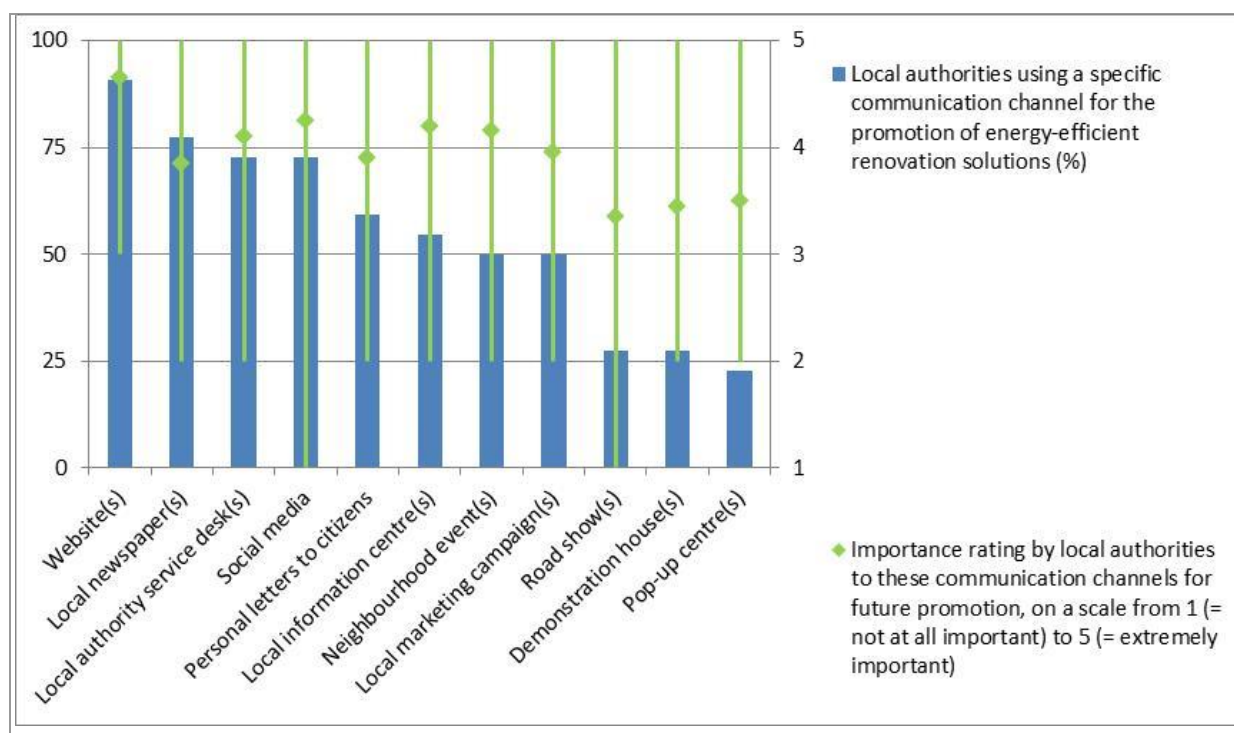
Figure 10 Channels local authorities (22 respondents) use to promote energy efficient renovation solutions, in order of decreasing current presence, and importance these local authorities attach to these channels for the future promotion of energy efficient renovation solutions.

Next to the channels LAs own or co-own there are also a lot of services to facilitate the promotion of energy efficient renovation solutions. Figure 11 shows an overview of the services LAs facilitate to promote energy efficient renovations, and compared to this, how important the LAs think these services are for promotion of energy efficient renovations.

Most LAs offer tailored energy advice for homeowners (17 of 22 respondents). Many are involved in information workshops for homeowners (12 of 22 respondents). Some LAs engage in facilitating peer-to-peer contact with 'experienced' homeowners (8 of 22 respondents), educational programmes for homeowners (6 of 22 respondents), and providing home energy monitoring systems to homeowners (6 of 22 respondents). A few LAs are engaged in communities of practice (5 of 22 respondents), renovation market places for homeowners (4 of 22 respondents) and local homeowner networks (3 of 22 respondents).

Other facilitation work includes for example financial support and grants; renovation advice; thermal, solar and green roof mapping; support in building regulations and spatial planning; specific agencies and forums; organisation of supply-side networks and building fairs; face-to-face talks; local energy corporations, group purchases and energy switching schemes; and specific actions for vulnerable groups.

The importance addressed to services follows more or less the line of implementation. Most LAs want to implement or reinforce these services.
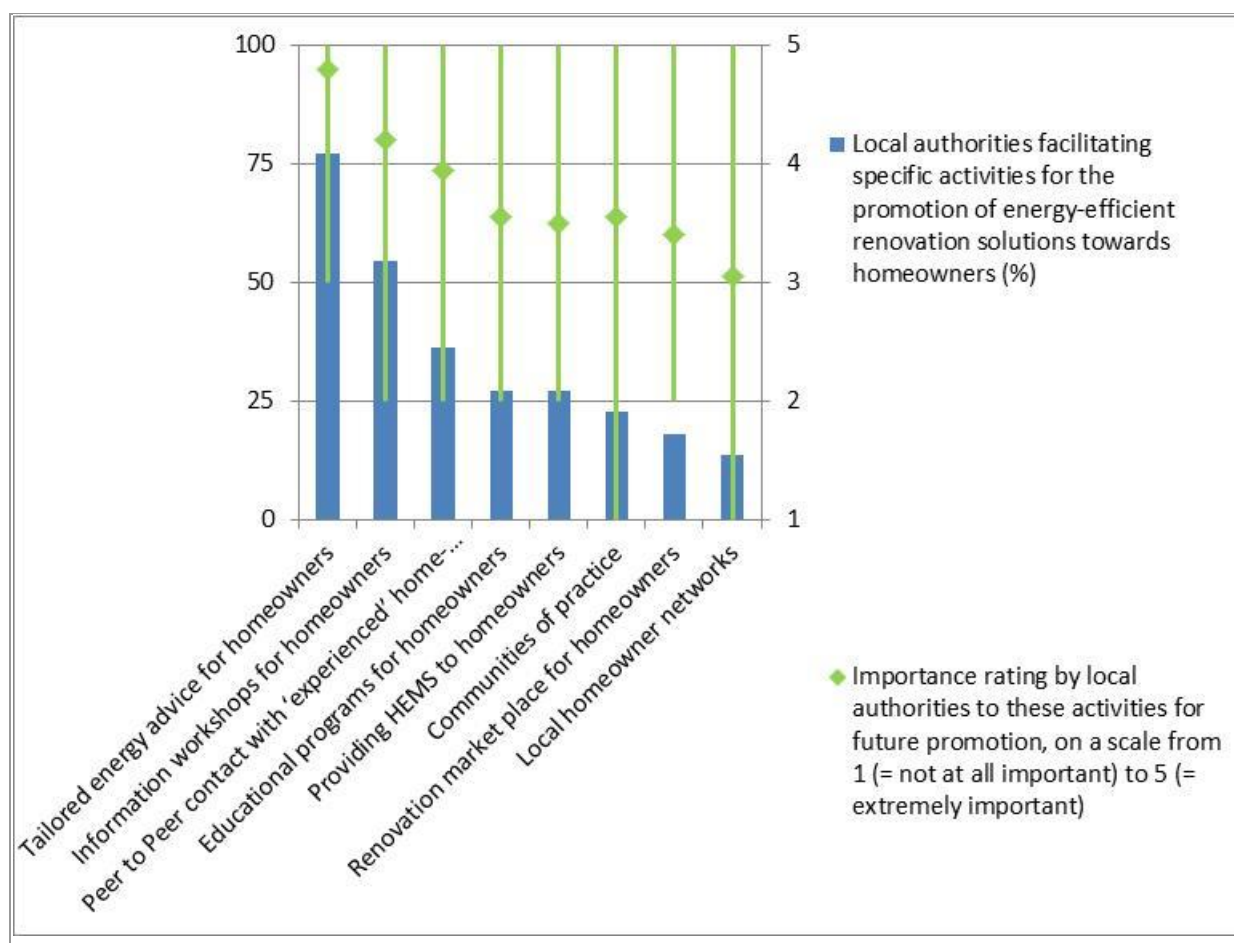
Figure 11 Services local authorities (22 respondents) facilitate the promotion of energy efficient home renovations, in order of decreasing current presence, and importance these local authorities attach to services for the promotion of energy efficient home renovations, in order of decreasing average importance.

LAs usually have or promote specific financial schemes to support energy renovation measures. An overview of such schemes can be found in the Appendix of this report. These incentives are often the driver to develop surrounding communication.

The following Figure 12 shows amongst other the current presence of subsidies for renovation measures, renewable energy systems, tailored energy advice; green loans/ financing schemes and local tax incentives. Most popular incentives managed by LAs are green loans (14 of 19 respondents), subsidies for energy saving measures (12 of 19 respondents) and subsidies for tailored energy advice (11 of 19 respondents). Compared to this, Figure 8 shows how important the LAs think these facilitation actions are for the future promotion of energy efficient renovation solutions. Many LAs still want to implement obligations of achieved energy performance, local tax incentives and incentives for stimulating groups of citizens.

Next to the financial incentives some LAs also (want to) engage in organising contests between homeowners, stimulation of self-organisation of homeowners, group buying initiatives, facilitation of third party financing and obligations of energy performance.
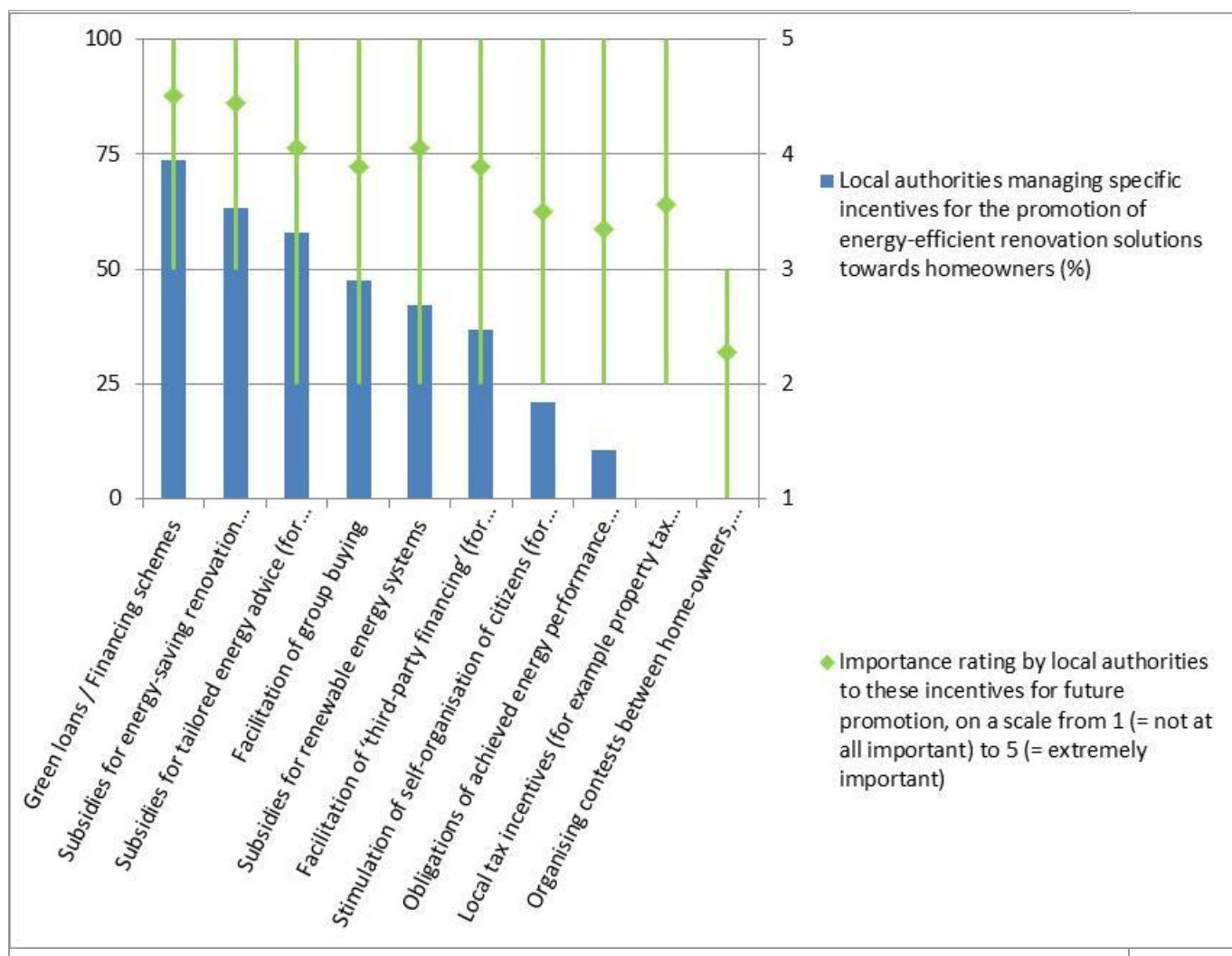
Figure 12 Incentives managed by local authorities (19 respondents) to facilitate the promotion of energy efficient home renovations, in order of decreasing current presence, and importance these local authorities attach to incentives they manage for the promotion of energy efficient home renovations.

