



# Save the Homes

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# 1 Executive Summary

The overall aim of **Save the Homes** is to contribute to an increase of an annual renovation rate of > 5% by offering attractive OSS services to homeowners, managed and implemented or supported by municipalities as being trustworthy entities for citizens. This is achieved by the implementation of OSS Citizen HUB concept, offering renovation offices, both as physical HUBs and web-based virtual HUBs at local level based on the concept of medium-sized cities and to maximize replicability, at city level, national and EU level.

This deliverable handles ‘the definition of the local Citizen HUB Platform functionalities’ for both Rotterdam and Valencia, and how it is integrated into the existing platforms. In Work Package 2 the demand and supply side are mapped, and thus describing the current situation, and the first steps towards a HUB were described. Work Package 3 goes into detail into what the citizen HUB should look like and what it should do. Therefore this deliverable 3.7 focusses at the **functionality**.

We start with describing the **local context** in which the HUB would function. It seems that there is a difference in starting point of both pilot cities. In Valencia the local government has taken up the sustainability task and put already an office in place, but initiated by the regional government. Whereas in the Rotterdam situation, the national policy is now working towards tangible results, but as a result, on a local/cities level lacks coherence because one is still piloting and looking for most effective solutions.

One of the solutions lies at offering the right **measures**. In Rotterdam the component renovation approach is used, it goes beyond single measures, but tries to improve a complete part of the building, like the roof, the façade or the installation. In Valencia people are helped by the Energy Office and get a selection of measures they can take. But in Valencia they are also working towards products that are complete and ready.

The local activities did not start out of the blue. In Valencia, the Municipality already started an **energy service** related to energy bills, access to energy, energy education and energy communities (initial activities of the Oficina de la Energía<sup>1</sup>), while the Regional Government was launching green frameworks for public sector contracting (Guia Verde<sup>2</sup>) or different tries of networks for managing housing renovation services (mainly information – the now dismantled RED oir). Also a capital actor in the residential building local context, the building administrator, was already turning their attention to the need of ‘standarized’ processes for quality assurance of renovation works, and energy renovation, as a source of potential financing of the other needed works on the building.

Save the Homes comes therefore on the exact moment to exploit these incipient activities, by adding a new service to the Oficina de la Energia: the home renovation service, launching a new framework for municipalities to start their own OSS housing services, including the home renovation, or building an agreement with the building administration council to train associates in the energy renovation process and specialties.

In Rotterdam the last couple of years several initiatives were started, but none of them got a follow up because the city is still experimenting and gathering results to set up a city-wide strategy. That results in several **local achievements**, but with no clear structure or coherence between these actions.

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<sup>1</sup> <https://climaienergia.com/es/oficina-de-l-energia/que-es-la-oficina/>

<sup>2</sup> <https://guiaverda.gva.es/es/els-contractes-de-serveis-i-obres-d-edificacio>





At this moment there is a start with one project, initiated by a **local initiative**, Alex Energie and homeowners. It is a renovation of 16 home and now the functionalities of the HUB are matched with this project as Alex Energie is the link between homeowners and project Save the Homes. This way all tools and solutions that are available will be of use to support future projects. The setup of a local place (the HUB) and the project of 16 homes **coincides**, and both paths can come out stronger. It follows a way from a menu to concepts for the homes, towards leaflets that can be used when asking for quotations. Because of the use of components, the menu, concepts and leaflets can be re-used. The replicability is illustrated by the Component Renovation approach.

Finally this deliverable mentions the available **financial offers**, because they are relevant to the overall process. Other deliverables in Work Package 3 go into detail on this topic. But the short version is that in Valencia the energy office is paid for and organised (by the government), but the financing of the actual renovation has not crystallised yet. In the Rotterdam case, homeowners can apply for a loan, so they can pay for the measures, but the financing of the actual HUB is not clear. Therefore, there is not yet a place ready where people can get the needed information but a network of neighbours, which Alex Energie as an energy community is.

In the end the functionality of the HUB and whether it should be digital or physical is explained. In Rotterdam a digital tool will be explored. In Valencia the focus lies at physical advice, but they are also looking at digital solutions and models.





## 2 Energy transition

As previously expressed, existing initiatives existed in both pilot markets for energy transition. Both, based on national and EU regulations, then deployed into a regional or local level. This section is about this energy transition context in which the pilot initiatives are framed.

### 2.1 Spanish context

According to the last International Energy Agency (IEA) report for Spain<sup>3</sup>, the Spanish framework for energy and climate is based on a 2050 objective of national climate neutrality and 97% renewable energy in the total energy mix. As such, it is centred on the massive development of renewable energy, **energy efficiency, electrification** and renewable hydrogen. Notwithstanding its considerable progress to date on decarbonising and increasing the share of renewables in the electricity sector, Spain's total energy mix is still heavily dominated by fossil fuels. The transport, industry and **buildings sectors** all have considerable work ahead of them to meet the country's targets for increasing the share of renewables and reducing emissions.

Toward this end, the central strategy document guiding Spain's energy and climate policies over the coming decade is its **NECP for the period 2021-30**. It outlines a number of policy actions in various sectors that will support the country's climate targets, including in the areas of energy efficiency, renewables and transport. Its 2030 objectives include: a 23% reduction in greenhouse gas emissions from 1990 levels; a 42% share of renewables in energy end use; and a 39.5% improvement in energy efficiency; among others. Policies include **refurbishments and increasing the use of renewable heating in the residential** and commercial sectors.

Also to be noted, Spain has emphasised the concept of a just transition to ensure that communities in traditional energy sectors, notably coal mining, are not left behind. To this end, Spain's **Just Transition Strategy** includes measures to promote employment opportunities in the energy transition, supported by a framework of vocational **training**, active labour policies, support measures to the most vulnerable and economic stimulus plans for those regions most affected by the energy transition. These are executed through "just transition agreements" between the government, unions and businesses, which can serve as an example to other countries facing similar issues.

In this context, the government of Spain will ensure that the **National Recovery and Resilience Plan supports achieving the NECP's targets**; improve co-ordination with regional authorities and municipalities to implement the NECP's measures, especially on energy efficiency, more effectively; reinforce efforts to create more flexibility in the electricity market and to ensure proper price signals for investments in generation, through increased interconnectivity, continued integration of regional markets, and the development of demand-side response and storage; and finally review taxation to avoid excess charges and distortionary impacts on electricity relative to oil and gas consumption to promote electrification.

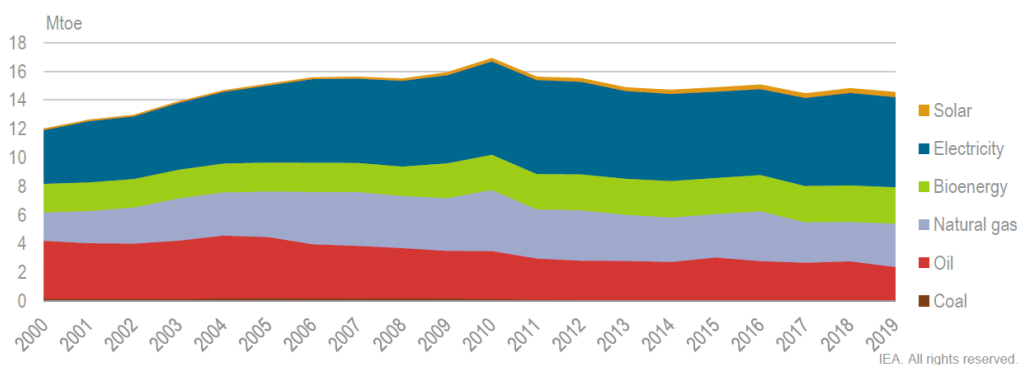
#### The residential sector

In 2019, electricity was the main energy source for the sector, accounting for 43% of total energy consumption, followed by natural gas (21%), bioenergy (18%) and oil (16%). Other renewables (mainly solar) accounted only for 2%, but have been increasing in recent years.

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<sup>3</sup> <https://www.iea.org/reports/spain-2021>





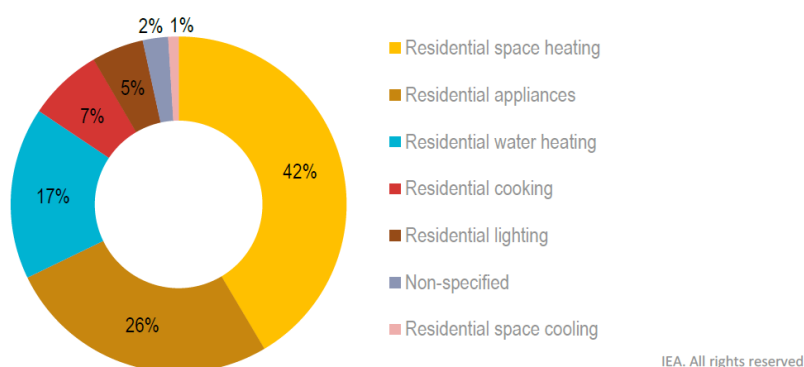
The contribution of electricity to energy consumption in the residential sector has been increasing, while oil has declined.

Note: Mtoe = million tonnes of oil equivalent.

Source: IEA (2021), *IEA World Energy Statistics and Balances* (database), [www.iea.org/statistics](http://www.iea.org/statistics).

Figure 1.- Energy consumption in the residential sector in Spain by fuel, 2000-19

In 2018, 42% of the energy consumed by residential buildings was used for space heating, followed by residential appliances and water heating, which were responsible for around 26% and 17% of total residential energy consumption, respectively. Energy consumption for residential space and water heating has been decreasing over the last decade, while residential appliances increased their consumption by almost 60% between 2008 and 2018. In terms of both per capita and per dwelling, Spain’s energy intensity of the residential sector is lower than the IEA average.



Residential space heating and residential appliances consumed more than half of total demand in the residential sector.

Sources: IEA (2020), *Energy Efficiency Indicators 2020* (database), [www.iea.org/statistics](http://www.iea.org/statistics).

Figure 2.- Breakdown of energy consumption in the residential sector in Spain by use, 2018

### Institutional responsibilities

The **Ministry for the Ecological Transition and the Demographic Challenge (MITERD)** is responsible for preparing basic energy legislation, developing national energy policy and measures to ensure co-ordination with other ministries, and monitoring of policies related to the fulfilment of energy policy objectives. Therefore, it is responsible for energy savings and efficiency policies, through the Secretary of State for Energy, the General Sub-Directorate for Energy Efficiency, in charge of developing the guidelines; and the **Institute for Energy Diversification and Saving (IDAE)**, who manages energy efficiency programmes and projects to help Spain meet its energy efficiency objectives. These





programmes are often financed by the **National Energy Efficiency Fund**. Finally, energy efficiency policies and measures are frequently **implemented at the regional and municipal level**.

### Energy efficiency targets and strategies

Spain's energy efficiency objectives are aligned with EU Energy Efficiency Directives, which establish a common framework of measures to promote energy efficiency within the European Union, with EU-wide targets of 20% improvement by 2020 and 32.5% by 2030 (relative to 2007 levels). Spain accepts these objectives and establishes, in the National Energy and Climate Plan (NECP) 2021-2030, a national guideline for an **energy efficiency improvement of 39.5% by 2030**.