The LAs refer to the web portals listed in Tables 8 and 9 as their main web portal communication channel with homeowners for creating awareness about low carbon technologies for renovation.

Local authority	Web portal url's mentioned by respondents
BELGIUM	
City of Antwerpen	www.antwerpen.be/ecohuis www.antwerpen.be
City of Bonheiden	www.bonheiden.be/natuur-milieu-duurzaamheid www.bonheiden.be/bonheiden-klimaatneutraal
City of Ghent	https://stad.gent/energiecentrale https://klimaat.stad.gent/nl/de-energiecentrale Specific instruments: https://klimaat.stad.gent/checkjehuis https://klimaat.stad.gent/nl/themas/wonen/warmtefoto https://klimaat.stad.gent/nl/themas/wonen/zonnekaart
City of Hove	www.hove.be www.facebook.com/duurzaamhove/
City of Mechelen	www.mechelenklimaatneutraal.be
City of Oostende	www.eos-oostende.be www.oostende.be
City of Sint-Niklaas	www.sint-niklaas.be www.sintniklaasklimaatstad.be www.facebook.com/sintniklaasklimaatstad www.dewarmstewijk.be
THE NETHERLANDS	
City of Breda	www.energiekbreda.nl www.breda.nl/duurzaam-wonen https://regionaalenergieloket.nl/breda
City of Heerlen	www.duwparkstad.nl www.energiebespareninlimburg.nl
City of Rotterdam	www.rotterdamenergiebesparing.nl

TABLE 8 OVERVIEW OF LOCAL AUTHORITY WEB PORTALS USED FOR ADDRESSING HOMEOWNERS WHO WANT TO RENOVATE ENERGY EFFICIENTLY (BELGIUM AND THE NETHERLANDS).

Local authority	Web portal url's mentioned by respondents
FRANCE	
PSEE Picardie	www.pass-renovation.picardie.fr
UNITED KINGDOM	
Dover District Council	www.dover.gov.uk/Environment/Energy-Advice/Energy-Advice.aspx www.dover.gov.uk/Environment/Climate-Change/Home.aspx
Essex County Council	www.essex.gov.uk/Pages/Energy-Switch.aspx www.essex.gov.uk/Environment%20Planning/Strategic-Environment/Pages/Reducing-carbon-emissions.aspx
Gravesham BC	www.gravesham.gov.uk/home/housing/saving-money-on-your-bills/overview www.gravesham.gov.uk/home/about-the-council/policies-strategies-open-data/transparency-and-open-data/greenhouse-gas-emission
Kent County Council	www.kent.gov.uk/warmhomes www.kelsi.org.uk/school-management/maintenance-and-operations/eco-schools/energy-saving-projects
Southend on Sea Borough Council	www.southend.gov.uk

TABLE 9 OVERVIEW OF LOCAL AUTHORITY WEB PORTALS USED FOR ADDRESSING HOMEOWNERS WHO WANT TO RENOVATE ENERGY EFFICIENTLY (FRANCE AND UNITED KINGDOM).

Tables 8 and 9 show that most LAs refer to a number of different web portals, ranging from main LA portals to Facebook pages. In most cases, there is no clear picture yet if these web portals effectively reach local homeowners.

4.2.2. Awareness raising and Attitude formation

LAs have their own specific intake on what kind of information they (want to) provide on their web portals to inform homeowners. The questionnaire asked the LAs to evaluate the importance they attach to information related to energy, costs, renovation processes and technologies on their web portals.

LAs believe that the following is the most important energy information for convincing citizens to take up energy-efficient renovation measures: information about the own energy use (16 of 19 respondents) and information about the energy savings due to renovation measures (16 of 19 respondents).

About half of the respondents (9 of 19 respondents) attach high value to providing information about supporting motives for energy saving measures such as indoor air quality, thermal comfort improvement and energy prices.

Only a few LAs attach high importance to providing information about energy use in the neighbourhood (4 of 19 respondents), energy labels/certificates (3 of 19 respondents), energy consulting audits (3 of 19 respondents), the future LA policy (3 of 19 respondents), energy cooperatives (3 of 19 respondents).
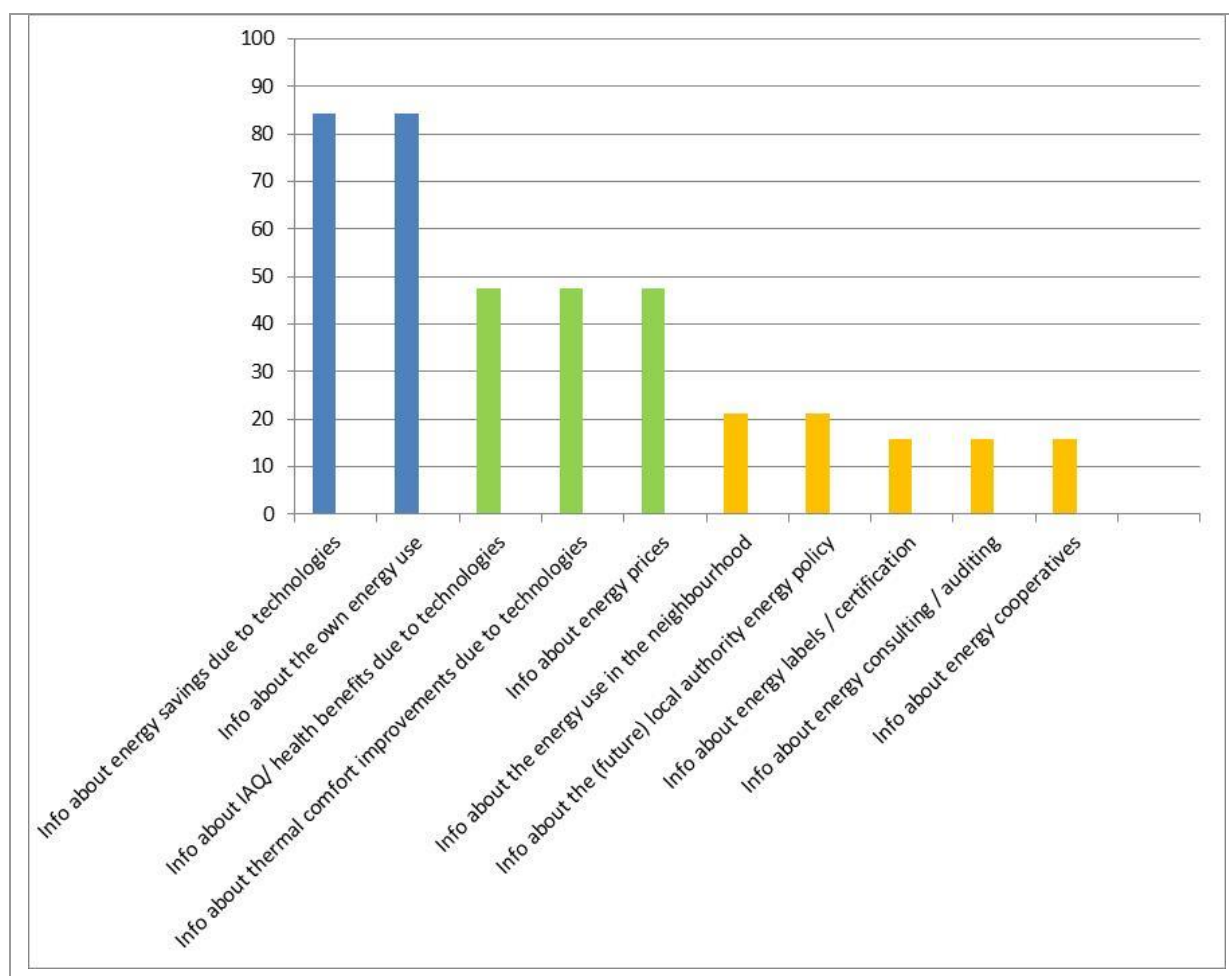
Figure 13 Energy information groups local authorities find important for the promotion of energy efficient home renovations, in percentage of 19 respondents and in order of decreasing importance. Respondents were asked to select maximum five categories.

For cost information, local authorities mainly prefer to put emphasis on the importance of information about financial savings due to energy-saving technologies (17 of 19 respondents), costs of energy-saving technologies (14 of 19 respondents), local and national subsidies (14 of 19 respondents) and the possible value increase of the house after renovation (13 of 19 respondents).

Information about green loans / financing schemes / tax reduction (10 of 19 respondents) is less highly rated and only few LAs attach highest importance to information about financial initiatives from market parties, e.g. third-party financing for renovation (6 of 19 respondents) and information about financial incentives from civil society, e.g. help for reducing energy poverty (5 of 19 respondents).
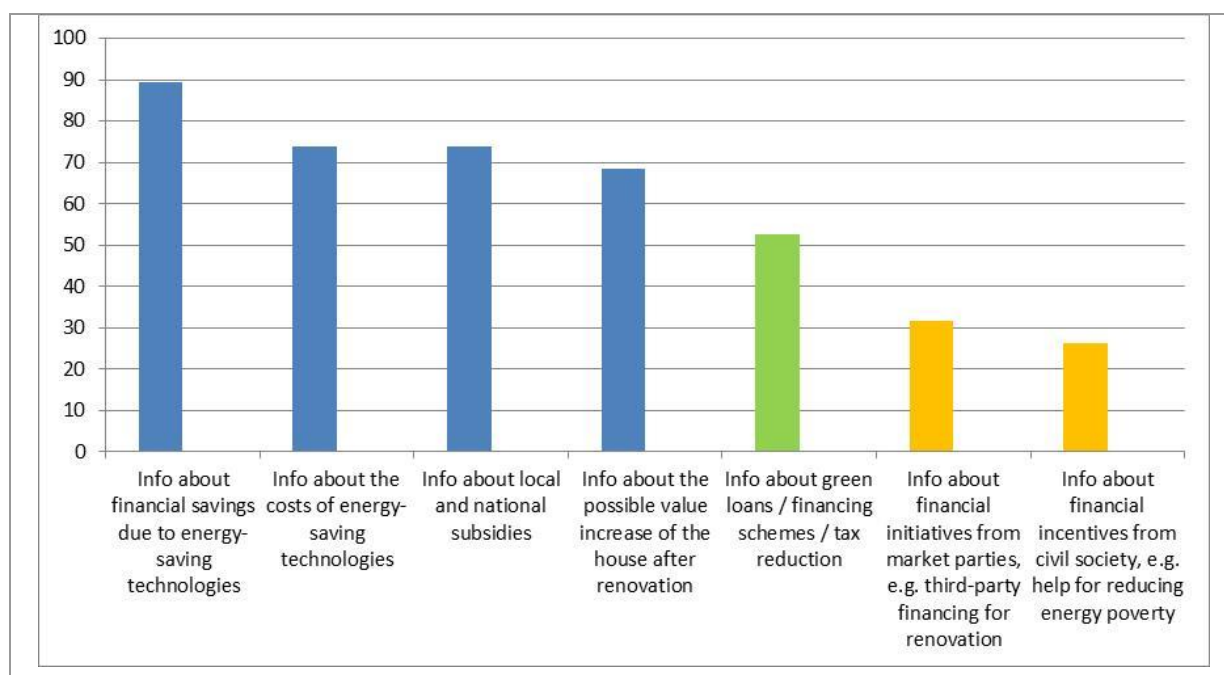
Figure 14 Cost information groups local authorities find important for the promotion of energy efficient home renovations, in percentage of 19 respondents and in order of decreasing importance. Respondents were asked to select maximum five categories.

For building process information, LAs put emphasis on the importance on information about single contact points for all energy-efficient renovation measures, information, consultancy and contracting (and after-care); e.g. renovation store, one-stop-shop (15 of 19 respondents). Also information about a renovation process in steps information and about combining energy-efficient renovation measures with home improvement and maintenance is considered very important (respectively 14 and 13 of 19 respondents).

Many LAs still see the need for information about DIY (Do-It-Yourself) of energy-efficient renovation measures (10 of 19 respondents), about the way energy-efficient renovation measures are processed in demonstration houses (9 of 19 respondents) and about an integrated renovation process (8 of 19 respondents).

Only a few LAs think information about processes used in passive house and/or zero-on-the-meter renovations (3 of 19 respondents) or about legal issues in case of group-buying (1 of 19 respondents) is highly important.
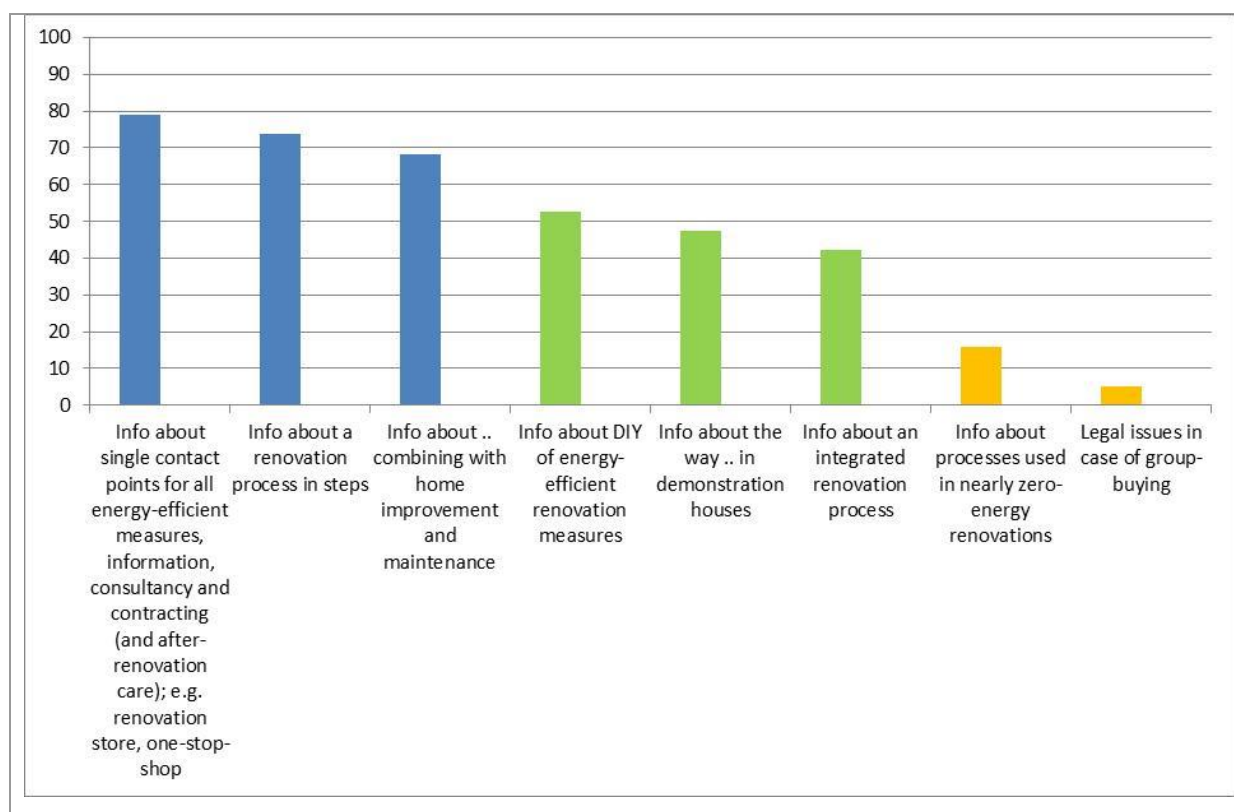
Figure 15 Building process information categories local authorities find important for the promotion of energy efficient home renovations, in percentage of 19 respondents and in order of decreasing importance. Respondents were asked to select maximum five categories.

In general LAs express that detailed information about all kinds of technologies is important to convince homeowners to adopt such technologies. Relevant information categories are thermal insulation and airtightness, heating and cooling systems, heating and cooling storage systems, heating and cooling monitoring and control systems, ventilation systems, ventilation control systems, renewable energy production, energy monitoring and management systems, electricity storage systems, green roofs and walls, lighting and household appliances.

One respondent suggests that it is useful to consider three information layers: enthusiasm, making it easy and making the investment affordable. Two respondents would like to consider more qualitative and quantitative research on citizen attitudes. One respondent remarks that social marketing studies reveal that people are more keen to act if you make them aware of their spoiling energy than of their saving energy.

One respondent remarks that home-owners don't know where to start, what they should do first and that there is hardly any support from professionals (architects, independent consultants, installers) for zero energy renovation. One respondent notes the need to address the right moment for the homeowner.

LAs have promoted or intend to promote various specific tools on their web portals for convincing homeowners to apply low-carbon technologies. The questionnaire asked the LAs to evaluate the importance they attach to energy and financial calculation tools, to be able to convince citizens to take up energy saving renovation measures.

LAs think that the following are the most important energy calculation tools to convince citizens: calculation of own current energy use of the home based upon energy readings (15 of 19 respondents), calculation of energy-savings and energy use for individual energy-efficient renovation measures (15 of 19 respondents) and on-line simulation of the energy effect of best-practice energy-efficient renovation measures based on the own house (13 of 19 respondents)

About half of the respondents also see the need to be able to estimate available solar energy production based on roof surface (11 of 19 respondents), to estimate the current heat loss of the home based upon infrared thermography or airtightness testing (10 of 19 respondents) and to compare the own current energy use of the home with neighbours or similar houses (9 of 19 respondents).
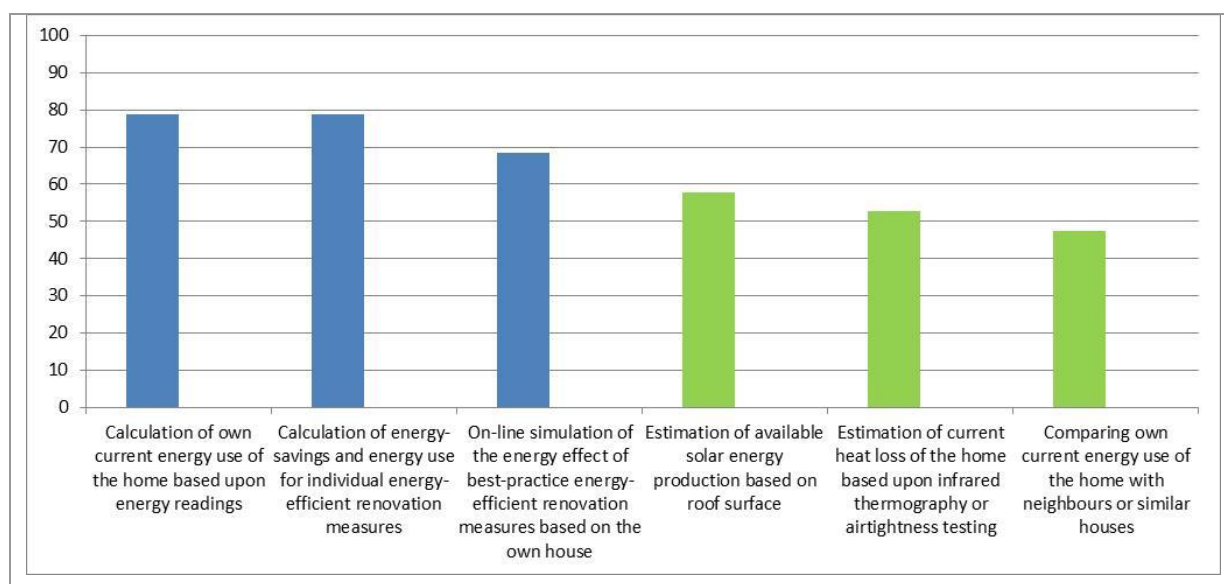
Figure 16 Energy calculation tools local authorities find important for convincing homeowners to take up energy saving renovation measures, in percentage of 19 respondents and in order of decreasing importance. Respondents were asked to select maximum five categories.

Considering possible cost calculation tools, LAs attached highest importance to calculation of financial savings due to energy saving (17 of 19 respondents), of available subsidies for the own house (13 of 19 respondents) and of the future sales value of the home (12 of 19 respondents).

About half of the respondent sees high importance for calculation of return on investment (10 of 19 respondents). To a lesser extent LAs attach importance to a multi-year investment plan for implementation (7 of 19 respondents), calculation of price reduction for group buying (5 of 19 respondents) and calculation of mortgage plan (3 of 19 respondents). One respondent noted that besides these categories the calculation of the total renovation cost is also highly important.
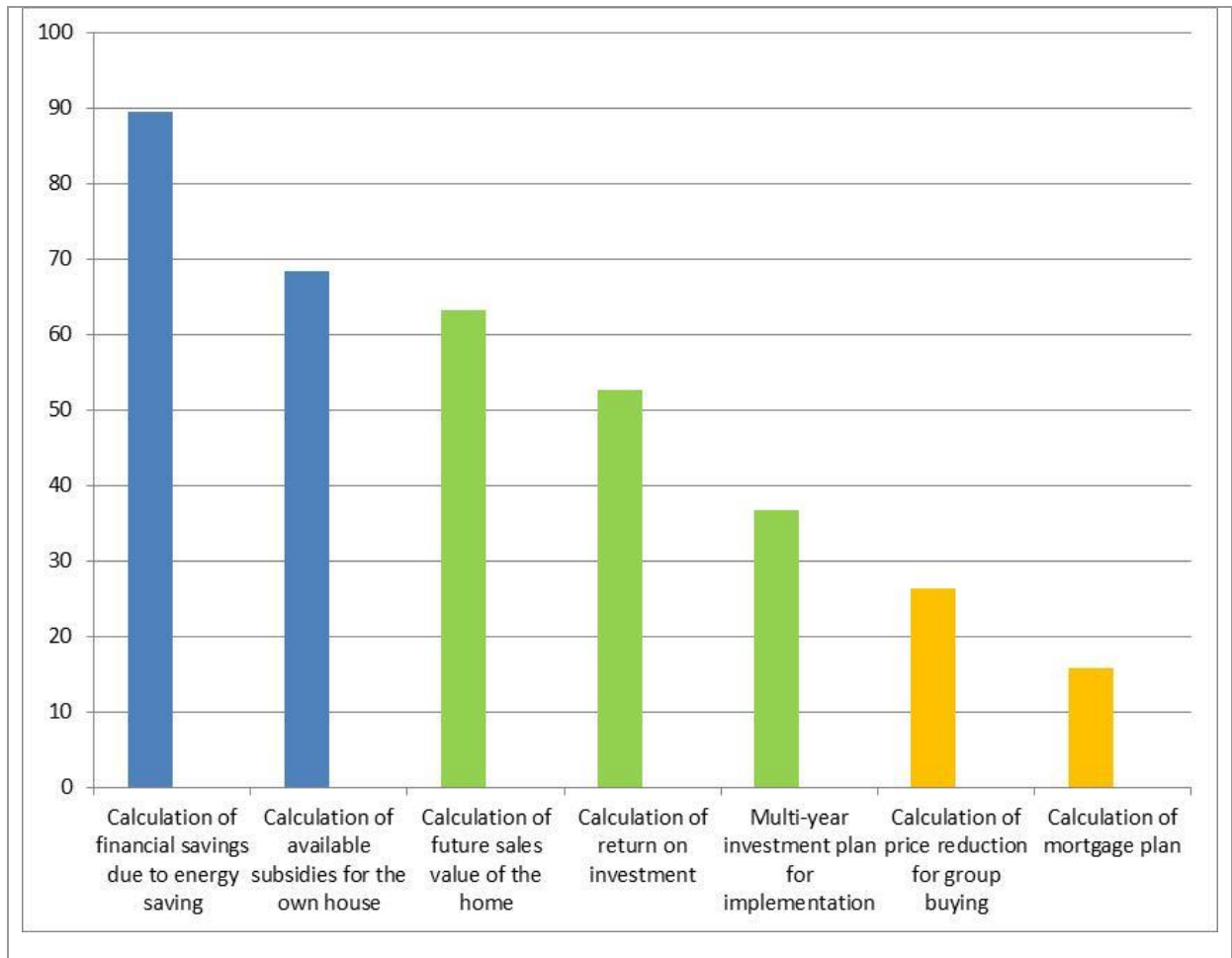
Figure 17 Financial calculations tools local authorities find important for convincing homeowners to take up energy saving renovation measures, in percentage of 19 respondents and in order of decreasing importance. Respondents were asked to select maximum five categories.

Next to the web initiatives for convincing homeowners, LAs express high importance for personal contact: with home-owners that already implemented energy-saving technologies (or renovation); with a representative of the LA; with an energy expert; for assistance in applications for local and national subsidies / green loans / financing schemes / tax incentives; and - to a lesser extent - for (assistance in) contacts with market actors.

One respondent suggests to relate energy saving more to comfort. Another respondent undertook citizen advice events with local residents and suggested homeowners are driven by cost savings. One respondent remarked the need and urgency for information about cost savings. One respondent remarks that more practical reasons hinder homeowners (such as dust, move to another house during works, no decent list of market actors...) and is concerned about the gains versus the work to be done (administrative, follow up, ...).

4.2.3. Access simplification, Aid and Acknowledgement

LAs have promoted or intend to promote various specific functions on their web portals for helping homeowners during the contracting phase. The questionnaire asked the LAs to evaluate the importance they attach to lists of experienced market actors and various types of model contracts.

Considering (referral to) lists of experienced actors for convincing homeowners, LAs attached highest importance to a list of energy consultants/ auditors (13 of 19 respondents), contractors (13 of 19 respondents) and LA consultants (13 of 19 respondents).

To a lesser extent importance is expressed for a list of architects (7 of 19 respondents), renovation stores / one-stop-shops (7 of 19 respondents), material and product suppliers (5 of 19 respondents), building surveyors (4 of 19 respondents), real estate brokers (2 of 19 respondents) and project managers (1 of 19 respondents).