The NECP proposes 17 measures to meet the 2030 target, designed along a sectoral approach, applying proportional savings to each sector based on its consumption. The residential sector amounts to an expected 6.7 Mtoe of savings in 2021-30.

### Energy efficiency policies in the buildings sector

The **Technical Building Code**, approved by Royal Decree 314/2006, is the regulatory framework that establishes the basic quality requirements that buildings and facilities must meet. It was modified in December 2019 to comply with the latest EU Energy Performance of Buildings Directive (EPB). In particular, the Basic Document of Energy Saving, which is mandatory for new and refurbished buildings, was amended to more clearly define nearlyzero energy consumption buildings. The new definition sets a more ambitious limit of a 40-60% reduction in energy consumption, improvements in thermal envelope requirements, tighter conditions for controlling energy demand, conditions for thermal installations, conditions for lighting installations, a minimum contribution of renewable energy to cover the demand for hot water and a minimum generation of electricity from renewable sources.

The government also provides **financial support** for energy efficiency renovations through the Energy Rehabilitation of Existing Buildings (PAREER-CRECE) programme.

The NECP outlines the following efficiency measures in the buildings sector:

- 1) **Energy efficiency in existing buildings in the residential sector: In line with an updated Long-Term Building Renovation Strategy, the government promote energy upgrades of the existing building stock, prioritising the thermal envelope of buildings as well as thermal installations for heating, cooling and hot water.**
- 2) Renewal of residential equipment
- 3) Energy efficiency in services sector buildings
- 4) Energy efficiency for cooling equipment and large air-conditioning systems in the services sector and public infrastructure

**Spain's long-term renovation strategy (LTRS)** builds on previous strategies, setting out a comprehensive and well-structured set of policies organised in a coherent and articulated implementation plan. The LTRS target of renovating 1.2 million dwellings over 2021-2030 (improving the EE of the building envelope) would mean an expected substantial increase in the annual renovation rate - from 30 000 dwellings today to 300 000 in 2030.

In the residential sector, the strategy aims for a 99% reduction in greenhouse gas emissions by 2050 compared to today. Resources seems appropriate, comprising a combination of public and private investments. The LTRS sets ambitious but still achievable objectives and targets.

Information on the building stock

- Of the total of 25.7 million houses in Spain (2020 estimate), 74.6% are main dwellings (18 771 653) and 25.4% are secondary and empty dwellings (6 375 471).





- Multi-family housing accounts for 71.8% and single-family for 28.2% of the housing stock.
- In the secondary housing stock, single-family homes account for 46.9% and multi-family housing for 53.1%.
- Among the buildings with an Energy Performance Certificate (EPC), less than 5% are classified as either A or B and slightly more than 15% have a C class.
- Renovation has increased from 25 996 buildings in 2017 to 28 364 in 2019 (9.1%).

Objectives:

- 1.2 million homes (out of 18.7 million primary residence homes) are on the market for renovation in the coming decade. **Energy renovation** of 1.2 million homes would reduce the number of people being diagnosed with cardiovascular problems by 96 000. The total accumulated energy savings would reach 6,949 ktoe.
- Adequate measures for **photovoltaic** installation and self-consumption (i.e. generating power for one's own use), together with energy efficiency renovations are likely to lead to the expected decarbonisation of the building stock by 2050.
- **Socioeconomic benefits**, including savings on energy bills, increased GDP of 0.47% in 2030, generation of 33-88 000 jobs in 2030 (+0.44%) and improved indoor air quality and health.

EU has highlighted the strong point of this strategy in terms of legislation, financing, energy poverty, public buildings, ESCOs, skills and advisory tools, such as the wide network of **local and regional one-stop shops** ('ventanillas unicas') that provide the public with various services (including financial and technical advice); campaigns to raise the public's **awareness**; technical and explanatory **guides**; or user-friendly public **tools**.

## 2.2 Dutch context

In the Netherlands, the national government referred to a more local level to implement energy savings. There are 31 Energy regions, and each region has to put up a **Regional Energy Strategy (RES)** based on the use of potential renewable energy sources. The RES is a product that describes the strategy the RES region uses to determine and achieve local/regional energy objectives. In 2020 all RES reports were submitted. After the adoption of Regional Energy Strategies, every municipality has set to work drawing up a vision upon the **heating transition**. Its the next step, where a RES handles a region is the heat vision focussed at the city. Most of the municipalities succeed in putting up a heating transition vision before the end of 2021. This has cleared a major hurdle for municipalities and the course for energy reduction has been set. Now the boundaries have been set, but the aim of the next step is to converge into **implementation plans**. Because most heat visions look at the neighbourhood or even district level. However, to meet the requested deadline, a lot has been aggregated.

Unfortunately, now it only really starts. Until now you could get away with key figures, average building performances and an indication of the housing type, possibly combined with the year of construction. You could then, as a policy maker, start calculating this in many variants, considering various **scenarios** in price increases and expected developments due to, for example, innovation<sup>4</sup> or

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<sup>4</sup> The heat visions indicate how a district will be heated and which infrastructure will be built. Different solutions (heat, all electric, green gas) can impose different preconditions on the home. A house that is heated at a low temperature (LT) must be better insulated than a house at a medium temperature (MT). An owner is responsible for the adjustments to his home, but does not always have an influence on the choice in terms of heat vision.



market forces to get an indication of the costs: a doubling of the gas price (not even such a crazy assumption now appears), major growth in the potential for biogas, or the application of hydrogen gas as an alternative. All variables that can be used in the city-level scenarios. But now or in the near future, the sustainability plans will have a major impact on homeowners and their residents. This must become concrete in the **district implementation plans** (wijkuitvoeringsplan - WUP). Which is the next step in the Dutch government.

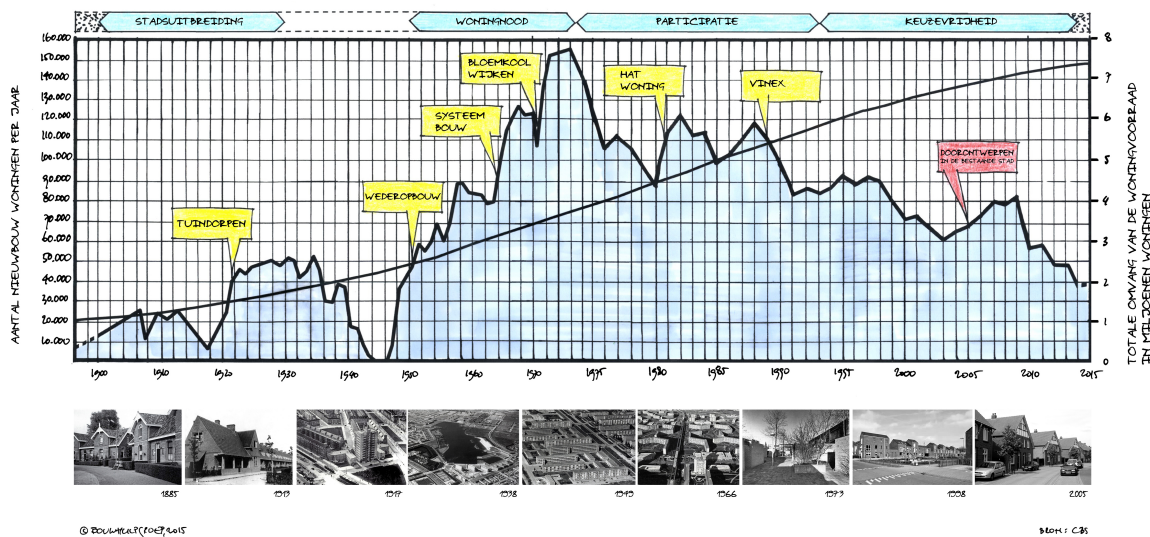


Figure 3: Development of the building stock in The Netherlands

Each city has to develop plans on a neighbourhood scale, so actual **implementation** can take place. This assignment starts with the neighbourhood and its current residents. This means that the plan must be based on which homes and other buildings are located in the district and, above all, who lives, works and cares there. And what all these people have in common is that they live in a different way, enjoy different things, and have different financial space. So the important question is how to bring a vision into the next step, a district implementation plan (WUP)?

### Individuals

There is no model or calculation tool to estimate energy and costs savings that accurately calculates what **each individual** home-owner need in an area or neighbourhood. Based on key figures, we can certainly make a first and meaningful selection about what the cheapest or most efficient solution for the neighbourhood in a general sense is, at least in theory that is. As soon as it becomes concrete, you need more specific information, but above all the consent of people living there. It is simply no longer possible to combine everyone and everything together. People want to choose a solution for themselves, and different people find different solutions important. People need help on how to achieve this, but they are experts themselves on what they want. This is addressed in the **personas** in D 2.1.

Of course, housing associations choose from their perspective to approach a complex largely in the same way, but for a private individual there is a difference in the wishes. Based on everyday practice in renovating homes one can assume three (un)certainities when looking at inhabited homes:

1. Despite the fact that they are originally identical homes, the starting point has changed over the years and the **homes have become different**;





2. In addition, you almost know for sure that residents all **want something different**;
3. And you are almost sure that they all want this **at a different time**.

This makes it clear that an approach in 'archetypes' or 'contingents' has only limited practicality. Where in the Regional Energy Strategies and the Heat Visions buildings could be combined, at the district level another scale is needed. In practice, the group of homes that seems so uniform turns out to be divided into several small groups, which means that the prospect of **scale** and therefore **affordability** are considerably smaller.

### A thousand clients

In the neighbourhood and the WUP, one has to deal with many different clients, most of whom do not even know that they are a 'client'. They live in their home, but are **not yet concerned** with sustainability or renovation, let alone a neighbourhood implementation plan. Nevertheless, this group will have to get improving their building in the coming years and start investing in a more sustainable home. That starts with **awareness** and realization of what still needs to be done. The part of raising awareness and realization is of great importance. It lies at the start of the Save the Homes trajectory. Although the customer journey tends to start with onboarding.

How to come from a policy and a program (the WUP) to concrete actions and proposals? There is not only a technical issue, but also a **financial** issue. Communication about the assignment is essential for success and scaling up. As a municipality you have to make known what your (energetic) vision is for a neighbourhood, and indicate what the expectations are that go with it. For example, the choice for a Medium-Temperature (MT) district heating can easily be substantiated on paper, but it imposes requirements on the degree of insulation of the buildings in that district. Labelling a neighbourhood as All Electric means that people have to look for a heating method themselves. That means, for example, a heat pump and more insulation, both expensive interventions over which you as a resident had no say. And this happens in a thousand households a day! (1)<sup>5</sup>

### Control

A complicated task with many challenges at the same time, while the timer towards 2050 slowly is counting down. But what options are there? As mentioned, all municipalities now have a Heat Vision and they are starting to draw up and implement these plans for each **district**. Most municipalities will start with their WUP in one district first. But before you know it, several neighbourhood implementation plans are running simultaneously, because a city like Rotterdam has 123 neighbourhoods. It is undoable, all that work that has to be done in all those places at the same time. Especially in a building and construction market where people are **not yet used to working for private clients**. Where there is hardly an offer available and where there is hardly any choice to improve your home to your liking and taste. And to top that all off, there is **lack** of trained and/or qualified people to actually perform all this! Waiting for the first district to be ready and only then start with the next district is not an option, it will be 2050 before you know it. But fortunately, municipalities like Rotterdam are already working in several neighbourhoods on the **degasification**. It even can help in the energy transition program, because measures can be combined. This approach illustrates a gap between policy makers and the actual world where steps have to be taken. But learning from prior tasks in housing, for example in the eighties, when people first started thinking about this

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<sup>5</sup>E'novation: [http://www.bouwhulparchief.nl/kennisdeling/materialen/072\\_E\\_novatie\\_Terug\\_in\\_de\\_toekomst.php](http://www.bouwhulparchief.nl/kennisdeling/materialen/072_E_novatie_Terug_in_de_toekomst.php)



sustainability challenge, we are well on our way. The problem is that it is not (yet) fast enough and we need some acceleration.