One respondent remarks that the LA as a public body cannot directly propose a list of actors.
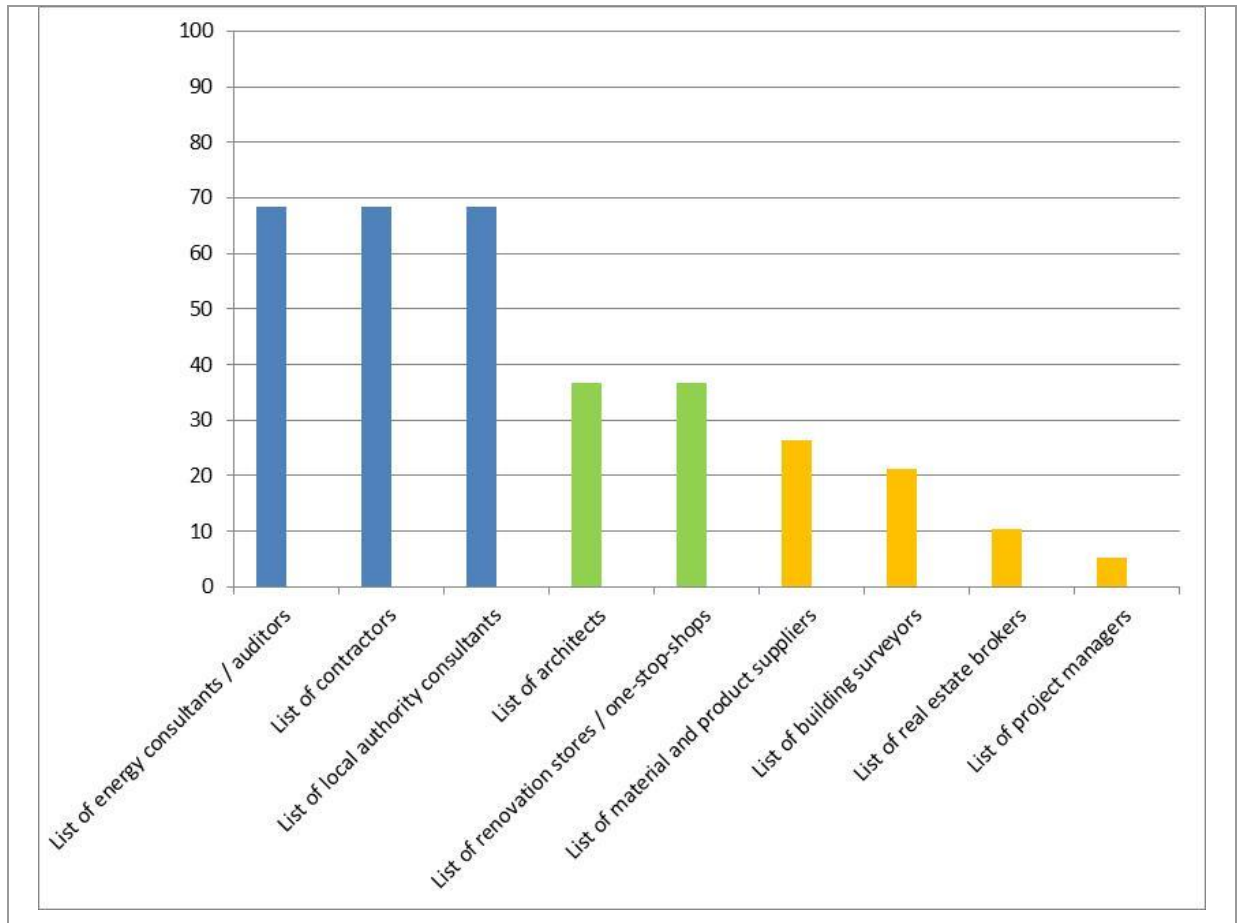
Figure 18 Lists of (experienced) market actors local authorities find important for convincing homeowners to take up energy saving renovation measures, in percentage of 19 respondents and in order of decreasing importance. Respondents were asked to select maximum five categories.

When asked about the importance LAs attach to detailed model contracts for facilitating citizens contracting energy-efficient renovation measures, they express relatively high importance of such model contracts for integrated renovations including energy performance guarantees (compared to contracts without guarantees), but also for individual renovation measures and group buying of measures and project management services.

Many authorities see the need to develop specific actions related to project management. Two respondents expressed the need for independent assistance/guidance in the renovation process, with a clear message from the LA, and the need for assurance and good contract management when installing (innovative technologies), delivered by the LA. Two respondents emphasized the need to provide full-care options. One respondent mentions the need to reduce costs, trouble and paperwork for homeowners. One respondent remarks that support in selecting a market actor to undertake the works (through the trusted LA brand) is important.

Most LAs have not yet developed specific functions on their web portals for helping homeowners after the contracting of energy saving renovation measures. As explained earlier, this might induce a risk that homeowners cancel their adoption process.

The questionnaire asked the LAs their perception of the importance of needed information for homeowners during construction and after delivery of energy-efficient renovation measures.

A majority of 18 respondents finds it very or extremely important to provide information about various issues such as: a performance check with infrared thermography /heat scan / blower door testing; a performance check using energy monitoring; post-occupancy evaluation of achieved comfort; platform for sharing experiences and best practices; possibility for reviews (rating) of contractors and installers; possibility for reviews (rating) of consultants/advisors.

The respondents attached relatively lower importance to providing personal contact with LA for review and to possibility for reviews (rating) of applied energy-saving technologies.

Three respondents expressed the need to provide word of mouth advertising, to use the experience of predecessors for further promotion and one respondent to collect information about investments for neighbours. One respondent remarked developing LA supported measurement, monitoring and evaluation schemes, for houses that have installed external wall insulation.

4.3.   Analysis for Triple-A websites

For the seven LA Triple-A partners Antwerpen, Mechelen, Oostende, Kent, Picardie, Rotterdam and Breda, we discuss the results in the framework of the results of the literature study, as summarized in Figure 9.

4.3.1. Targeting groups of homeowners

The web portals discussed are listed in Table 10, together with the number of visitors of these web portals in March 2017.

Local authority	Web portal url's	Number of visitors (March 2017)	
BELGIUM			
City of Antwerpen	www.antwerpen.be/ecohuis	3,696	
City of Mechelen	www.mechelenklimaatneutraal.be	1,030	
City of Oostende	www.eos-oostende.be	354	
FRANCE			
PSEE Picardie	www.pass-renovation.picardie.fr	1,489	
THE NETHERLANDS			
City of Breda	www.energiekbreda.nl	50	
City of Rotterdam	www.rotterdamenergiebesparing.nl	3,500	
UNITED KINGDOM			
Kent County Council	www.kent.gov.uk/warmhomes	238	

TABLE 10 OVERVIEW OF TRIPLE-A LOCAL AUTHORITY WEB PORTALS FOR TESTING NEW WEB FUNCTIONS.

The number of visitors of these web portals varies from 50 (Breda) to 3,696 visitors per month (Antwerpen). LAs commented in personal communications that homeowners visit their web portal not directly by typing the url, but via other channels such as search engines. The effectiveness of the result depends highly on the search query. None of the web portals occur on top of Google searches by for example typing 'renovation house [city name]' in the own language. It can therefore be questioned if the homeowners are effectively reached for the purpose of awareness raising in an early stage.

Most LAs focus their attention on owner-occupants of single-family homes and owner-occupants of apartments. Besides these two groups only Picardie indicates that they also specifically address owner-occupants that rent out parts of the house, starters, young families and owners over the age of 55 years.

Most LAs do not focus their web portal specifically on certain **housing types**. Their web portals are aimed at the homeowners and the owner occupied housing sector in general. To try to persuade homeowners to take up energy saving technologies most LAs point out the potential benefits for the homeowners on their web portals. Looking at the seven LAs three possible motives are specifically emphasised that can be realised by homeowners who take energy-saving measures in their dwellings: the financial savings that can be realised, the benefits for the environment and the improvement of thermal comfort.

Almost all LAs think that their current web portals are easy to find for citizens. Only Kent County does not know that for a fact. Nonetheless the idea that their web portals are considered to be easy accessible all LAs (again with the exception of Kent County) have taken actions to make their web portals easier to find for 'their' homeowners. Usually this has taken the form of advertisements and campaigns via local news channels. Last year, Antwerp and Mechelen have completely renewed and updated their web portals.

The **functions** the web portals of the LAs contain to follow up their clients are still in the early stages of development. Four of the seven LAs (Rotterdam, Breda, Mechelen and Oostende) count both the unique visitors of the main page as the unique visitors' individual pages. Rotterdam, Breda and Mechelen also keep track of the number of forms that are being downloaded from their web portals. The functions on Mechelen's web portal seem to be the most developed of the seven LAs. Besides the three aforementioned functions, Mechelen also registers the contact details of the visitor and the energy renovation measures the clients have in mind. Besides that the city keeps track of data via specific tools.

In the case a homeowner who has consulted the web portal indicates that he or she wants more information and wants to have personal contact all municipalities (accept Picardie where the answer is missing) undertake actions to follow this up. Generally the LA contacts the homeowner via email and if necessary by phone.

4.3.2. Awareness raising and attitude formation

With respect to the information the web portals provide about **energy issues** the picture is varied. A more or less common information aspect that most web portals provide is that they give insight in the potential energy savings that homeowners can realise if they undertake energy-saving actions in their houses. According to the survey Rotterdam, Breda and Mechelen appear to provide the most 'information bits and pieces' on their web portals. For instance on the web portal of Rotterdam information is available about energy labels (or certification), energy consulting and auditing, thermal comfort improvements that can be realised through energy saving technologies, the (future) LA energy policy and information about energy cooperatives. The LAs were also asked in the survey what kind of information about energy issues they find important to convince homeowners to undertake action. When the outcomes of that question are related with the actual information the current web portals provide there appears to be two clear 'information gaps'. The first one is information about the own energy use of the homeowners. Six LAs find that providing that information is important to convince homeowners and currently only one of them (Mechelen) addresses this subject one way or the other on its web portal. The second issue is information related to the positive effects energy saving technologies can have on the thermal comfort and indoor air quality of the dwelling. Although certainly the first issue (giving information current energy use of the homeowner) is not easy to realise, these are the two themes LAs could pay more attention to in the near future.

The web portals of all seven LAs provide information about various **costs aspects**. On almost all web portals information can be found about local and national subsidies, green loans, financing schemes and possibilities for tax reduction. This applies also to information about subjects like the costs of energy saving technologies and the possible financial savings that can be realised when applying these energy saving technologies. In sheer numbers Oostende and Mechelen (and to a lesser extent Antwerp) provide relatively less information about costs issues than the other LAs. When the answers of these two LAs on the question what costs aspects they consider import is confronted with their actual provision of costs information, one can conclude that they could provide more information about financial savings and the possibilities of green loans, financing schemes and tax reduction. Overall the actual information about cost issues the web portals of the LAs currently provide corresponds largely with their answers on the question how important they find information about these subjects. In other words the web portals of most LAs reflect what they consider important cost information that should be provided to homeowners.

On the web portals of Kent County, Antwerp, Mechelen and Oostende (hardly) any information is available about **renovation processes**. Nonetheless (in earlier questions) these LAs have indicated that they find the provision of information on some 'renovation process issues' important to persuade homeowners to make their dwellings more energy efficient. This applies especially to information about subjects like both a step-by step as an integrated renovation approach, the possibilities of combining energy efficient renovation measures with home improvement and maintenance activities and information about single contact points for all energy-efficient renovation measures. The other three LAs (Rotterdam, Picardie and Breda) provide information about a range of issues that are related to the renovation process. In general the information that

the web portals of these three LAs provides corresponds largely with what they regard as important issues.

Picardie and Rotterdam are the LAs that provide detailed information about a large number of possible **energy-saving measures**. Picardie provides detailed information about nine (of the twelve possible) energy-saving measures and Rotterdam seven. The other LAs are in this respect far more modest with providing information. The most common themes about which information is provided on the web portals of the seven LAs are thermal insulation, airtightness and green roofs and walls. Looking at what the seven LAs find important subjects the most mentioned are green roofs and walls, lighting, household appliances and renewable energy production. The biggest gap between the information that is actually available on the web portals and what information the LA consider important can be found in Oostende, Kent County and Mechelen. For example, the Oostende web portal currently provides no information about any of the selected available energy-saving measures, yet the municipality considers the provision of information about all these issues important. In Kent County and Mechelen this is also the case but to a slightly lesser extent. To improve this situation these LAs could for instance add links and references to other web portals on their own web portal that provide the necessary information.

Currently the web portals of four of the seven LAs (Picardie, Kent County, Rotterdam and Oostende) do not provide links to **calculation tools**. On the web portals of Antwerp, Breda and (to a lesser extent) Mechelen a few links can be found to calculation tools. In for instance Breda these links lead to tools that can be used to calculate the actual energy use of the homeowner, the possible energy and financial savings that can be realised when measures are being taken, the possible profit of solar energy production and the availability and amount of potential subsidies. Although the possibilities to find links to calculation tools are limited, almost all LAs have indicated in the survey that they think it is important that these links should be made available to homeowners to help convince them to take up energy efficient renovation measures. In this regard there appears to be plenty of work ahead for the various LAs. It is difficult to recognise a priority ranking when it comes to calculations tools. Looking at the answers of the LAs there are not specific calculation tools that stand out. Most LAs find it important to provide links to almost all calculation tools.

The current web portals of all LAs enable **personal contact** with persons or instances. The most mentioned contact channels are personal contact with a representative of the LA and with an energy expert (mentioned by four LAs). In four LAs it is also possible for homeowners to receive assistance during the application process for financial support (e.g. applying for local or national subsidies, green loans or financial support from other financial schemes). When the current possibilities for contact on the web portals of the seven LAs are related to what LAs find important the emerging picture is varied. Six of the seven LAs (the exception is Antwerp) consider personal contact with homeowners that already implemented energy saving measures important. Assistance in applications for subsidies, green loans or support from other financial schemes is on second place (mentioned by five LAs). Personal contact with the LA and contact with an energy expert share the third position (considered important by five LAs). Looking at the separate LAs Antwerp, Breda, Picardie and to a lesser extent Oostende do relatively not attach great importance to personal contacts. On the other hand Kent County, Rotterdam and Mechelen indicate that they find the whole range of personal contacts important. Yet their current web portals hardly enables personal contacts with persons or instances. So it seems that these three LAs have some work ahead of them.

4.3.3. Access simplification, Aid and Acknowledgement

On virtually none of the current web portals of the LAs a reference can be found that refers to (experienced) **market parties and actors**. Two LAs (Kent County and Breda) indicate that although their web portals do not directly refer to list of market actors, they indirectly refer to them by naming their web portal addresses. Regarding the above it will not come as a surprise that none of the current web portals of the seven LAs contain functions for market actors to contact homeowners. Nonetheless all LAs find it important that market actors should play a role to motivate and possibly convince home owners to carry out energy efficient measures in their dwellings. Market parties that are mentioned relatively often by the seven LAs are contractors, energy consultants, architects and renovation stores or one stop shops.

Only one of the seven LAs (Picardie) indicates that their web portal enables visitors to find detailed **model contracts**. On the web portal of Picardie detailed contracts can be found for both integrated renovations (including energy performance guarantees) as well for individual renovation measures. The web portals of the other six LAs currently do not offer these possibilities yet to

homeowners who visit their web portals. This could change in the near future because they all find it important that detailed model contracts are available for facilitating homeowners contracting energy-efficient renovation measures. Especially Kent County, Rotterdam and Mechelen are strong advocates of this opinion.

Currently the web portals of the seven LAs hardly provide **information that is related to the construction and delivery of energy-efficient renovation measures**. In Breda information can be found on the web portal about a performance check using energy monitoring and it is also possible to establish personal contact with the LA for review. The web portal of Mechelen contains information about a performance check with infrared thermography, heat scan, blower door testing or energy monitoring. In general Picardie and Antwerp do not attach a high importance to the provision of this type of information. On the other hand Kent County, Rotterdam, Mechelen and Oostende find it important that homeowners can be provided with all kind of information during construction and after delivery of energy-efficient renovation measures. Currently this information is not available on the web portals of these LAs.

4.3.4. Perceived needs for web functions

All LAs would like to **collect information from the homeowners** that use or visit their web portals, The wish lists of the two Dutch LAs is (with nine and seven items) the longest and those from the Belgian LAs the shortest (varying between two and four items). Picardie and Kent County find themselves (with five items) in between their Dutch and Belgian colleagues. All seven LAs would like to get insight in the measures or renovation activities the users of the web portal are planning to undertake. Other much mentioned items (by four or five LAs) are the motives and the types of the homeowners. These LAs also would like to get more insight in the need of the users for more information, tools, lists and functions.

It appears that the LAs do not have a clear profile of what type of homeowner is visiting the web pages. Therefore it is also difficult to show content that is directly related to the customer to keep the attention of the visitor. This could for example be solved by asking a few questions (also possible in the pop-up centres or during demo visits) or by tracking click through visits based on customer type information. A CRM system is the basis for following up the adoption process - from informing to contracting - and is currently missing. Form literature it is known that peer-to-peer communication works best for convincing people to adopt innovation. Therefore functions such as reviews and customer forums might be important to think about.

Four of the seven LAs (Kent County, Rotterdam, Breda and Mechelen) indicate that their web portal will need to **provide information about all Triple-A actions**: namely communication actions in specific neighbourhoods, information about (what to get in) pop-up centres, information about home energy monitoring systems and answers on the question how to find demonstration houses to visit. For Oostende only the last option (demonstration houses) is not necessary. For Antwerp only the first (communication actions) and last action (demonstration houses) are needed. Picardie remarks that the possible need for information about Triple-A actions depends on the question what the future will be of the Public Service for Energy Efficiency (PSEE).

The answers of the seven LAs on the question if there are there any **stakeholders that they want to cooperate with** for making a new web portal or adapting the existing one differ widely. Most mentioned (by three LAs) are local demands side networks, citizens and energy cooperatives. The Belgian LAs see no need for cooperation. Only Mechelen mentions the wish to cooperate with one stakeholder (energy distribution net managers). Picardie would like to work together with local demand side networks and citizens cooperatives. Kent County lists five stakeholders they wish to cooperate with (local demand side, supply side and mixed networks, consumer organisations, energy cooperatives and the local energy agency) and Rotterdam six (consumer organisations, citizens and energy cooperatives, energy distribution net managers and local, regional or national energy agency). Breda wishes to cooperate with seven stakeholders: local demand and supply side networks, citizens and energy cooperatives, local energy agency, local frontrunner companies and neighbourhood organizations.

Only a few LAs have given a (direct) answer on the question what actors they think can take **responsibilities for specific functions of their web portal**. Most outspoken is Kent County who states that a not-for-profit organisation could take on the ownership of the web portal. While LAs and local experts/ energy agencies could be responsible for keeping the web portal up-to-date. Oostende works together with a branding agency and their own personnel is responsible for managing and updating the web portal. Antwerp and Mechelen point out that their web portals refer to external links, which means that a lot of data is not generated or owned by them. Most

other LAs name other web portals that (could) offer direct content to their web portals and or have the same objectives as Triple-A.

Finally some remarks that have been made by some of the LAs with regard to (amongst others) the **future development of the web portals**. Kent County thinks it is essential for the future to make more use of software and hardware that enables them to improve the attractiveness and user-friendliness of their web portal. It is also important that it should be easy to add modules, links and partners. A one-stop-shop is needed for energy advice but collaborating and achieving this will be a challenge.

Rotterdam also emphasises that it is necessary for the near future to improve and enlarge the user-friendliness of their web portal, the amount of information that is available and the interaction possibilities. Rotterdam sees the needs to make the customer journey stages clearer in the organisation of the web portal. Other important things on their wish list are to provide more handy tools to calculate energy savings and cost benefits, and improving the possibilities of following the actions of the visitors after visiting the web portal.

Breda has recently renewed their web portal www.breda.nl. At the moment an internal discussion is underway about the future existence of energiekbreda.nl. It could therefore be possible this site will be discontinued and the content will be moved to a brand new site or the regional energy counter. In both cases there will still be a LA web portal active, only in another form. It is expected that the decision will be made within a few months.

Mechelen has made remarks from a different nature and is considering to promote do-it-yourself activities to reduce the costs for the nearly zero-energy renovation. Promoting one-stop-shops is according to Mechelen also very important. This could contribute to making the nearly zero-energy renovation process as easy as possible for homeowners. However to achieve this it is according Mechelen necessary that all professional parties need to believe in nearly zero-energy renovation.

4.4. Conclusions

The questionnaire was designed to better understand how LAs web portals support homeowners who want to renovate their homes. For the evaluation we used questions that relate to each step in the decision process of the homeowner.

LAs have many complementary means and services (tailored energy advice, workshops,..) to communicate with homeowners, but they deem their web portal as the most important communication channel. The web portals are nowadays mainly used for awareness raising, particularly related to ongoing policy programmes, facilitation actions and financial incentives, which LAs hope to reinforce with their web portal. LAs are also looking for opportunities to couple their web portal and web tools with personal contact.

For the development of the web portal LAs believe that the most important information and tools for convincing citizens to take up energy-efficient renovation measures are about the own energy use and the energy/cost savings due to renovation measures. This belief is in conflict with applied behavioural and social research (see Chapter 3), which recognize that homeowners do not solely base their decisions on energy and financial data. Only half of the LAs emphasize other advantages, such as comfort and health. The importance of awareness raising about collective actions and quality assurance for customer confidence is still largely underrated. When providing cost information, LAs tend to underrate the importance of unburdening in their communication.

LAs tend to find support of current renovation practices important, largely ignoring the opportunities for awareness raising about unburdening and integrated approaches such as renovation concepts and One Stop Shops. LAs attach high importance to the presence of a list of experienced consultants and contractors, but such a list cannot be consulted from the web portal. Aid during the construction phase is currently largely missing on existing web portals and limited to performance checks. For example, only Picardie offers model contracts. Acknowledgement is rated important, but currently the web portals provide no opportunities for reviewing and peer-to-peer contacts.

The Triple-A partners' web portal content is currently not ordered or searchable according to homeowner profile or building typology. This makes it less likely for the visitor to recognize the own situation. Some LAs currently have nothing more than the tracking of the number of visitors of the homepage and e-mail opportunities. Besides updating their (static) web portal with Triple-A actions, all Triple-A LAs would like to collect information from the homeowners, and indicate a need to develop a bidirectional information flow. The concept of Web Components has never been tested on the Triple-A LA web portals. The Dutch LAs, Kent, Picardie and Mechelen wish to collaborate with market actors to improve their portals, but only Kent is outspoken about the development of web functions in cooperation with market actors.

Our questionnaire explored the needs for developing LA web portals from the perspective of the LA experts. This does not provide a lot of information about the profile of the (limited number of) visitors of the web portal, and what homeowners would like to see on such a web portal. For this evaluation, separate questionnaires would be needed to compare results with the views of the LAs.

5. Set of modules to improve local authority web portals

5.1.   Introduction

Local scoping workshops were organized to jointly determine most effective modules to improve local authority (LA) web portals. An exemplary demo workshop used a list of desired web functions for LAs and facilitating posters, which are illustrated in Appendix 6.4. Based on this information the LA partners from Triple-A organised their own scoping workshop to assess the needs for (collaboration for) their LA web portals. The focus in this workshops was on improving ways for creating Awareness and Easy Access to low-carbon technologies via the existing web portals of the LAs.

Awareness needs to be created about (combinations of) various low carbon technologies and both integrated and step-by-step renovation processes. When information is not available, the homeowner will not be attracted to adopt these options. Preferably for persuasion purposes, this knowledge is deepened, exemplified and simplified for the specific situation of the owner-occupant.

To make homeowners change their **Attitude** towards low-carbon solutions, there are special challenges to make sure that the homeowner gets personalized information, for example with special tools (energy savings calculation, financial savings calculation, and so on) or by only showing the information that is relevant for the customer segment (based on homeowner profile, house type, investment capacity, and so on). Such 'personalized' service can also be bundled in group activities, for example in joint buying initiatives, neighbourhood initiatives and homeowner training.

There are special challenges to make sure that the homeowner gets easier **Access** to solutions, for example by making it easier to find trusted actors (consultants, auditors, contractors, and so on) and financing (grants, loans, third party financing, and so on).

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 so on) and to provide project management to unburden homeowners.

Most workshops also put emphasis on the need for **Acknowledgement** of the homeowner. 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.

Also demand side actors, market actors and other policy makers have their own web portals and work on related issues and therefore local workshops were organised to exchange ideas and stimulate collaboration. The market is currently also innovating with the development of one-stop-shop providers and intermediaries that offer full-service solutions for homeowners, from creating awareness to project management and quality assurance.

Transforming web portals for better supporting each step of the customer journey is a long-term challenge and improvement of web portals of LAs is only one of many possible ways to improve the customer journey. LAs are aware that not all their ideas can be put into action and that they have to focus on most promising functionalities, compatible with what is already on-going in the local market and on the national or regional level.

5.2. Workshops to assess local authority web portals

5.2.1. Overview of workshops

Table 11 gives an overview of the workshops that were organised by LAs. The first workshop in Rotterdam was facilitated by TU Delft and was combined with a preparation meeting for the Triple-A partners. Antwerpen and Oostende organised a joint workshop in Gent.

The participants were local stakeholders personally invited by the LA. The invited stakeholders varied according to the organizing LA and their views on who could possibly give advice. For example, Mechelen used an existing active LA support group. Kent invited several partners to the workshop including utility companies, consumer organisations and consumer representatives, such as the National Landlords Forum and the Citizens Advice Bureau. Rotterdam invited possible co-creators from the supply and demand side. Breda additionally invited a large group of targeted homeowners. The LAs based their choice for invitations on previous local collaborations and possible future allies for the web portal development.