### Small common denominators

Instead of working in a **project-based** way, neighbourhood by neighbourhood and street by street, one can also look for more contemporary and innovative ways of organizing. Look for smaller **common denominators**, instead of continuing to divide homes administratively into types and then developing a unique offer for the entire home. In this way you can reach many more homes without having to completely overhaul them. Therefore we introduced a way to look at a part that is smaller than a home, but larger than an individual product. At the BouwhulpGroep we have called this since 1997: **the component**. The basic idea behind 'Component Renovation' is that the current resident chooses the moment to take renovation steps, the integral quality of the existing home is improved one step, provided that it does not block subsequent steps in quality improvement in the future. Our definition of a step is the component and our definition of the component is: **“a composite component that provides in usable function.”** Because of the advantages Component Renovation has, we adopted this method in Save the Homes, for example I the menu-card.

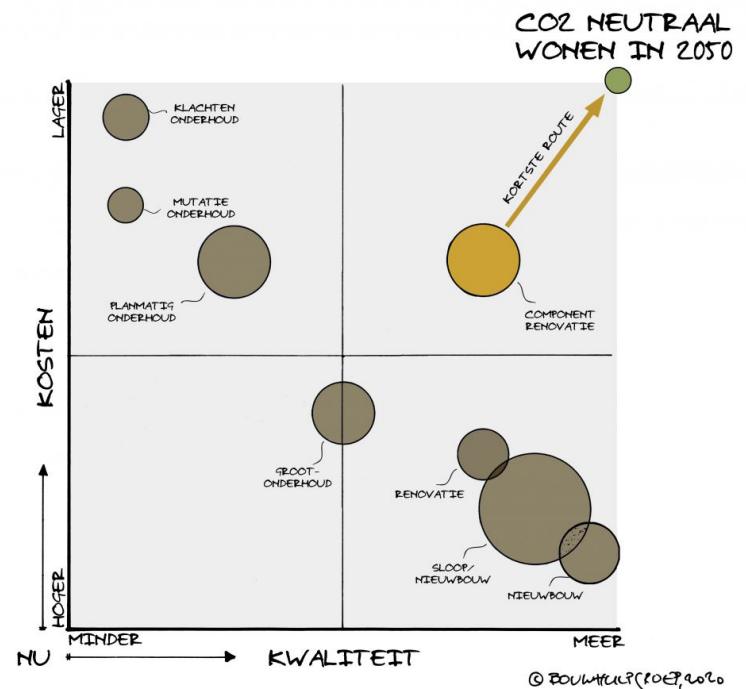


Figure 4: Different forms of building and renovation

Earlier national research, in the early 1990s<sup>6</sup>, has shown that we had to look at the housing stock differently and organize the practice of **quality improvement** differently. At that time, a large wave of **maintenance work** was approaching, the like of which we had never seen. The construction peak from the 1960s then needed maintenance. There was no prior practice in large maintenance projects, and no people to do so. The lesson of that time was that, by not immediately bringing all houses of the same type to the same quality at the same time, space would be created for people, resources and industrialization to do so in their own pace, i.e. **differentiation in the approach**. With Component Renovation, it is not only possible to apply this differentiation at home level (archetype), but also at component level. This puts people and their needs for improvement at the centre, and not the technical unit of the home. So it is a response to the demand side instead of submitting an offer.

### Component

The component offers a greater degree of **repetition** than is possible based on a division on archetype. Thinking and organizing in components creates a platform on which a repetition in product, process and collaboration can be organized in the daily practice of renovation. This repetition then offers room for the necessary innovation for scaling up and increasing the impact through CO<sub>2</sub> savings. When

<sup>6</sup> E'novation: [http://www.bouwhulparchief.nl/kennisdeling/materialen/072\\_E\\_novatie\\_Terug\\_in\\_de\\_toekomst.php](http://www.bouwhulparchief.nl/kennisdeling/materialen/072_E_novatie_Terug_in_de_toekomst.php)

categorized by archetypes (as in TABULA), the group will split into smaller groups (due to differences from the past, among other things), as a result of which the scale decreases. The expected scale for repetition often diminishes. With Component Renovation, the starting group is already larger, so that even with the aforementioned (un)certainities, sufficient scale remains.

### VERDELING VAN WONINGSTYPEN NAAR BOUWJAAR da.11/2012

BOUWJAAR → WONINGSTYPE ↓	< 1 1945	2 1946-1964	3 1965-1974	4 1975-1991	5 1992-2011	TOTAAL
1 VRIJSTAANDE WONING	216.000	225.000	119.000	221.000	256.000	1.037.000
2 'TWEË-ONDER-BEN' KAP	140.000	145.000	142.000	224.000	249.000	900.000
3 RIJDESWONING	523.000	498.000	606.000	879.000	509.000	2.997.000
4 KATENWONING	113.000	113.000	22.000	94.000	57.000	399.000
5 GAARDENWONING	~ 5000	64.000	174.000	109.000	162.000	514.000
6 PORTIEKLETINGWONING	256.000	267.000	112.000	142.000	101.000	878.000
7 OVERIGE FLATWONING	49.000	50.000	125.000	125.000	196.000	545.000
TOTAAL	1.302.000	1.342.000	1.700.000	1.794.000	1.528.000	7.266.000

Blom: - AFGESCHAPEL  
- BOUWKUURKLEP  
© 2013

Figure 5: division of the Dutch building stock

### Market opened up for owner-occupiers

Component Renovation is more than a standardization of product and process for the implementation. The greatest potential of this method lies with the **home owners**. By thinking in terms of components, the barrier of home ownership has been overcome. When using Component Renovation, it no longer makes any difference whether to talk to a private home owner, a Home Owners Association, investor or housing association. Because with Component Renovation one is able to (digitally) translate all these individual wishes of residents into **implementation flows** that can be bundled into a collective, with more options for scaling up and financing, using the component as scale. Such an approach previously could only occur with corporations and large clients such as investors.

### Confusion of tongues

However, a confusion of tongues arises around this **repeatability**. Components can be repeated and there are buildings that have repeatable components. But not every component has to be tackled at the same time and according to the same taste. Components allow you to follow your own pace. You only need a platform on which the multiple (individual) requesters are **brought together**. The collective then forms one client and you can take the next step towards realization with that collective. Such a collective does not have to live in the same street. It can be the same district or neighbourhood, or this collectively can be organized within a city. The IHRS organisation should be able to fulfil this function. This approach is in contrast to classifications at building type level. The degree of repetition is smaller, the variation in the work performed (in the past) is greater and the assumed uniformity necessary for scale is therefore hard to find.





### Far away?

This is not a plea to stop the neighbourhood approach. But let's not draw any boundaries now, because once upon a time we found it useful to divide an area and give it a name and number. Certain solutions are more common and can be repeated. The point is that you can create a **platform** where people who want to change something about their home come together and actually take steps. By making the **lowest common denominator** (component) visible to everyone, a platform is created where you can find and apply this information. This creates room for component development.

It may sound far away and still a big task to develop. But it is already there. We have developed and demonstrated this at the BouwhulpGroep under the name Mobile Neighbourhood Factory. We are currently in the roll-out phase to give these local platforms a full place. In chapter 5.2 of this deliverable this structure will be discussed. The big advantage is that you don't have to start over per district, but that you **scale up based on the same solutions** that will be applied in more places. It allows for a way to further develop sustainable renovation and to be able to easily access this digitally at the kitchen table, based on the **wishes** that you, as an expert resident of your own home, have.



## 3 Component Renovation

### 3.1 Framework based on a methodology

The HUB proposes to develop a **bottom-up solution**, engaging inhabitants at the district level. This process can be supported through different aspects of a collective and integrated district level approach. By closely following up on, and evaluating, such collective initiatives it will be possible to implement **technical** and **process** innovations that support the scale up of the approach. The integrated process must ensure direct visibility of improvements in **affordability, quality, sustainability** levels and inhabitant satisfaction. When, in a second phase, existing local initiatives are also connected with each other for them to cooperate and learn from each other the system will satisfy the important requirement of economies of scale through larger demand volumes.

Upgrading the sustainability level of existing neighborhoods is necessary to achieve the objectives of the climate agreement. For far-reaching sustainability, our housing stock must be renovated on a large scale and on a high level. And all these plans need to be supported by (neighborhood) residents. The costs of a traditional renovation consist normally of **60% labor and 40% material**, and labor is hard to get. The needed labor and the rising costs and difficulties with financing are the main dilemma's that will be addressed in Save the Homes. Moreover, the works are mainly **project-based** and **not cross-project oriented**, so it seems that each project must be restarted. This is an inefficient way of working, especially with the ongoing shift to the private market where the size per project diminishes to 1. Therefore, there is a growing need for a more efficient way of renovating. To start, we use a methods that already exist, to accelerate renovation: Component Renovation (CR).

**Component Renovatie** (Dutch for Component Renovation) is a method developed by the BouwhulpGroep that has been used since 1997 to organize repetition in product, process and collaboration in the daily practice of renovation<sup>7</sup>. This repetition gives room for the necessary innovation for scaling up and increasing the impact through CO<sub>2</sub> savings, without higher costs. By dividing a house into components, the existing housing stock is **structured** in a different, more efficient way. Instead of a traditional division into **housing type and year** of construction, each component is structured to **form and use**. As a result, there is only a **limited differentiation** in components (for example: only nine different types of roofs occur, when looking at 7 million dwellings).