Organizing project partner	Location workshop	Date workshop	Number of participants
City of Antwerpen/ EOS Oostende	Gent	6 September 2017	20
City of Breda	Breda	22 June 2017	31
Kent County Council	Maidstone	11 October 2017	10
City of Mechelen	Mechelen	21 June 2017	11
City of Rotterdam/ TU Delft	Rotterdam	18 May 2017	32
PSEE Picardie	Amiens	18 July 2017	16

TABLE 11 OVERVIEW OF TRIPLE-A WEB PORTAL WORKSHOPS HELD IN THE 2 SEAS REGION

The LA used various workshop formats and agenda's for discussing web portal development. For example, Rotterdam and Picardie applied specific Triple-A workshop posters developed by TU Delft (see Appendix) for structured discussion about needed web functionalities. Antwerpen and Oostende invited participants to evaluate their website directly. Breda used structured discussions based on the themes of Awareness, Access and Adoption. Kent County Council asked a network of staff to conduct a search for home energy efficiency advice through their search engines and to give feedback on what advice they found, and whether they trusted this advice. Figure 19 shows some impressions of workshop activity in Rotterdam and Breda.

After the workshops the LAs were asked to evaluate the formulated web portal development ideas according to their relevance for creating awareness, changing attitudes, providing easier access, aid and acknowledgement. While reflecting on future needs for co-creation of web functions, components and databases, they were asked to rate these ideas according to feasibility for adoption. This included for example a qualitative analysis if the proposed developments could be favourable and well visible, and easy to implement and test on the local authority web portal.

Figure 19 Impressions of Triple-A workshops in Rotterdam (upper two) and Breda (below).

5.2.2. Exemplary workshop in Rotterdam

A preparation meeting in Rotterdam was organized for all partners to show possible tools and working formats for the scoping workshop (see also Triple-A Deliverable D.1.1.1.). The workshop was attended by main observer organizations active in the Rotterdam area, including an intermediary actor (ICDuBo), an energy distribution net manager (Stedin), supply side federations (UNETO-VNI, Bouwend Nederland), Dutch observer cities of the Triple-A project (Leiden, Heerlen), partners of the Triple-A project and representatives of the Dutch Ministry of Economic affairs (EZ / National enterprise service RVO). Six invited actors and the LA web portal developer were also allowed to pitch their ideas for most interesting development in their own web portals, to be able to discuss possible synergies.

Introductory presentations provided information about the framework of the Triple-A project and the Dutch/ Rotterdam context for web portal development (for the full minutes of this workshop see Deliverable D.1.1.1).

Rotterdam aims to work together with the WoonWijzerWinkel, a local supply-demand intermediary hosted by the Innovation Center for Sustainable Construction (IcDuBo), which is conveniently based in Rotterdam. This collaboration provides interesting web portal development opportunities as IcDuBo already implemented some innovative web features, such as a monitoring of the process and the rate of conversion and a Customer Relationship Management system.

The main challenge of the workshop was to identify five most important web functions for further development. To explore possible web functions the posters shown in Appendix 6.4 were used for interactive discussion, providing post-it's with descriptions of possible web functions as found from literature (see also Chapter 3). Table 12 provides an overview of all the main options that were on the table.

The setup of the discussion was to identify most important options for each phase in the homeowner's decision process: from creating awareness; to convincing with consultancy, easy access and tools; and for facilitating contracts, follow-up and quality assurance. Based on the discussion and rating during the workshop, Rotterdam defined most interesting web functions for further development.

This approach was recommended to other Triple-A partners for organising their own scoping workshop. However, not all partners used the same approach as the context in each LA is very different regarding current web portal development and possible partnerships. For example, Breda still had to initiate main contacts and centred a more general discussion around the themes awareness, access and adoption. The Flemish partners sought closer connection with on-going Interreg-projects and partners involved in these projects. Picardie worked on close integration with the on-going Picardie Pass initiative. Kent was faced with the problem that web portals for informing homeowners about renovation measures still have to be developed.

Further details about each local scoping workshop (agenda, participants, discussion format and results,..) can be found in the minutes of these workshops (Deliverable D.1.1.1.). After the workshops all Triple-A LAs were asked to describe their results and choices for further development of web functions, taking into account the results from the workshop and the information from the previous chapters. The main results are described in the next section.

Homeowner's adoption phase	Possible web functions
Creating awareness: Homeowners seeking information	Selection of information/ intelligent information showing based on customer profile, renovation motives, targeted groups of homeowners and/ or types of houses and neighbourhood
	Module explaining energy renovation, integrated or step by step; Information about combining measures with maintenance or home improvement
	Information about demo projects for single-family housing, also triggering the emotional side/ good architectural quality
	Information about subsidies, loans, tax benefits, support and requirements from the public side
	Information about specific actions such as neighbourhood initiatives and contests, pop-up centres, neighbourhood energy maps,..
	Showing own current energy use, possibly compared to others
	Information and request for specialized services such as tailored advice, contact with LA consultant, infrared thermography, installation of HEMS or smart meter
	General web tools such as web count of unique visitors, CRM, web content rating, tool reviews
Changing Attitudes: Convincing/ consulting homeowners	Detailed information related to energy use in general (energy saving, own production, comfort) or to specific energy saving measures (pros and cons, various technologies and solutions)
	Specific calculations tools for example for energy savings, financial savings or future home value
	Detailed information related to financial support (financing schemes, third party financing, legal issues)
	Module for (self-)organizing group investment and processes
	Educational tools such as renovation training modules for homeowners (measures installation instructions, particularly for do-it-yourself)
Easier Access: Contracting phase	Referral to a list of acknowledged or rated energy consultants/ auditors/ contractors/.. (collaboration with external parties)
	Standard model contracts including renovation contract advice, warranty information, quality assurance; either for measures or for integrated renovations
	Referral to one-stop-shop actors providing full-service project management
Providing Aid: Implementation and quality assurance	Specific project management modules such as for time management of implementation actions, management of resources and finances, handling questions,..
	Specific information about quality assurance and control, available certificates, performance checks and tests, energy monitoring and feedback
Facilitating Acknowledgement: Homeowners seeking peer-to-peer contacts	Renovation testimony videos and possibility to visit a demo project
	Showing own current energy use, possibly compared to others
	Good integration of demand side portal (collaboration), including for example homeowner's discussion forum for sharing experiences, actor and experience feedback input module, review of market actors

TABLE 12 OVERVIEW OF SUGGESTED WEB FUNCTIONS FOR IMPROVEMENT OF LOCAL AUTHORITY WEB PORTALS

5.3. Selection of web functions for the improvement of local authority web portals

The Triple-A LAs evaluated the locally needed functions during a local workshop together with observers and invited actors. Based on these results they internally proposed web functions as exemplified above, and proposed possible partners for co-creation.

For each proposed functionality they evaluated how this function can lead to relative advantage, visibility and simplicity, both for the homeowner and for the LA web portal. They also checked the compatibility of the proposed functionality before implementation in the LA web portal. They further evaluated the market advantage of such functions for market actors, in view of sustaining the proposed functions also outside the LA sphere. All these workshops were documented and evaluated.

Parties wishing to contribute to the co-creation of LA web modules or functionalities can ask for, or discuss, workshop results by addressing the main contact person per LA.

The local scoping workshops that were organized by LAs allowed to determine most effective modules to improve LA web portals. Local discussion with stakeholders reveals the main opportunities and barriers for improving existing LA web portals and a selection of various web functions for immediate development. The Triple-A work also reveals that the way to integrate most effective modules can be very different in each locality, because of differences in the local development of knowledge transfer, policies and for the engagement of stakeholders.

Overall, the Triple-A LAs proposed multiple web functionalities that can help homeowners who want to renovate. They observe that it is important to always think from the homeowner's perspective. LAs will need to fill the gaps in the customer journey with proposed functions, promoting trusted knowledge to convince the homeowner. Features for unburdening the process and facilitating connection with peers can be key new developments.

For increasing awareness customer-oriented and targeted information needs to be presented about local target area actions, including information about demonstration exemplars, pop-ups and requests for home energy monitoring systems. The proposed web functions for awareness raising are largely different but complementary. Some LAs observe the need to restructure their portal and to include a more intuitive approach for the homeowner, for example including search functions, Q&A, contact persons, soft values and emotional triggers. For the short term many LAs think that testimonials might be suitable for integration in their web portal, thus evolving to a more emotional and individual approach.

For convincing homeowners, LAs see the need to integrate an energy and cost calculation tool. However, the workshop results also demonstrate that besides financial information also a presentation of non-energy benefits, low-burden opportunities and possible interventions of real advisors might be important. Most LAs are keen to integrate peer-to-peer communication tools to convince homeowner with advices from their peers.

Various LAs propose to offer standard contracts for easier access to low-carbon technologies on their web portal and are looking for opportunities to integrate a list of acknowledged and/or rated consultants and/or suppliers. LAs also expect that they can provide better aid to homeowners by offering a contact person or one-stop-shop portal to support the customer journey. In both cases related web tools are needed, for example a step-by-step action plan for home renovation would be in line with current (Flemish) developments for changing the energy performance certificate and would fit the development of a home renovation passport as an e-service. Furthermore, video clips might support homeowners in their search for information about correct execution and information might be provided about tests for quality assurance.

Overall, LAs still need to do a lot of work to develop the proposed web functions. Seven LAs will now develop each five web portal developments (functions, components, databases or applications) and will test these in practice, involving also observer LAs. For the further development of these web platform ideas LAs will also reflect how they can ensure continuity, in connection to the development of their own web portal and the web portals from their partners, and in relation to other Triple-A activities (pop-up centres, demonstration exemplars and home energy monitoring systems).

Future work also aims to reinforce existing conditions and to co-create the proposed functions together with other key actors. In the long run this might lead to some form of collaboration

between existing LA portals, supply side and demand side portals. In theory, current software developments allow easy embedding of modules and information from third party portals. In practice, it remains to be seen what is (legally) feasible for LAs.

The collated experiences will provide insights how LA e-services can develop in the future, taking into account individual LA needs and recent evolutions in web technology development. In 2020 a roadshow will inform all local authorities in the 2 Seas Region about their experiences.

6. Appendix

6.1. Inventory of low carbon technologies for LA web portals

Each LA made an inventory of low-carbon technologies to which they want the web portal to provide easy access to. The full inventory of each LA is shared for cross-reference in Deliverable D.1.1.3. The following summarizes the findings.

The Triple-A LAs present information on the following websites about low carbon technologies:
• Kent County: www.kent.gov.uk/warmhomes (and also www.energysavingtrust.org.uk/home-insulation).
• Rotterdam: www.rotterdamenergiebesparing.nl.
• Breda: www.energiekbreda.nl and www.regionaalenergieloket.nl/breda.
• Antwerp: www.antwerpen.be/nl/overzicht/zoom-in-op-uw-dak/welkom-2.
• Mechelen: https://klimaatneutraal.mechelen.be/maak-je-gebouw-energiezuinig.
• Oostende: www.eos-oostende.be.
• The current website of Picardie refers in this respect to the websites of the French Environment and Energy Management Agency (www.ademe.fr/) and the website of Amiens Métropole (http://pass-renovation.amiens.fr/).

In most LAs information can be found about insulation and technologies to generate renewable energy. All 6 local authorities present information about technologies in the category thermal insulation and airtightness (e.g. cavity wall insulation, floor and roof insulation, double and triple glazing). Five of them (except Kent County) also present information about renewable energy production (e.g. solar panels and solar water heaters).

Measured in numbers, the current websites of Rotterdam, Antwerp and to a lesser degree Mechelen and Breda seem to cover the widest range of low carbon technologies. In addition to the above mentioned information on thermal insulation and renewable energy production, the website of Rotterdam for instance also covers subjects like heating and cooling systems, green roofs and lightning. Furthermore information can be found about energy labelling and the possibilities to get a tailor-made energy advice. The current website of Antwerp covers more or less the same subjects. However the answers in the questionnaire sketch a more detailed picture of the possibilities that are offered to interested homeowners.

In the light of the fact that the website of Picardie currently does not provide information about low carbon technologies it will not come as a surprise that their wish list for the future website is quite long. They want to present pages about low-carbon technologies in general and include references and links to other websites where further detailed information can be found about the various technologies. It is Picardie's intention to present technologies that cover more or less all possible categories (e.g. thermal insulation and airtightness, heating and cooling, ventilation, renewable energy and green roofs, etcetera). Besides that Picardie wants to provide specific information about HEMS that they already have provided to homeowners who have used the Picardie Pass Rénovation to renovate their dwellings.

Also Kent County (which website currently offers a limited amount of technologies) presents an elaborate and detailed list of technologies (covering the whole range of possible subjects) that is going to be included on their website. In most cases reference will be made to other websites (especially the website of the Energy Saving Trust: http://www.energysavingtrust.org.uk) where the visitor can obtain detailed and specialised information. Kent County also wants to provide

information about the efficient use of water. For the 'water-items' mentioned, Thames Water Information Sheet are added on the website.

The other local authorities will keep the technologies that are currently presented on their websites also on their future websites. They generally want to update the information and some local authorities (e.g. Rotterdam) want to add information about new technologies. Most LAs also state that they want to add new information about home energy monitoring and management systems. Oostende points out explicitly that possible other new technologies have been defined during the scoping workshop 'web portals' that has taken place within WP1.