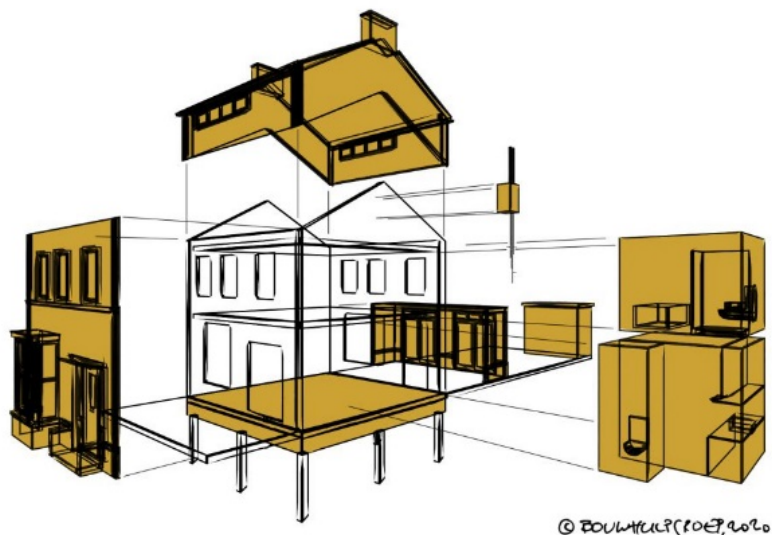


Figure 6: Component Renovation discerns 9 components

<sup>7</sup>Source: <https://www.duizendwoningenperdag.nl/duurzaamheid-2/component-renovatie-de-heilige-graal-voor-op-schaling/>

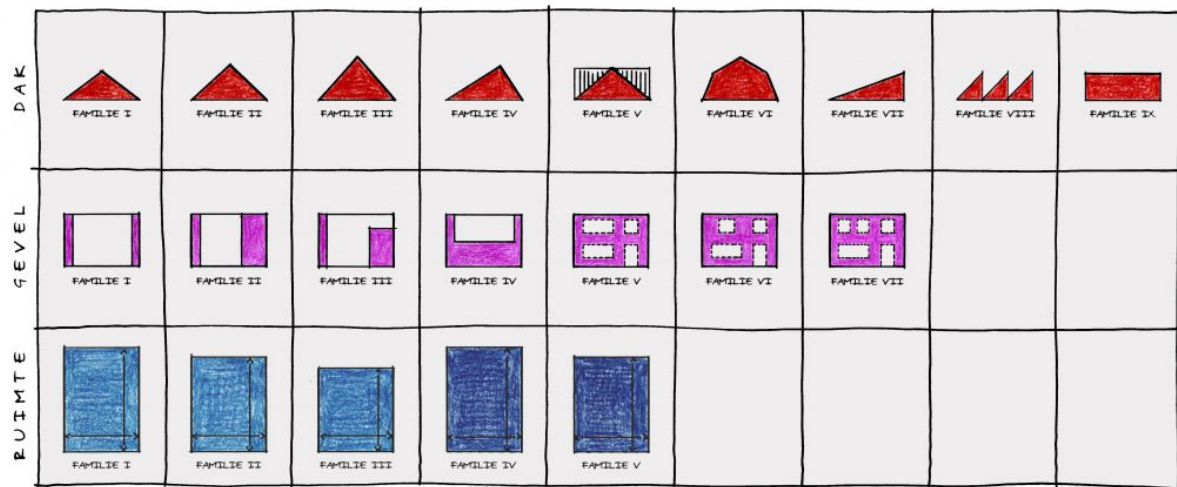


Figure 7: Division of the component Roof, Facade and space into families

This simplifies the challenge and creates the opportunity for an offer that is focused on form and use. Component Renovation offers a different form of repetition than the traditional one. It is more than a standardization of product and process for implementation. The greatest potential of this method is on the side of all homeowners. By thinking in terms of components, the **ownership of the homes** is not a complicating issue anymore. By using Component Renovation, it makes no difference whether you are talking to a private homeowner, a Homeowners Association, an investor or social housing association. With Component Renovation we can translate all these individual wishes of residents into production flows that can be bundled into a collective request that is prepared for industrial production, assembly and financing. A method that previously only occurred with corporations and large clients. Although you have several houses that need to be improved it becomes a cross-project approach with **only one start**. Because the focus lies only at the component, the efficiency can be improved and so the traditional balance between labor and material can shift (working towards more affordable pricing). The advantage is that not all buildings need to be in one street. By **combining several components into one quotation** the contract can make an offer for the group of home/owners.

## 3.2 Advantages

Thinking in components ensures that the boundaries of a city, district, complex and housing are exceeded and the typing of the existing housing stock is simplified. The search for **repetition** and **scale** can be done with components. Then the approach of home renovations becomes manageable, since the same question suddenly applies to a facade in city A as to a facade in City B. Perhaps this repetition even crosses national borders and solutions in Rotterdam even are **similar** to component solutions in Valencia, could also be used in Rotterdam. For now we look at local repetition and replicability. But also the distinction in ownership does not matter any longer. This allows the market to focus on a **smaller part of the building**, but the solution can be repeated on a larger scale. It is of course interesting to find a solution for roof renovation that occurs 2.5 million times. Or a facade that can be repeated 1.7 million times within the Netherlands. **Classification** into families ensures a new scale, thus providing a platform for innovation.

The first advantage of component renovation is looking guarantee the conditions for mass, quality and price with customization. Those were the conditions that made industrialization in the building sector in around 1970 huge. Another advantage is that dividing it into components makes it possible not to do everything at once, but only at the moment the component actually needs replacement.

In summary, Component Renovation offers the following benefits:

- The **size** is limited: the component
- It offers the possibility of **innovation** on a limited scale
- Limited **investment** is required
- The customer determines the **moment** of renovation
- There is a choice between **step-by-step** renovation or all at once (combining components)
- Scale benefits occur through repetition of the components (**replicability**)
- It is executable in **series of one** (so private and combined quotations are possible)
- There is an individual offer with **freedom of choice** (residents in control)
- Component development is **easier** than concept development



## 4 Prior existing activities

Sustainability does not come at once. The issue has been known for years, however, the importance and the impact are just becoming more and more inevitable. Up until now several initiatives haven't been undertaken, some of which might be incorporated in the HUB or in the approach that is sought after. Therefore for both cities the **prior activities** are described.

### 4.1 Valencia

In Valencia, the Municipality already started an **energy service** related to energy bills, access to energy, energy education and energy communities (initial activities of the Oficina de la Energía<sup>8</sup>). The Valencia Energy Office is an information and training space aimed at citizens, where personalized advice, workshops and activities are provided in different areas, designed by trying to answer to citizens' questions:

- **RIGHT TO ENERGY: What can I do if I can't pay my bills?**

No one should be cold or hot at home... At the Energy Office we defend the universal right of every person to have the necessary energy to enjoy a decent life. We help you to know your rights and to defend them. If you have difficulties paying the bill, you cannot register the electricity or you have received a notice for non-payment or supply cut, we accompany you throughout the **process**:

- Personalized advice on energy matters
- Explanation of your electricity and gas bills
- Help in negotiations with energy companies
- Access aid and subsidies such as the Social Electricity Bonus

We offer you an individualized intervention plan to empower you energetically.



Figure 8 Oficina de la Energía

<sup>8</sup> <https://climaienergia.com/es/oficina-de-l-energia/que-es-la-oficina/>

At the Energy Office we collaborate with the Social Services of the Valencia City Council to fight against the **energy impoverishment** of citizens:

- Analysis of your current situation
- bill tips
- good energy habits
- Grants and subsidies available
- Other resources at your fingertips
- Installation of Energy Efficiency kit
- Group workshops Energy for All



Figure 9: Themes of the Valencia Oficina de l'Energia

- **RENEWABLE ENERGY: How can I install solar panels on my building?**

Why bet on local renewable energy? At the Oficina de l'Energia we want to promote a sustainable, clean and democratic energy model based on the local production of **renewable energies**. Thus, as citizens we can be part of the Energy Transition, produce energy in our homes and buildings, and contribute to local development.

Remember that self-consumption is:

- Economic: The cheaper technologies, the elimination of certain taxes and tolls and the regularization of the sale of surpluses have caused these facilities to have a amortization of between 6 and 10 years
- Legal: The generation and self-consumption of renewable electricity is a legal activity and administrative procedures have been significantly simplified as of Royal Decree 244/2019
- Sustainable: Producing and consuming renewable and clean energy reduces CO<sub>2</sub> emissions and mitigates the effects of climate change, in addition to reducing dependence on non-renewable and imported fuels





We recommend contacting different authorized photovoltaic solar energy installation companies to be able to compare different proposals for your installation.

Apart from the budget, you have to take into account:

- The type of installation (connected to the network or with batteries)
- Installed power (kW<sub>peak</sub>) and annual energy generated (kWh)
- The quality of the equipment
- The amortization period
- The processing of available grants

And by choosing local companies we favor the economy of our environment.

We offer workshops and individual appointments:

- Personalized advice on renewable energies
- Workshop Connect to the Sun

- **ENERGY EFFICIENCY: How can I save money and energy?**

The best energy... the one that is not consumed. Do you know where the kWh that appear on your electricity bill come from? Could you tell which part corresponds to air conditioning, how much corresponds to lighting or how many kWh come from the washing machine?

At the Energy Office we work to help you **understand the impact** that your day-to-day life has on greenhouse gas emissions, energy consumed and the cost of your bill.

We want to accompany you step by step in this Savings Itinerary:

- 1) Habits: Improving habits is the measure with the lowest cost and the most direct impact
- 2) Performance: Improving equipment performance implies lower consumption without changing demand
- 3) Demand: Analyze the energy diet of your home: the best measure in the medium and long term
- 4) Self-consumption: Consume little and cover your demand with renewable energy, one more step towards sustainability
- 5) Llars verdes (Green Homes): Extend the commitment to environmental improvement and become a reference

At the Energy Office we believe that the true Energy Transition implies an increase in the **energy culture** of all citizens, as well as a proactive attitude towards our energy consumption.

your energy diet! Contact us, request a personalized appointment and from the Office we will make a detailed study of your current energy consumption, we will emphasize the most significant partial consumption and we will give you some initial advice to improve them.

- **LOCAL ENERGY COMMUNITIES: How can I participate in a renewable energy community?**

The Local Energy Communities seek to empower citizens to actively **participate** in the Energy Transition, producing, managing and using local renewable energy. It is about promoting a democratic and fair transition, which not only decarbonises cities, but also promotes energy collaboration.

Benefits of Energy Communities

- Empowered Citizenship: Citizens who participate directly in the energy transition, producing and managing their own local renewable energy
- just transition: Cooperative models of energy sovereignty that promote a fairer, more efficient and collaborative use of energy



- decarbonized cities: Energy autonomous cities with zero CO2 emissions, decentralizing energy production
- Economic benefits: Save on electricity bills thanks to own energy production and a transparent and collaborative model



Figure 10: Training in Oficina de l'Energia

- **ENERGY TRANSITION: How can I fight for a fairer and more sustainable model?**

WHAT is the Energy Transition? It is the change from the current energy model to a new, more sustainable and fair energy model: from carbon based to **decarbonized**; from non-renewable to renewable; from based on Product to based on Rights; from centralized to Democratic; from dependence to Sovereignty

WHY is it important and necessary? We do not have enough cheap and sustainable energy to supply the world's consumption. In all our daily activity, the things we consume or use are made with energy and/or need it for their operation. Our current energy consumption is based mainly on fossil, non-renewable and polluting resources. In order to guarantee the access and use of energy in a fair and sustainable way for society and the planet, we have to change the current **energy model**.

HOW are we doing it? To promote a New Energy Culture, from the Office of Energy we carry out **workshops** and environmental **awareness activities** in the educational centers and associations closest to the Office, creating a neighborhood project in transition, which is a precursor and prescriber for the rest of the municipality. We work with all age ranges and all groups because we all need and consume energy in our daily lives.

Educational Centers in Transition: we work with **schools** and **institutes** in the following sessions:

- Presentation
- Electricity (lighting)
- Thermal tour
- Electricity (electrical and electronic devices)
- Draw conclusions and develop materials
- report results
- awareness activities



In addition, a series of complementary activities are offered, such as:

- Training for the faculty on electricity bills
- Training for the AFA (Association of Families of Students) on:
  - Electric bill
  - Energy efficiency in the home
  - Visit Energy Office
  - Didactic unit Energy
- **ELECTRICITY AND GAS BILLS: How can I optimize my invoices?**

The Energy Transition begins by **informing** us and consuming responsibly. As energy consumers, we must understand our rights, as well as what we are buying and paying for each month. At the Oficina de l'Energia we explain how you can fight for another energy model, while saving money every month, with simple changes to your bill.

- Electricity bill: Adjust power, time discrimination, free or regulated market, renewable energies, cooperative model...
- gas bill: Types of rates, rights, estimates or real measurements, free or regulated market...

At the Oficina de l'Energia we help you to better understand your bills so that you yourself can make the changes that most interest you.

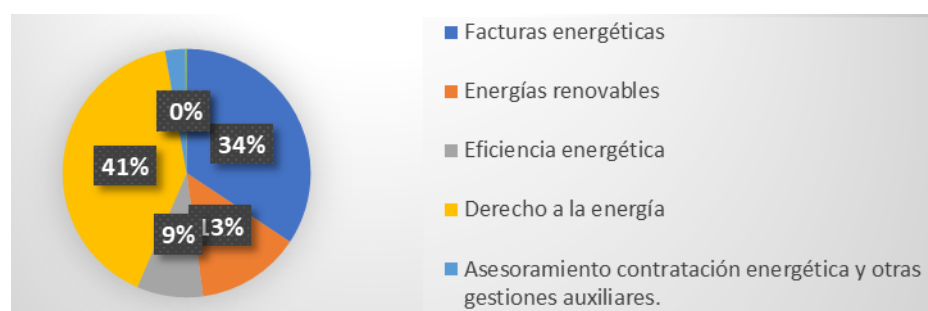


Figure 11.- Advice appointments by theme

Most concerns of citizens are energy bills and energy rights, while energy efficiency (and therefore energy renovation) was of very low interest, but finally, to achieve 2030 and 2050 goals, needed!

While so, the Regional Government was launching green frameworks for public sector contracting (Guia Verde<sup>9</sup>) or different tries of networks for managing housing renovation services (mainly information – the now dismantled RED oir). Also a capital actor in the residential building local context, the building administrator, was already turning their attention to the need of ‘standardized’ processes for quality assurance of renovation works, and energy renovation, as a source of potential financing of the other needed works on the building.

Save the Homes comes therefore on the exact moment to exploit these incipient activities, by adding a new service to the Oficina de la Energia: the **home renovation service**, launching a new framework for municipalities to start their own OSS housing services, including the home renovation, or building an agreement with the building administration council to train associates in the energy renovation process and specialties.

<sup>9</sup> <https://guiaverda.gva.es/es/els-contractes-de-serveis-i-obres-d-edificacio>



## 4.2 Rotterdam

The municipality of Rotterdam is the second largest municipality of The Netherlands. Also on the level of sustainability/climate adaptation Rotterdam is a front runner. Rotterdam is a member of the Resilient Cities network<sup>10</sup> where cities that are committed to building and investing in urban resilience come together. Within this network a **broad range** of solutions is regarded. The program for energy efficiency are put in place since 2014, and there is a program concerning the switch from **natural-gas** towards other sources for heating, supported by national program (Proeftuinen) and supported by the municipality itself. One of the main places where inhabitants of Rotterdam can find information on sustainability is 'duurzaam010'<sup>11</sup>. This web page depicts what already is **going on in Rotterdam** on the topic of sustainability. The website goes beyond building and energy, and describes for example climate adaptability, a healthy outdoor environment, and the change of the harbour district. Because next to a city of more than 650.000 inhabitants, Rotterdam also is home to one of the largest seaports in the world.

The last couple of years several initiatives were started in Rotterdam, with different outcomes. The common denominator is, that they all relate to energy reduction. But despite all actions there is a lack of coherence between these actions.

A short inventory of actions and initiatives of Energy Saving in the period 2014 to 2021 in Rotterdam:

### 1. *Neighbourhood scan with thermal imaging photo (Smart living)*

People could request a heat scan of their own home, so they could be pointed towards the weak spots. This was organised in a neighbourhood and directed by the local municipality with the aim to raise awareness and interest.

### 2. *Construction site + heat photo (Smart living)*

Here people could request a heat scan, but instead of going to the city office to collect the scan, the municipality held talks in a building shack at location. This was **low key** and easy for people to come to.

### 3. *Purchasing campaigns*

There have been multiple **purchasing campaigns** for various measures. These campaigns were organised in cooperation with Woonwijzerwinkel, but also in cooperation with contractors.

### 4. *Door-to-door action*

**Door-to-door action** with advice in collaboration with external parties (including follow up in time).

### 5. *Open houses*

Open houses in combination with the **owner telling people** about the choice he/she made and how it all worked out. This was combined with the offer of making a heat scan of the homes of the people that visiting the open houses.

<sup>10</sup> <https://resilientcitiesnetwork.org/>

<sup>11</sup> <https://duurzaam010.nl/> which translates as 'sustainable 010', linked to the net code of telephone numbers in Rotterdam



### 6. Heat scan

The heat scan is a popular way to get people involved. It is a low key way to show personal problems, like poor insulation, leaks near windows or faulty details. The heat scan was followed up by an advice in a **personal meeting**. It is a good mean to raise awareness.

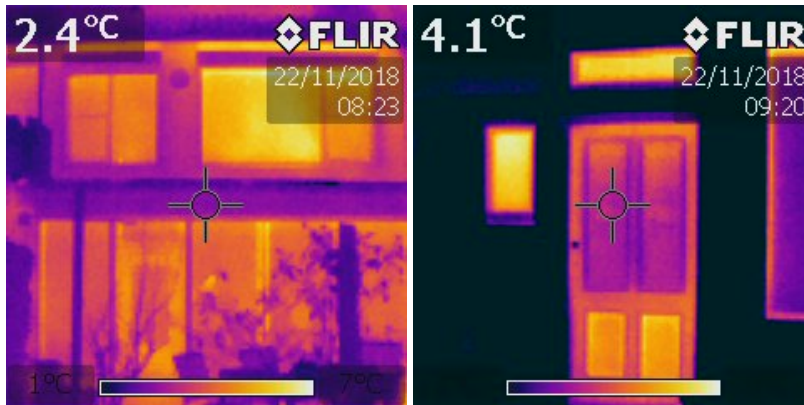


Figure 12: Heat scan

### 7. Sustainable homes route

A good example inspires people to act. So there is a sustainable homes event that people can follow and even take a look in some of the homes in their neighbourhoods. The national open houses route<sup>12</sup> initiative was not successful in Rotterdam. In the autumn it is also a **cycling route** through the city, that brings you to homes that already have been renovated. It was at that time difficult to find homeowners who were interested to open their houses. Since 2015 Rotterdam organizes its own open house events.

### 8. Energy breakfast

Energy breakfast brings people **together** that are thinking about sustainability. It is the counterpart of the information gatherings in the evening. But when looking at different personas it sometimes is easier to gather people in the morning rather than in the evening. There are various themes (like insulation or heat pumps or just sustainability) and the aim is to build a network that later on will help people to realise measures.<sup>13</sup>

### 9. Opbouwwerk (supporting neighborhoods)

The municipality also **initiates** activities that are carried out by external parties. In this case the foundation Buurkracht organised several initiatives:

- 12 weeks approach
- Energy parties

The power of Buurkracht lies at getting people into action and getting them organised to make collectively choices: which measure which contractors and asking them quotations and selection of contractors. The energy renovation is carried individually but collectively organised.

<sup>12</sup> <https://duurzamehuizenroute.nl/>

<sup>13</sup> <https://duurzaam010.nl/events/energieontbijt-in-de-duurzaamheidswinkel-iedereen-een-betaalbare-energierekening/>

### 10. Education / raising awareness

Another external party that has done work for the Rotterdam municipality is HOOM. HOOM has also organised a group purchase together with Alex Energie. But they focus more at education, sharing knowledge and supporting energy communities.

### 11. Energy coach

Rotterdam has a lot of experience with energy coaches, in different forms.<sup>14</sup> Energy coaches are **volunteers** who, on the basis of short training and often also own experience, help neighbours with small energy-saving measures in the home. Think of installing radiator foil, LED lamps, draft strips and a water-saving shower head.

### 12. Eigen Huis Coach

Next to the energy coach there is also the **Eigen Huis Coach** (homeowners coach). An Eigen Huis Coach helps homeowners in Rotterdam on their way to a well-maintained home. A well-maintained home is beautiful. In a well-maintained house you live safely and with a well-maintained house you can save money, for example on your heating costs. The Eigen Huis Coaches are employed by the municipality of Rotterdam. He/she can therefore give homeowners free and independent advice, where maintenance and sustainability come together but do not replace a professional energy advisor.

### 13. Pop-up store<sup>15</sup>

A physical place, located in popular and regular spots (like a shopping mall), where people can come in and ask their questions about sustainability. There are also some samples to see and people that can show you around. If people have questions about how to apply for subsidies or loans, they can be guided in one of the pop-up stores. There have been **pop-up stores**<sup>16</sup> at several locations (city center, Ommoord, IJsselmonde). The last one-stop shop is the Duurzaamheidswinkel (co-financed by EU program Interreg2seas), which is also a concept store to inspire and to support others to open such a store. Replication has taken place: by citizen initiative De Aktiegroep in city center, de speeltuin in Prins-Alexander, in Capelle a/d IJssel. Other cities have also shown interest.



Figure 13: 'Duurzaamheidswinkel' in Rotterdam

<sup>14</sup> <https://duurzaam010.nl/thema/energiecoaches/>

<sup>15</sup> <https://duurzaam010.nl/duurzaamheidswinkel/>

<sup>16</sup> <https://www.youtube.com/watch?v=Ye09fw4BulA&t=119s>

#### 14. RRE and RREW energy boxes (with KEB)

The central government had made budgets available to provide **energy boxes** (about 90 euro per box) to home-owners and tenants. The city organised the actions. People could ask online to get a box sent or brought by energy coaches who will help them with the installation. This allows for a **first contact moment** (touchpoint) and a possible follow up. They could request also instead an energy advice.



Figure 14: energybox with energy saving products like lamps and foil.

#### 15. Power for your home

Home owners in Rotterdam can receive extra help from 1 December 2021 to make their homes more sustainable and a subsidy of 500 euro per household. With the 'Power for your House' campaign<sup>17</sup>, the municipality of Rotterdam **offers a complete package** through the WoonWijzerWinkel. With a complete step-by-step plan, residents are provided with free tailor-made advice and assistance with the application for quotations and subsidies. In combination with a national subsidy ISDE for 20 (now increase to 30) percent of the measure costs, the measures can result in significant savings on energy bills.

#### 16. Triple A: Awareness, easy Access and Adoption

The project aimed at increasing awareness, creating easy access to information and finally leading at adoption of carbon neutral measures by homeowners through **actions initiated by local authorities**. The city of Rotterdam learned a lot from the Interreg-2 seas project Triple A<sup>18</sup> During the project, there has been room made to discuss with stakeholders about their expectations and the positions they see for themselves and of the municipality to accelerate the uptake of the energy transition. The experiments during this project also brought insights that were used in the actions mentioned above.