Looking at the overall wishes of the local authorities with respect to the information provision about technologies on their future websites (see also section 4 in the annex) it appears that they could inspire and support each other on a wide range of subjects. As stated before most LAs explicitly point out that they want to add new information about home energy monitoring systems on their websites. However there are far more shared wishes for future information. This would include (new) technologies on insulation and airtightness, heating, cooling and ventilation, renewable energy production, up to lighting and household appliances. The LAs could not only cooperate on developing and sharing the new information, but also discuss the way it is (or should be) presented to their web clients.

6.2. Inventory of financial schemes for LA web portals

One of the major barriers to the take up of retrofit measures at scale relates to the ability to implement sufficiently attractive financial and funding models to support projects. The failure of some finance options (such as the Green Deal in the UK), and the lack of widespread take up of other models in the respective partner regions means this will need to be addressed for web portal development. The following lists inspiring finance options and funding sources that could be included in the Triple-A web portal development.

6.2.1. Financial schemes

PUBLIC (SUPPORTED) FINANCE SCHEMES

The Funding Picardie Pass Rénovation provides technical and financial support, enabling the inhabitants of Hauts-de-France to engage in and implement energy-saving work in a dwelling. Financial support is provided by a third-party financing mechanism which allows PSEE to advance ALL the work without the beneficiary having to go through a credit agency. Indeed, they would reimburse us directly. Furthermore, the tax reduction device Crédit d'Impôts Transition Énergétique (CITE) can be promoted which is an energy transition tax credit for renovating houses with the aim of saving energy. Also, the eco PTZ is worth mentioning, a zero interest rate eco-loan that is granted to owners to finance their energy renovation work.

Rotterdam and Breda can promote the national grant for sustainable energy measures (SDE) and the national Individual Energy Savings Loan which provides low interest rate loans for specific measures. Besides that, the Dutch LAs can also promote the national subsidy scheme (20%) for combining at least two thermal insulation measures. Rotterdam also offers a local subsidy for (selected addresses for) housing improvement, a green roof grant, an insulation coupon and discount on energy advice. Besides these offers there is an opportunity to promote a VAT refund for solar panels and reduced VAT for thermal insulation.

The Flemish partners would like to promote the Flemish Energy loan for energy saving measures with an interest rate ranging from 2% to 0%, as well as the Flemish energy subsidies offered via energy distribution grid managers. The applicable grants in each LA can always be traced on www.energiesparen.be by giving a postal code. Besides this Antwerpen and Mechelen also give own subsidies to stimulate homeowners to take energy and water saving measures. Antwerp homeowners can also apply for a renovation allowance for technical advice, an estimation of the renovation costs, advice for comparing different offers and advice if a building permit is needed. Flemish local authorities can also support a discount on housing tax when achieving low-energy after renovation. In Flanders some authorities – for example Mechelen - would like to promote a grant for renovation of houses older than 30 years.

In the UK central government offers a Winter Fuel Payment and Cold Weather Payment to help pay the heating bills. The Citizens Advice Bureau can help check on any benefits or financial support to assist to pay for energy bills or for making energy improvements to your home. Homeowners who generate heat from renewable energy sources can receive money back form the government via the Renewable Heat Incentive.

LOCAL AUTHORITY LOAN AND COMMUNITY FINANCE

Typically LAs can offer a lowest cost finance secured through charges on the property where necessary.

For example, Dutch LAs - such as Breda - have a program in addition to the SDE loan so that local homeowners can loan at zero per cent interest. In Rotterdam there are also loans specially for energy savings for associated homeowners (more than 10 apartments). Breda also wants to experiment with the "Woningabonnement" (Housing Subscription), which is a proposed financial scheme - similar to a lease construction - in which all measures are pre-financed by a third party and the home-owner pays it back through a subscription fee ("abonnement") in 10 or 15 years. If possible this will not a be loan related to the homeowner but attached to the property.

Similarly, Flemish LAs can offer an interest rate reduction for the national EnergySavingsLoan.

Integrated into ongoing maintenance and general repair budgets for building blocks or neighborhoods, including linking to elimination of empty homes or neglected neighborhoods LAs might also provide finance or reduced land or house sales and rent prices to support and encourage renovation of properties for residential use.

Community finance includes the development of community share options / finance for the delivery of measures in domestic properties. Many local authorities start experimenting with facilitating group purchases.

For example, Mechelen offers group purchase of solar panels. Antwerpen facilitates group purchases of thermal insulation for apartment buildings. Flemish LAs aim to stimulate the Eandis initiative to support a coach that guides "neighbors". Oostende aims for the no-burden group purchase of roof insulation, solar panels and 'green' electricity/natural gas with a Budget Neutral Guarantee.

In theory mortgage finance allows linking loans to the process of moving home and enabling upgrades at that point. Alternatively, costs can be added to existing mortgage arrangements depending on circumstances. LAs perceive this is also an important task for local private financial stakeholders. For example, in Rotterdam various banks offer mortgage interest rate discount on the mortgage as the house's energy label is higher.

UTILITY OBLIGATION/ FUNDING AND ENERGY GENERATION TARIFFS

In the UK and Flanders utility providers have a legal obligation to support energy saving measures and/or reduction of energy poverty.

For example, the UK Energy Company Obligation is a grant for eligible homeowners towards the cost of installing insulation measures (such a loft and cavity wall insulation) or for replacing your boiler. Energy suppliers in the UK are legally obliged to help vulnerable customers to pay for their energy.

Flemish subsidies for energy saving measures are offered via energy distribution grid managers such as Eandis. Each year these utility providers propose measures to the Flemish Energy Agency to comply with regional CO_2 reduction targets. Vulnerable customers get a certain amount of energy for free. Future initiatives for inclusion in Flemish web portals can be the application for a "BENOvatiecoach": a sustainable renovation coach for stimulating collective renovation, which is an initiative of the energy distribution grid manager Eandis. Also various energy distribution net managers evolve towards supporting integrated renovations or multiple measures at the same time.

In the 2 Seas Region government-supported Feed-in Tariffs apply for those who have installed renewable energy technologies. Energy suppliers will give money back to those who generate their energy from renewables and export their energy back into the energy grid. Using off-peak Grid electricity at lower prices and promoting energy storage to minimize peak electricity costs on a 'behind-the-meter' basis is still an issue to be developed.

All Triple-A local authorities would like to support citizens to better follow up their energy consumption. For example, Mechelen wants to work together with EnergyID to clarify energy use and cost for homeowners. Rotterdam is considering teaming up with Buurkracht to allow homeowners to compare their energy costs in the neighborhood. Kent would like to integrate a new cost and energy savings estimation tool in their web portal.

SOCIAL BONDS AND HEALTH FUNDING

Linking with the reduction of poverty, public sector service providers also aim to deliver additional services that reduce public sector costs in long term.

For example in the UK, health sector social bonds and delivery of health outcomes can support. Additional impact on this is provided by the UK Social Value Act 2012. "Winter Warmth loans" in specific boroughs or districts in Kent are funding used to support elderly homeowners with ongoing health and disability issues particularly around cardiovascular and respiratory illness.

In Picardie ANAH is an organisation that provides financial aid to people who has low-level income so they can renovate their houses.

In Flanders social aid is provided by Public Centres for Social Welfare ("OCMW's"), which are well connected with LA administrations. In Flanders, some local authorities such as Mechelen would also like to integrate a grant for improving and adjusting a dwelling to be able to live longer in the dwelling.

Grants for living longer in the own house at old age are also emerging in Dutch municipalities, particularly those with a decreasing population.

6.2.2. Some related questionnaire results

Each LA made an inventory of financial schemes to which they want the web portal to provide easy access to. The full inventory per LA is shared for cross-reference in Deliverable D.1.1.3.

The following Table (Triple-A partner answers to the question 1.9) provides an overview of the incentives that are already managed by the local authorities.

INCENTIVES MANAGED BY THE LAS	PSEE	Kent	Rdam.	Breda	Antw.	Mech.	EOS
Subsidies for energy-efficient renovation	Yes	Yes	Yes	Yes	Yes	No	No
Subsidies for renewable energy systems	No	No	Yes	No	Yes	No	No
Subsidies for tailored energy advice	No	No	Yes	Yes	No	Yes	Yes
Green loans / Financing schemes	Yes	Yes	Yes	No agreement	Yes	Yes	Yes
Local tax incentives	No	No	No	No	No	No	No
Organising contests between home-own.	No	No	No	No	No	No	No
Stimulation of self-organisation of citizens	No	No	No	Yes	No	No	No
Facilitation of group buying	No	No	No	No	No agreement	Yes	Yes
Facilitation of 'third-party financing'	Yes	No	No	Yes	No	No	Yes
Obligation of post renovation energy performance	No	No	No	No	No	No	No
Other:	No	Yes	No	No	No agreement	Yes	No

Yes	
No	
No agreement (more respondents)	

TABLE 13 INCENTIVES MANAGED BY THE TRIPLE-A LOCAL AUTHORITIES FOR THE PROMOTION OF ENERGY-EFFICIENT RENOVATION SOLUTIONS TOWARDS HOMEOWNERS

As 'Other' incentives directed to homeowners Kent County also noted collective switching campaigns to help residents to switch energy supplier (Energy Deal). Antwerp also specifically referred to the use of building permissions, rural planning and the housing policy of AG Vespa. Mechelen also noted a pilot project co-financing.

It can be seen that incentives like green loans or financing schemes and subsidies for energy efficient renovation measures are being implemented in most LAs. Local tax incentives, contests and obligations are currently nowhere implemented. We can speculate that this has to do with the fact that currently municipalities do not have the power or the means.

Providing access to grants/funding is essential for the LAs and some regard this as a basis for including quality assurance in a trusted, LA branded scheme. Despite the financial incentives, LAs are aware that some homeowners (for example elderly, households living in energy poverty,..) are not sufficiently triggered for adoption.

The LAs rated the importance of the future promotion of financial incentives (in question 1.12):

IMPORTANTCE OF INCENTIVES	PSEE	Kent	Rdam.	Breda	Antw.	Mech.	EOS
Subsidies for energy-efficient measures	4	5	5	4,5	4,5	4	4
Subsidies for tailored energy advice	2	5	5	3,5	3	4	5
Green loans / Financing schemes	5	5	5	4,5	4,5	5	4
Local tax incentives	2	5	5	3,5	3	4	3
Incentive for energy advice services	2	5	5	3	3,5	3	5
Organising contests between home-own.	2	3	2	2,5	2	3	3
Stimulation of self-organisation of citizens	2	5	5	4	2	3	5
Facilitation of group buying	3	3	5	3,5	3,5	5	5
Facilitation of 'third-party financing'	4	5	5	4	3	4	3
Obligation of post renovation energy performance	2	3	5	3,5	2	3	3

1	Not at all important
2	Slightly important
3	Neutral
4	Fairly important
5	Extremely important

TABLE 14 TRIPLE-A PARTNER'S RATING OF IMPORTANCE OF INCENTIVES FOR THE FUTURE PROMOTION OF ENERGY-EFFICIENT RENOVATION SOLUTIONS

The Table shows that for the near future subsidies and loans will remain important next to other financial initiatives. In Breda and Antwerp the scores reflect the average score of two respondents. However, subsidies should or can be provided only for a limited time.

Stimulation of self-organisation of homeowners and facilitation of group buying is being considered as important by more than half of the LAs. For example, Kent held an Energy Workshop with their Observer partners (The Kent and Medway Sustainable Energy Partnership) where group buying was discussed. Group buying on behalf of communities (e.g. bulk buying oil, gas etc.) was seen as a cost effective rather than energy effective solution to driving down the costs of energy for residents. They concluded that what might be more energy efficient is bulk purchasing insulation or other energy efficiency measures for residents instead.

Compared to the previous Table we can speculate that the interest to setting demands on a maximum energy performance after renovation will increase. Contacts with regional government on policy and tools on Energy renovation (e.g. energy label) are being developed.

Respondents from three LAs mention the future importance of local tax incentives, but it is unclear how they think to realise that. Besides the fact that LAs generally are statutory not allowed to set regulatory demands on a local level, there is also the question how such a demand can be monitored and enforced properly.

Some LAs already experiment with new initiatives. For example, in Breda an Energy savings loan Breda with a 0,0% interest rate is already offered with co-financing by local energy cooperatives (Bres-Breda, Princenstroom, Anneville). Breda also develops an ESCo scheme for homeowners called 'Woningabonnement'. Heerlen supports neighbourhood approaches in collaboration with energy providers.

Bonheiden provides a specific subsidy for the use of ecological materials. Sint-Niklaas offers free renovation advice at the kitchen table and supports passive house renovations (based on certificate). Antwerpen is experimenting with a scheme for households living in fuel poverty to pay their investment back via realised energy gains. EOS Oostende also provides green loans and now

also created a "profit guarantee" contract: households living in fuel poverty pay their investment back via realised energy gains.

In the UK, experiments are ongoing with public health funding (CESP scheme) to support energy saving measures for residents with qualifying health conditions, and for supporting collective switching schemes (Energy Deal).

PSEE Picardie is the only LA Triple-A partner that currently provides an integrated approach from informing homeowners to financing, contracting and offering quality assurance. Certainly the LAs can learn from this programme.