#### 17. Loans from Rotterdam Energy transition funds ETF

The city has developed a **municipal loan** as financial instrument to support inhabitants of Rotterdam (home owners of single and multiple family houses, small companies and societal buildings (schools,..) to finance the energy retrofit and improving the quality of their houses or buildings. The ETF is a **revolving fund** which have been launched in 2020.

<sup>17</sup> <https://www.woneninrotterdam.nl/nieuws/power-voor-je-huis/>

<sup>18</sup> <https://www.triple-a-interreg.eu/>

## 5 Available technical offers

There is an idea of what to offer to **individuals**. Based on experience and based on the first experiences of the activities.

The idea of a **One-Stop-Shop** is to get people activated, make them do the conversion (choose a solution) and then come to the execution. Save the Homes tries to bring the demand and supply side together at a local level. In Deliverable 2.1 the demand side and the supply side were mapped. However, this was mainly theoretical. Now in the demo cases it is all about trying to implement the demand and supply. That means that an offer should be in place, that people can choose from. Up until this moment, there is not yet such an offer that is already in place. An advice can be made, by the **Energy Office in Valencia**, or by **Alex Energy in Rotterdam**, but that advice still has to be realised by a third party, that is not part of the HUB. So, we cannot speak of an offer within the HUB. But the HUB can advise (based on replicability in the area) and even what kind of information the homeowner needs to bring that advice further when asking a contractor for a quotation. The HUB even goes that far and is exploring ways to guide the quotation towards a collective action.

### 5.1 Valencia

#### 5.1.1 Resources and tools in place

In order to put in place the Valencia citizen Hub services some resources are already available:

##### A. VCE workshops

- Energetic Rehabilitation. We accompany you to **renovate** your home + DOMESTIC ENERGY SAVING GUIDE OF THE ENERGY OFFICE<sup>19</sup>
- **Understand** your electricity bill: We will learn how the electricity market works and the different concepts that appear in the electricity bill. We will answer questions such as: How to reduce the contracted power? What is time discrimination? Do I have access to the social bonus?. Duration: adaptable between 1 and 2 hours.
- **Save** energy at home: With some simple tips that only require a change of habits or small investments, you will learn to reduce energy consumption in your home. You will learn to make good use of energy in order to consume less kWh, pay less and gain comfort. Duration: adaptable between 1 and 2 hours.



Figure 15.- Energy Office savings guide

<sup>19</sup> ([https://drive.google.com/file/d/1o\\_rCuPE6dNqQnL1yA\\_1aLZk9sHQfTkK8E/view](https://drive.google.com/file/d/1o_rCuPE6dNqQnL1yA_1aLZk9sHQfTkK8E/view))





- Connect to the sun: We will learn the steps to follow to have a **photovoltaic solar energy** installation that allows you to produce the energy you need in your home or community of neighbours. We will know if it is economically viable and what the current situation is in relation to the legislation. Duration: adaptable between 1 and 2 hours.
- Energy for all: We will learn about the **rights of consumers** in relation to the use of energy, as well as about basic concepts of bills and how to save at home. We will answer questions such as: what is the social bond? What can I do if I can't pay the electricity bill? Can I contract renewable electricity? Duration: adaptable between 1 and 2 hours with a personal appointment

## B. IVE preliminary solutions catalogue

- **Residential building typology catalog**<sup>20</sup>: The document presented here is part of the activities of the European project EPISCOPE «Energy Performance Indicator Tracking Schemes for the Continuous Optimization of Refurbishment Processes in European Housing Stocks» of the Intelligent Energy Europe programme. The Valencian Institute of Building participates as a partner with the aim of expanding its line of research on energy efficiency in the rehabilitation of buildings. The initiative aims to make energy rehabilitation processes in the housing sector in Europe more transparent and effective. The conceptual framework is based on the national typological classifications of residential buildings developed during the European TABULA project and also in the context of the Intelligent Energy Europe programme. Each country participating in TABULA and/or EPISCOPE has published the **typological classifications** of their country through a "Catalogue of residential building typology" that contains the matrix of building types in the country and a file for each type where the energy characteristics of the building are explained, and the measures to be adopted are illustrated graphically. This document contains the typological classification established for Spain prepared by the Valencian Institute of Building. The energy efficiency of buildings is related to a series of parameters such as the construction period, the size of the building, the situation with respect to neighboring buildings, the type and age of the installations and the energy saving measures already implemented. Knowing these characteristics of a building, it is possible to give a quick estimation of its level of energy efficiency, allowing to reduce the effort to energy assess a portfolio of buildings or the building stock of a country.
- **Catalog of constructive rehabilitation solutions**<sup>21</sup>: The document aims to **provide information** on two fundamental aspects within the field of energy rehabilitation: on the one hand, to characterize the different construction types of the elements that make up the thermal envelope of the buildings to be rehabilitated, and on the other hand, to propose different solutions to **improve** energy their initial state. In relation to the proposed rehabilitation solutions, the catalog contains information regarding the thermal performance achieved, including the corresponding construction details and giving criteria for the selection of each of the proposed solutions from a point of view not only technical, but also economic, of execution and, of course, from the point of view of sustainability. The Catalog of Constructive Rehabilitation Solutions is a Recognized Document according to the provisions of Decree 132/2006, of September 29, of the Consell, which regulates the Recognized Documents for Quality in Building, has the objective of helping technicians who have to undertake an energy rehabilitation.
- **improve your tourist home**<sup>22</sup>: We help you improve the sustainability and comfort of a home intended for tourist use. The Regional Ministry of Housing wants to help you find out about the

<sup>20</sup> (<https://www.five.es/tienda-ive/catalogo-de-tipologia-edificatoria-residencial/>)

<sup>21</sup> (<https://www.five.es/tienda-ive/catalogo-de-soluciones-constructivas-de-rehabilitacion/>)

<sup>22</sup> (<http://www.five.es/espacio-ciudadano/vivienda-turistica/autoevaluacion-vt/>)



possible improvements that you could carry out in a home or apartment for tourist use. Responding anonymously to a few questions, we offer you personalized advice to make your home more comfortable, accessible and sustainable.

- ENERGY CONSUMPTION TEST FOR HOUSEHOLDS IN THE VALENCIAN COMMUNITY:**<sup>23</sup> The Valencian Institute of Building has developed a tool aimed at the citizens of the Valencian Community, who wish to know what the **global energy consumption** is in their home and how they can reduce it, in order to reduce the costs allocated to energy in the home. To make use of the audit we must answer the questions posed by the tool, obtaining at the end personalized advice for our home and an estimate of our consumption, comparing it with the average consumption in our community obtained from the "Study of consumption habits of energy in homes of the Valencian Community" developed by the IVE in previous years. If you want to save energy and money and you are also concerned about sustainability and the environment, you cannot miss this opportunity. The knowledge generated from the data collected will allow proposing more effective energy saving measures and, in turn, better advising citizens to reduce their energy bill.

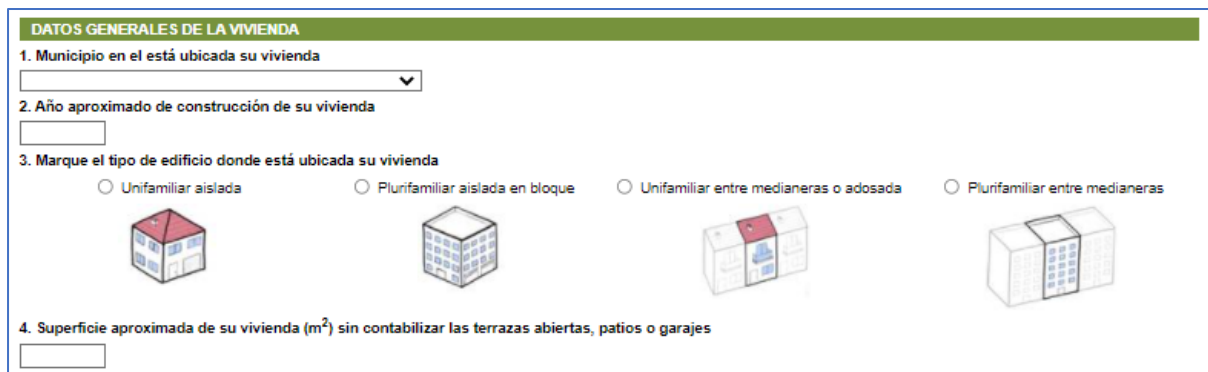


Figure 16.- Energy consumption test

- Renhata - home renovation and refurbishment**<sup>24</sup>: tips to rehabilitate your home with energy saving criteria, component by component



Figure 17.- Renhata web portal & elih-med solutions' factsheets

<sup>23</sup> (<https://www.five.es/productos/herramientas-on-line/test-de-consumo-energetico/>)

<sup>24</sup> (<https://renhata.es/es/ciudadania/consejos-para-rehabilitar-tu-vivienda-ahorro-de-energia>)







- **Elih-med project outcomes<sup>25</sup>**: Energy Efficiency in Low-Income Housing in the Mediterranean – ELIH-Med is a strategic project co-financed under the MED Programme. Its attention is focused on energy efficiency in **low-income housing** (LIH) in the Mediterranean area and on the involvement of residents in energy retrofit in LIH in order to help LED area to reach EU2020 objectives. ELIH-Med project focuses on energy efficiency in low income housing in the Mediterranean area. The target group of ELIH-Med includes tenants, owner occupiers with low income as well as households suffering energy poverty, which represents about 40% of the total building stock and is considered as « far to reach» through traditional public policies. Innovative technical and **financial approaches** are essential for this group in order to help them reduce their energy consumption. This project has various work packages which contain general information on energy efficiency, good practices applicable in low income housing together with various e-learning courses in order to raise public awareness about EE in building sector.

### C. IVE preliminary training & lists

- **micro-training**: in the context of BusLeague, this January 2022 started the first stage of training, consisting of 10 micro-trainings developed by the Valencia Institute of Building (IVE), also a partner in the BUSLeague project. The training is delivered online via the BAUHAUS Moodle platform and students can find different learning resources such as videos, documents, and other complementary materials. In more detail, the course is divided into the following 10 micro-trainings:
  - Introduction to EE-buildings
  - How to improve the EE
  - User behaviour
  - Insulation
  - Windows
  - Thermal installations
  - Existing thermal installations
  - Lightning
  - Home appliances
  - Renewable energies
- **IVE training** (seen in D2.4 & D3.6), including lists

### D. GVA/VCE disperse informative websites

- Regional regulation: (<https://habitatge.gva.es/es/web/arquitectura/normativa-arq>)
- Grants:
  - Regional site: <https://habitatge.gva.es/es/web/arquitectura/ajudes>
  - Municipal site: <https://climaienergia.com/es/oficina-de-l-energia/ayudas-y-subsenciones/>

### E. VCE other links

- To diverse resources related to energy efficiency: <https://climaienergia.com/es/oficina-de-l-energia/eficiencia-energetica/>

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<sup>25</sup> (<https://www.five.es/project/elih-med/>)





## 5.1.2 Replicability

### A. Geographical context:

The definition of the pilot area had from the beginning in mind that partners involved play a role on the main city and the whole region, so their previous activities and potential outputs would always have in mind applicability, exploitation and replicability in the rest of the area. **Valencia Region** is a coastal Mediterranean area whose capital is Valencia city. In EU context it is defined as a quite uniform climatic conditions (even if the technical building code finds up to 6 sub-climatic zones) and history/culture, therefore, building typologies according to building age and number of dwellings per building apply to the whole region; and population idiosyncrasy is also very similar: the preference for home ownership, concentration in urban centres where multifamily buildings abound, and a general lack of interest in renovation, but in investing in new developments. These characteristics pave the way for an easy replicability.

### B. Administrative structure

Spain has a **multilevel administrative structure**, with complex distribution of powers. Specifically, for housing matters the national level has framework competences, while the regional level is in charge of developing policies and the municipal level the one implementing its contents. In the Valencia Region, actual regional government has an interest of municipalizing the housing policies, since it is the local level the one more in touch with the citizens and their particular needs. Therefore, the housing plan 2020-2030, in line with the StH project foresees the deployment of the local housing OSS offices and launched 5 pilot experiences different from the project pilot, to learn from the project experience (inception XALOC network). Grants and subsidies suffer same complex distribution, but again solutions are on the way: national grant schemes are managed by regions, so again matching our pilot region boundaries, and municipalities have some room for manoeuvre with tax reductions and exemptions, so to adapt benefits to their own circumstances.

Only potential crash is related to **horizontal competencies** since many times energy and housing powers are hosted and managed by different branches of the governments. Is in this context where StH and the Citizen Hub has to mediate and centralize information, so to get all the opportunities to their customers.

### C. Market conditions

Valencia Region **size, population distribution and road structure** facilitate the reach of the main construction companies to the whole area. The problem for them to implement any of the solutions promoted by the Citizen hubs will be more related to their economic interest (size of the building) than to the difficulty to get or replicate the solution.

On the other hand, the **super atomized construction sector** makes quite homogeneous the availability to the different renovation works in any corner of the geography: problems with replication of solutions will be more related to the lack of knowledge or capacities than to the existence of renovation companies. That is why training and validation programs are capital and need to reach all the region, so to capacitate the micro-companies existing close to any residential building.



## 5.2 Rotterdam

From the beginning of the Save the Homes project, we started to gather **possible measures**, suitable for renovation. These measures are derived from the everyday practice of BouwhulpGroep. This number of measures will be looked upon, evaluated, and made more precise during the project. These solutions are combined with the interest that homeowners showed in a specific project. This combines a practice based gathering of solutions with the actual demand from the neighbourhood, resulting in a menu card.

### 5.2.1 Menu card

Alex Energy is becoming the local manifestation of the HUB within Prins Alexander. Alex Energy was founded in 2019 as a neighbourhood energy cooperative. Their ambition is to play a **socially responsible role** in the neighbourhood to make the area future ready. Not just by being there (and doing something with energy) but making an actual impact in the social network of the community. One of the initiatives was started by a member of Alex Energy, and via talks, raising awareness and giving information, now a row of 16 houses is interested in energy efficient renovation. These individuals now need to be brought further into the customer journey towards knowledge, linking, preference and conviction. Therefore the huge amount of **measures** from BouwhulpGroep (65+) are laid next to the demands of these owners. The path of the functionality of the HUB is described with the project in Lieven de Keystraat as a leading project. This is the **route to market**, which describes the conversion part. Later on the **route to realisation** will be discussed.

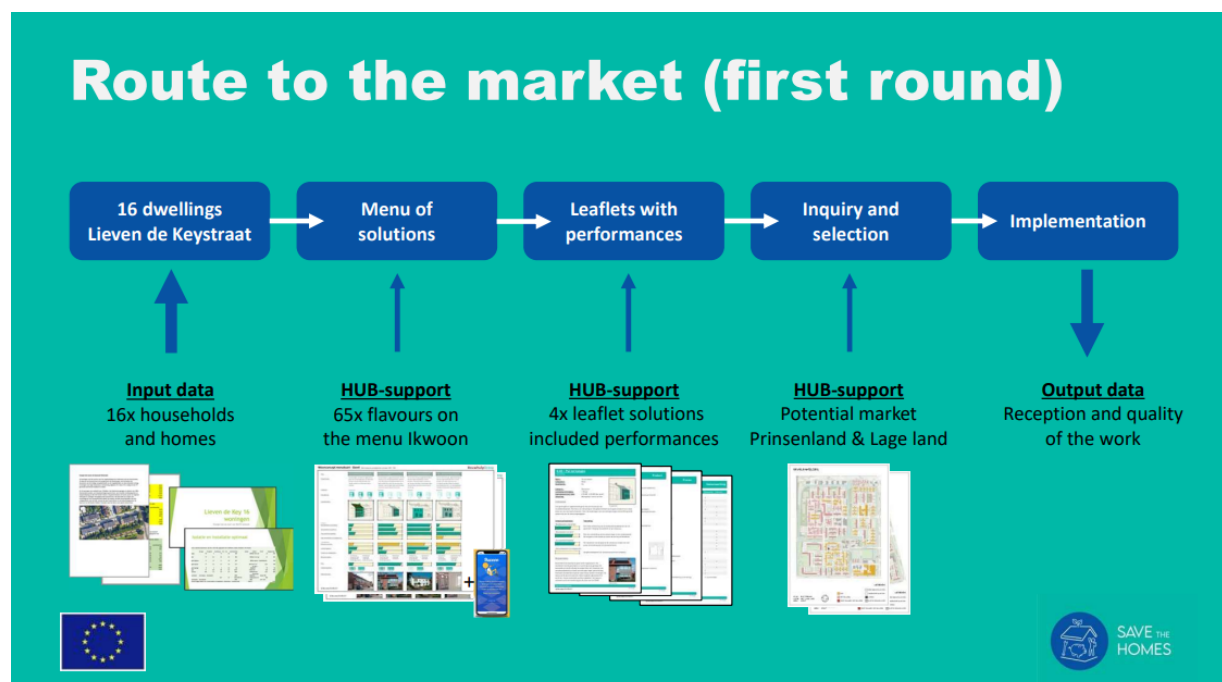


Figure 18: description of the route to market

This complete **menu** goes beyond energy related measures. It is also about creating more room, a more comfortable home, or more possibilities to use the house. In figure 7 an example of the menu is shown. The menu is structured on the level of the component, in the example the roof is shown. Furthermore the menu shows where the solutions (best) can be used, single family dwellings (EGW) or multifamily dwellings (MGW). Then a short description is given of the measure. What will be done to enhance the quality of the building. Besides that, **six indicators** are used to show the quality of the measures, which is depicted by icons in the menu:

- costs
- execution (1 home or a block)
- time needed for the renovation
- nuisance
- contribution to energy reduction
- contribution to circular building and renovating

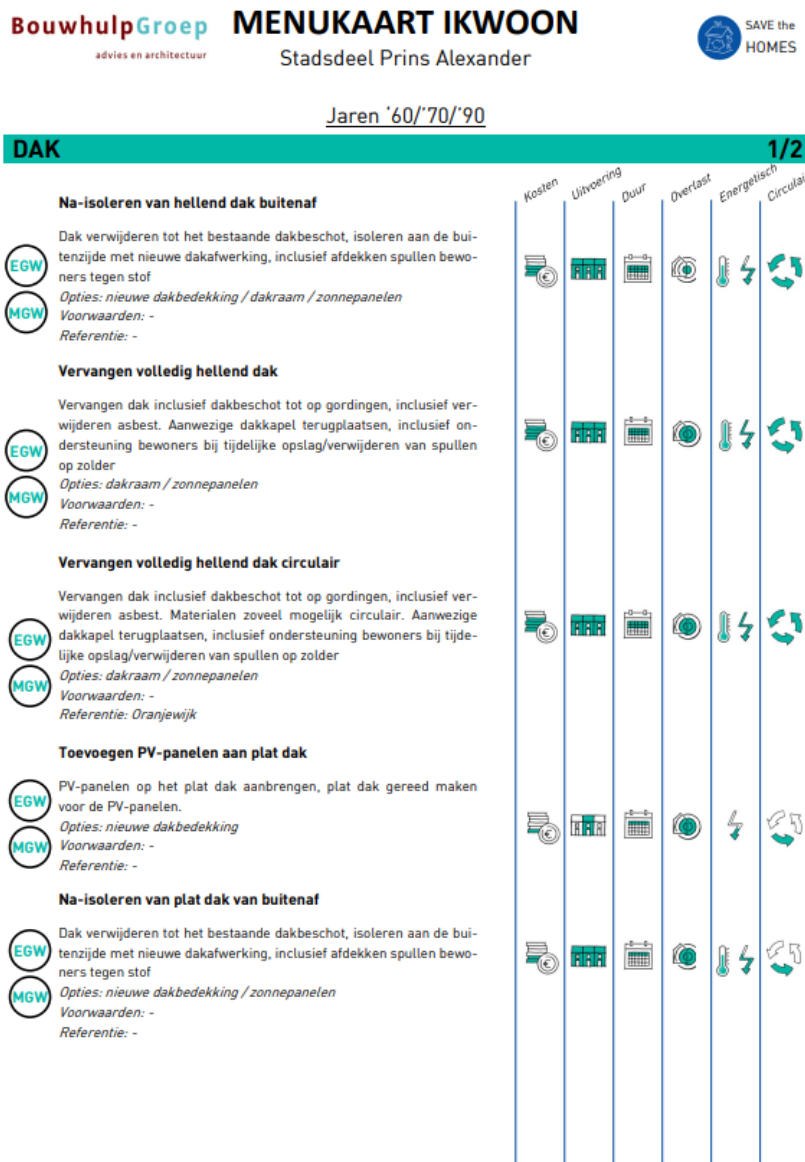


Figure 19: example of the menu for the component Roof



## 5.2.2 Concepts

The next step is to select all energy related measures from the menu and lay them over the given situation, in this case the 16 homes in Lieven de Keylaan, Rotterdam. The given situation was described by input generated by Alex Energy. Their expert reviewed 10 of the 16 homes, so an **advice** could be put up. Looking at the functionality of the HUB, this kind of advice is needed to proceed. It can be done by Alex Energie, but it can be done by other parties, if the task becomes to big.

The advice was based on measures needed and, combined with the menu it relates to 7 **concepts**, that can be chosen by the homeowners. A concept is a **set of combined measures**, that bring a certain solution. Currently (January 2022) these homeowners are in this decision phase. In this concept phase the combination of solutions that are fitting for their homes are presented and weighed next to each other. Alex Energy guides this trajectory and can give additional information on the solutions, so they can choose. In the assessment of the concept again indicators are used. Some are reoccurring form the menu, but some are new:

- Title
- Description
- Category of measure
- Family
- Concept sketch
- Appearance
- Living & Comfort
- Sustainability
- Use
- Nuisance
- Execution time
- Impact on energy
- Price
- Method of execution
- Reference

The idea of the concepts is that the **overall information** becomes more to the point and relates to the **quality** in the end, because that is what people need. They are not interest in the exact thickness of a roof, but they are interested in a **more comfortable home**. The menu of solutions shows that to them.