6.2.3. Conclusion

The options that LAs consider promoting for financing low-carbon technologies include national, regional and local financial incentives (grants and loans), grants and obligatory services from utility providers and specific incentives for vulnerable target groups. Experimentation with other financial incentives, such as third party financing is still in its infancy. LAs are recommended to also think about including information on their web portals about investment of the homeowners' own resources, mortgage refinancing, presenting financing by service providers, and financing supported by guarantee on energy savings.

6.3.   Questionnaire for local authorities

The questionnaire for Local Authorities consisted of 64 questions addressed to local authority representatives. These questions included:

- Identification of the LA (6 questions)

- Identification of LA promotion activities (13 questions), including identification of currently owned or co-owned communication channels; identification and importance rating of current and intended promotion of renovation solutions towards homeowners and market actors; identification and importance rating of current and future incentives managed by the LAs.

- Importance attached by LAs to information awareness raising to convince homeowners (12 questions), addressing the need for energy information and calculation tools, cost information and calculation tools, information about renovation processes, lists of (experienced) market actors, personal contact, model contracts, information during construction and after delivery, as well as connection to available studies and perceived barriers.

- Identification what LAs think is important to communicate in their web portals (21 questions), including identification of their websites for development, elements regarding the customer segment orientation, the targeted marketing and the visibility of the website, and the current perspective of the LA on including the previously listed information categories.

- Identification of tracking of homeowners who consult the website (4 questions), including identification of current number of visitors and kind of information to collect from homeowners as well as action needed to follow-up visitors.

- Evaluation how to make the web portal more self-sustaining in the future by working together with market actors (6 questions), including identification of relation with other LA Triple-A activities, identification of preferred stakeholders and their responsibilities, and specification of connection to other websites.

- Final remarks and contact details (2 questions).

Parties wishing to contribute to the co-creation of LA web modules or functionalities can ask for, or discuss, detailed questionnaire results by addressing the main contact person per LA.

The following Tables briefly illustrate how answers to the questionnaire for the Triple-A LAs were compared, mainly in a graphic form. This allowed the Triple-A LAs to interpret their differences and similarities in the web portal approach.

Table 15 shows an example how questionnaire results from Triple-A LAs were compared for yes/no questions, in this case for the question: "Does your current website specifically address homeowners' motives for the uptake of energy saving technologies?".

HOMEOWNERS MOTIVES	PSEE	Kent	Rdam	Breda	Antw	Mech	EOS
Financial savings by energy-saving							
Future value of the house							
Environmental reasons							
Improvement of thermal comfort							
Improvement of health							
Improvement of day lighting quality							
Improvement of easy access							
Need for more space							
Need for repairing the technical state							
Changes in family composition							

	Yes
	No
	No agreement (more respondents)

TABLE 15 EXAMPLE OF A TABLE TO COMPARE YES/ NO QUESTIONNAIRE RESULTS FROM DIFFERENT LAS.

In other analysis figures, questions (and answers) were analysed in terms of **Availability** and **Importance**. For some questions only 'yes' or 'no' could be ticked. Other questions offered a 5 point scale. For reasons of clarity the category 'yes' was equated with the response options 4 (fairly important) and 5 (extremely important). Table 16 shows an illustration for replies to the questions "Does your current website enable to find detailed model contracts?" and "How important do you think are detailed model contracts for convincing citizens to take up energy-efficient renovation measures?: (response categories: 1 through 5)".

MODEL CONTRACTS FOR	PSEE		Kent		Rdam		Breda		Antw		Mech*		EOS	
	A?	I?	A?	I?	A?	I?	A?	I?	A?	I?	A?	I?	A?	I?
Integrated renovations (IntR)	green		red	green	red	green	red		red		red	green	red	
IntR incl. energy performance guarantees	green	green	red	green	red	green	red	green	green	green	red	green	red	green
Individual renovation measures (IRM)	green	green	red	green	red	green	red	green		red	red	green	red	
IRM incl. integration of financial incentives	red	green	red	green	red	green	red	green		red	red	green	red	green
Buying renovation measures as a group	red		red	green	red	green	red		green	green	red	green	red	green
Buying project managem. services as a group	red		red	green	red	green	red		green	green	red	green	red	green

A ? = Available on website	Yes	No	Dis-agree
I ? = Important	Yes (4-5)	No (1-3)	

4 and 5 fairly or extremely) important; 1-3 less or not important

TABLE 16 EXAMPLE OF A TABLE TO COMPARE AVAILABILITY/ IMPORTANCE QUESTIONNAIRE RESULTS FROM DIFFERENT LAS.

6.4. Posters developed for the purpose of the scoping workshops

For the purpose of the workshops two working posters were developed to be able to reflect on critical issues for the customer journey and the positioning of web functions (see further in Chapter 5). The posters show a circular loop, as it is the objective of Triple-A to use (positive) experiences of homeowners as input for other potential adopters.

> ➢ Figure 20 shows a discussion poster that was used during a number of Triple-A workshops to identify current weaknesses in LA web portals from the viewpoint of customer journeys, for example by positioning post-it's with identified questions that homeowners might have during the process.
> ➢ Figure 21 was developed to position these questions and the related web portal needs in LA web portals or other web portals. As homeowners do not only rely on LA web portals, this should give input for discussion if certain web functions, components and databases can be better positioned outside the LA web portal.
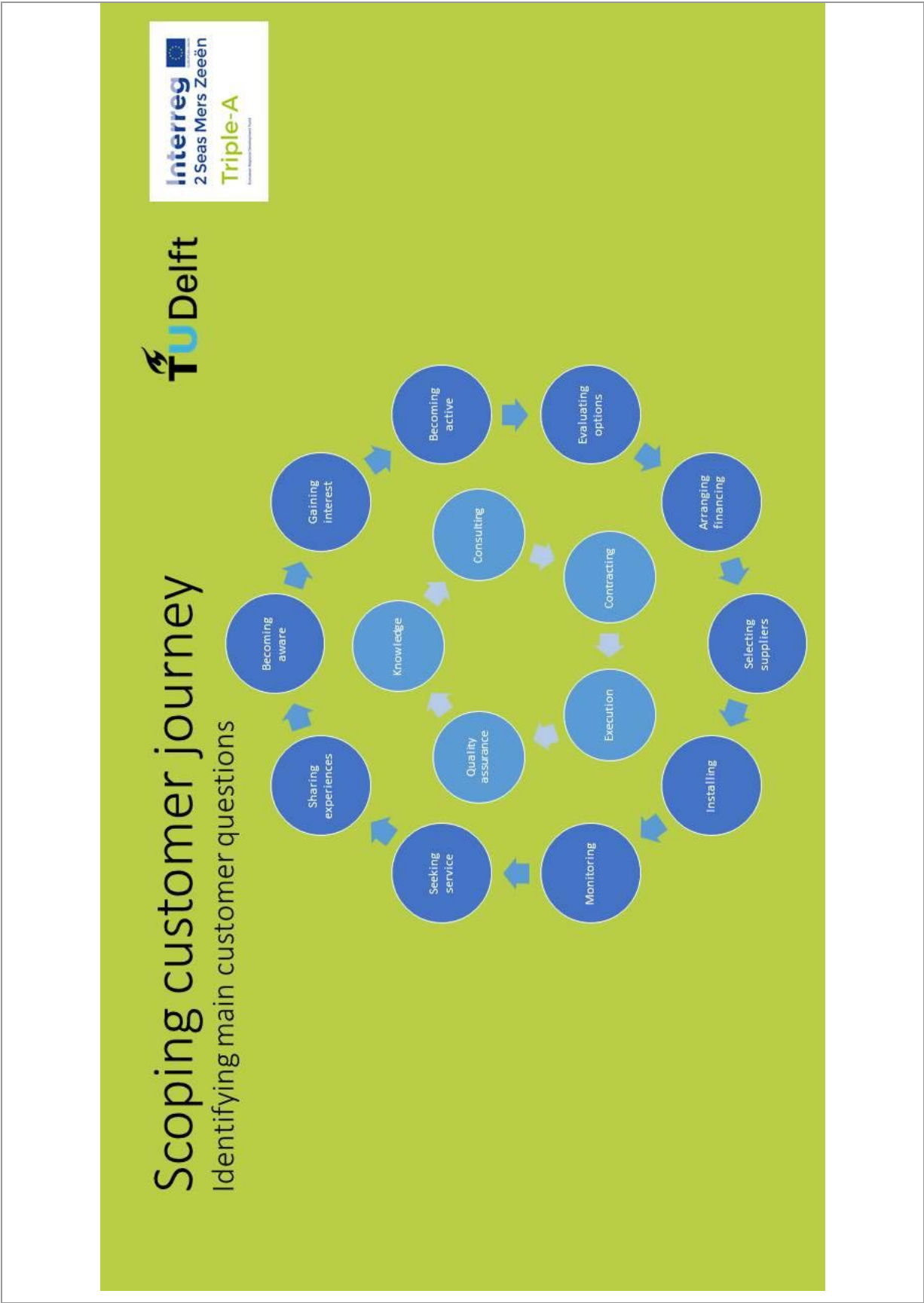
Figure 20 Poster for Triple-A workshops to identify current weaknesses in LA web portals from the viewpoint of customer journeys.
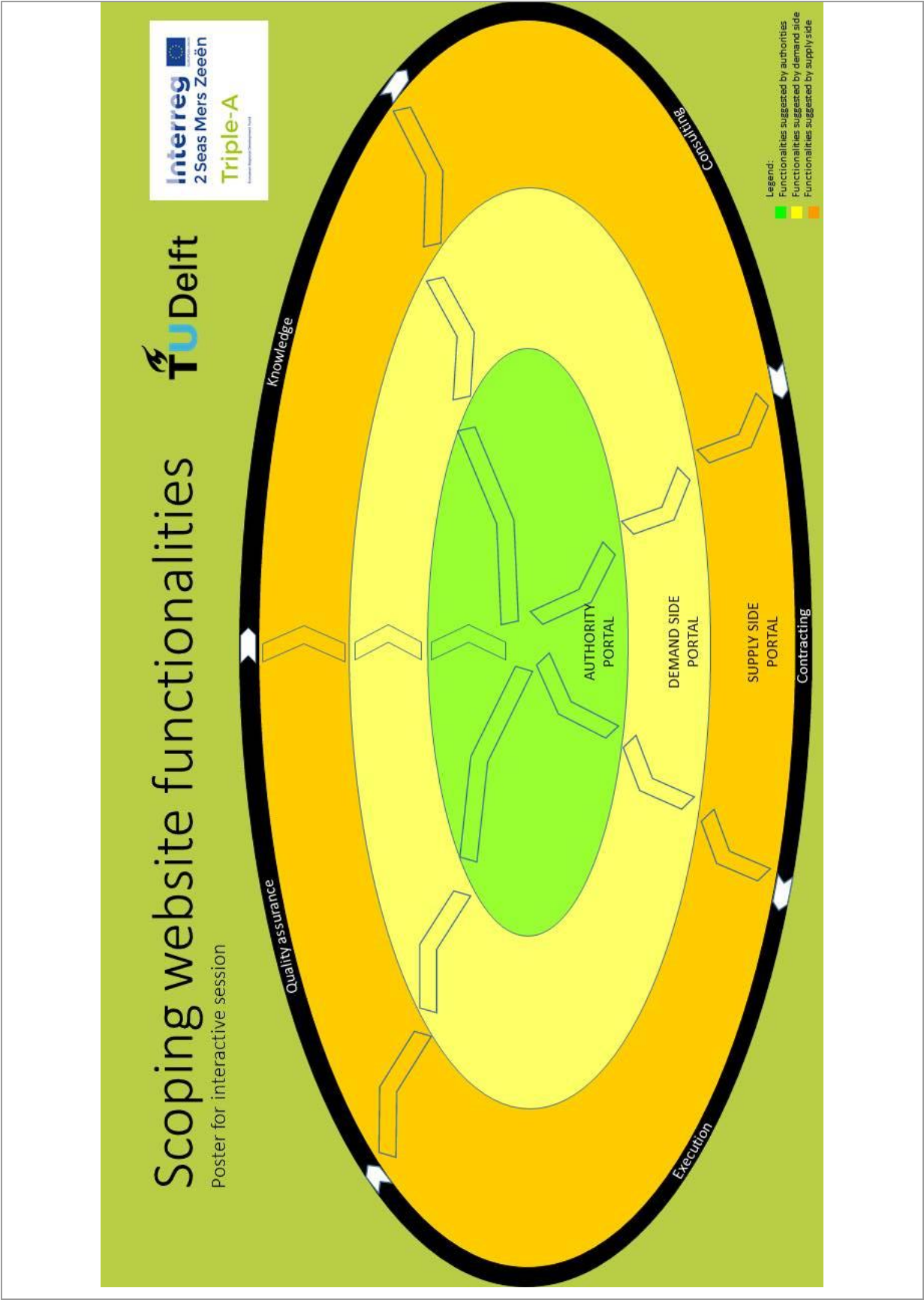
Figure 21 Poster for Triple-A workshop to identify LA web portal needs for additional website functions.

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