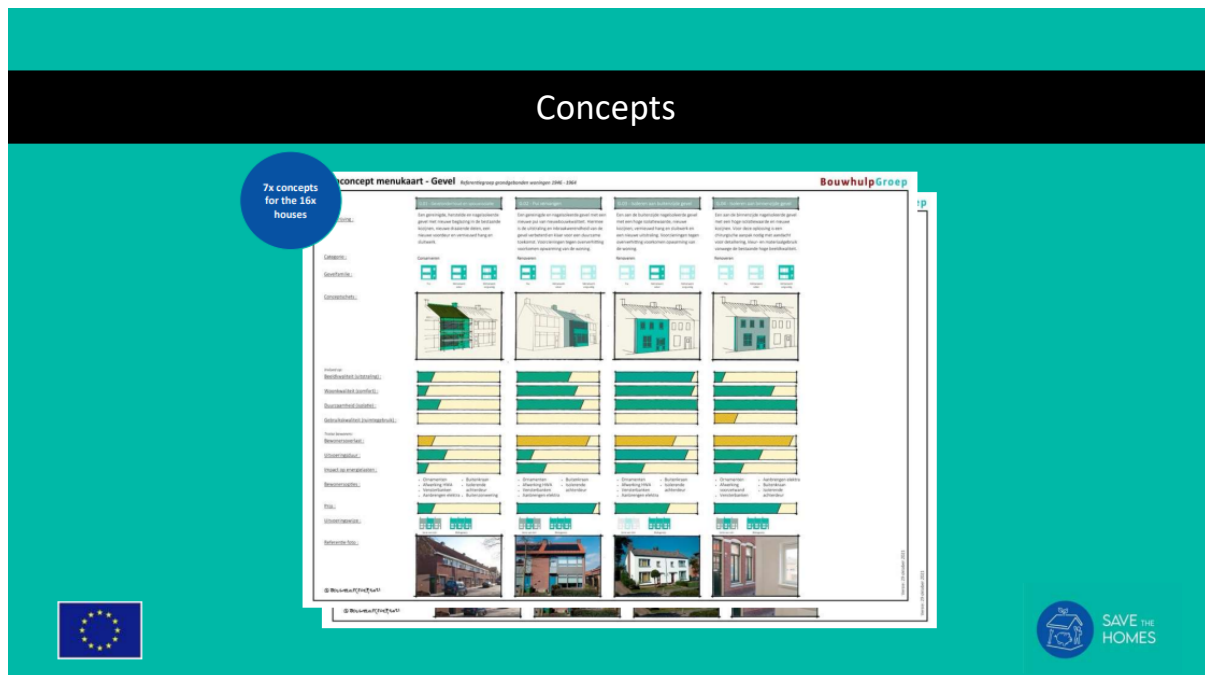


Figure 20: example of presentation of the concepts

This **menu of solutions sheet** is to help people to get all things that are relevant into perspective, and make a sound decision. This decision can vary per household. It is the question of how to proceed whether there is room for variation. The way quotations are provided (and asked) depends on this decision. From a viewpoint of replication, it should be possible to provide different solutions. For now, in a first project perhaps it will be more convenient to keep the number of solutions to a minimum.

### 5.2.3 Leaflet

Based on the concepts, one or more **solutions are chosen**. But the information in the concepts is too abstract to ask for quotations. There needs to be **more specific information** to go to the market, otherwise contractors can offer just anything they want. It is one of the jobs of the HUB to provide trustworthy information. To do so, the way the quotations are put out have to have some level of professionalism. The first question is whether the quality that is provided in the quotation is suitable for the home, and if multiple quotations are provided, it is often impossible to compare them. In a traditional method, there needs to be an architect or consultant to make the project design and guide the selection of companies. The research by Millin and Bullier<sup>26</sup> points this out, project design and selection of companies is highlighted, see also figure 16. But these are also **tasks the HUB can provide**, depending on the functionality. But then, from a point of replicability this design should be more generic. In the main model of Millin and Bullier, this points towards a support model or an implementation model. But even in an advice model this information could be used.

<sup>26</sup> Towards large-scale roll out of 'integrated home renovation services' in Europe. Millin, C and Bullier A.





Figure 21: Current market approach by Millin / Bullier

Therefore we already worked out leaflets as an example that can be used when the selection of company starts.

## Leaflet example

**4x leaflets for the 16x houses**

**0.02 - Pui vervangen**

**Product**

**0.02 - Pui vervangen**

**Prices**

**0.02 - Pui vervangen**

**Samenwerking**

**0.02 - Pui vervangen**

**Product**

**0.02 - Pui vervangen**

**Prices**

**0.02 - Pui vervangen**

**Samenwerking**

**0.02 - Pui vervangen**

**Product**

**0.02 - Pui vervangen**

**Prices**

**0.02 - Pui vervangen**

**Samenwerking**

**0.02 - Pui vervangen**

**Product**

**0.02 - Pui vervangen**

**Prices**

**0.02 - Pui vervangen**

**Samenwerking**

Figure 22: example of a leaflet

The leaflet describes more into detail what is needed for a certain solution. Again some information reoccurs, like appearance, living & comfort, sustainability, use, nuisance and execution time and of course the impact on energy. But now more **detailed information** is added. What kind of materials should be used (wood, aluminium or plastic), what insulation value ( $R_d$  w/m<sup>2</sup>K) is minimum, what



details are crucial to the quality and need to be addressed by the contractor, what is asked in the process before execution, during execution and after execution and what needs to be done by the contractor and what does the home owner do by themselves. There is no **price** given in the leaflet, so the contractor has to give one, doing all activities mentioned in the leaflet. In the previous step a price was mentioned (in relation to that conceptual solution). That is an indication whether the price that is given in the quotations is conform current market values.

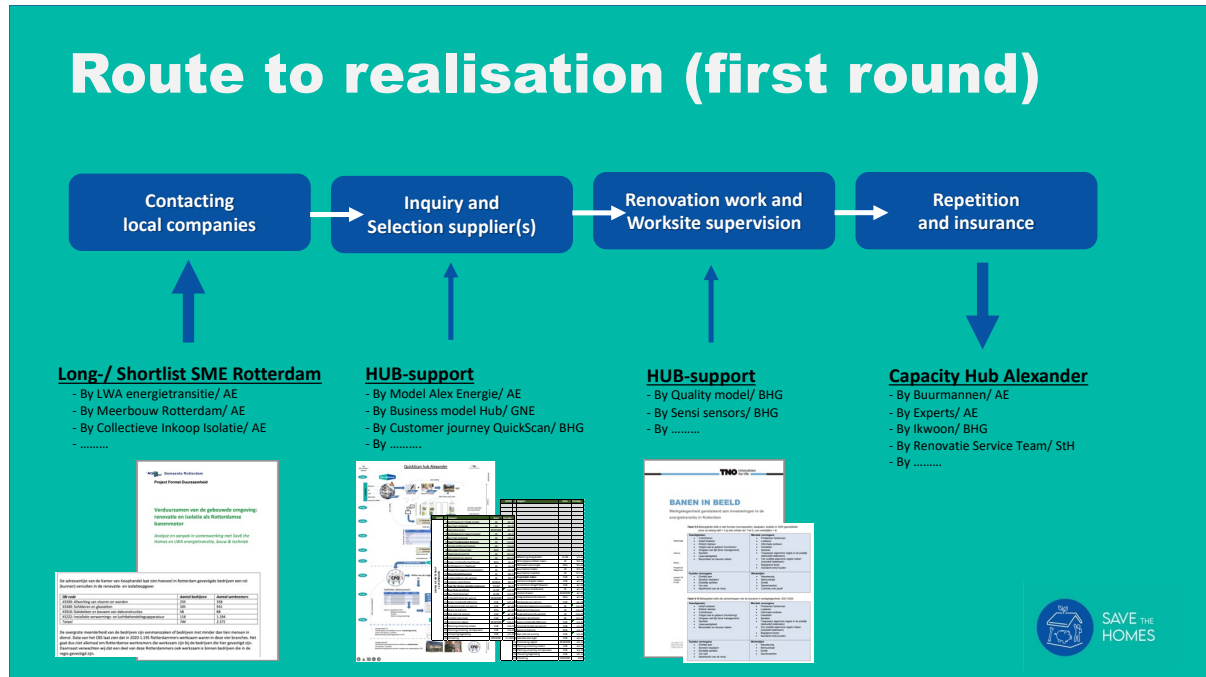


Figure 23: Description of the route to realisation

These leaflets should be produced by the **local HUB**, and put ready to use for most common measures. The leaflets are not freely accessible, the people that man the HUB use them **to guide people** to the best fitting solution. When these leaflets are available, it does not matter if there is variation in the demand, because the performances are known, and the contractor can account for 10 times solution A and 6 times solution B. This also brings us to the part of **replicability**.

Then the **route to realisation** can really start. The HUB can guide the contact of local companies. For now there is no list of companies available, but in Valencia they recently launched a website that does. (<https://registrohc.five.es/>). Another task that could be performed by the HUB is worksite supervision and making sure the guaranteed conditions are met. This is part of the **quotation** process and follow up. Alex Energie for now does not have this ambition, and will take the role as coordinator, rather than the party that will do the actual work. This last part is also described in Deliverable 4.5

## 5.2.4 Replicability of the offer

In Deliverable 2.1 the market has already been described. The municipality had BouwhulpGroep make an oversight of Prinsenland and Het Lage Land, based on replicability. This division is based on the principles of Component Renovation as mentioned in Chapter 3 of this deliverable. It goes beyond the classification in for example Tabula<sup>27</sup>.



Figure 24: potential of replicability Het Lage Land from prior study

Prinsenland and Het Lage Land districts comprise of respectively 5,150 and 5,870 homes. They are located in the **Prins Alexander district**, in the northeast of Rotterdam. 21% of the Lage Land consists of single-family homes and in Prinsenland this share is approximately 35%. The rest of the neighbourhoods consist of multi-family homes. There are approximately 11,000 homes in total, more than 60% of which are (social) rental homes, the rest are **owner-occupied homes**. The municipality is looking for a way to facilitate sustainability in these two neighbourhoods. In the case of private stock in particular, this will not happen by itself, but initiative will have to be taken from outside. In making the project more sustainable, the options for future maintenance are being looked at, and account is taken of the fact that the neighbourhoods will eventually be completely independent of natural gas, which is a program initiated by the Dutch government. That means the municipality focuses in particular on making homes more sustainable and making the homes natural gas-free. Where possible, this should go hand in hand. The **strategy** that the municipality uses in Prinsenland and het Lage Land is to install a High Temperature (HT) (70 degrees) heat network in suitable neighbourhoods, which will be lowered in temperature over time (50 degrees). The basic principle is that the homes in those neighbourhoods are made suitable for this purpose.

<sup>27</sup> <https://episcopes.eu/welcome/>



The ordering was about typologies, the focus lies at **organizing and approaching** the two districts differently. And what can be found out about replicability of solutions and process in this area.

The houses are analysed by means of a survey of the neighbourhoods, whereby an image is formed of the housing types that occur. A classification is being drawn up for the homes in Lage Land and Prinsenland. This means documenting the existing housing types and dividing them into components. BouwhulpGroep has developed a typology this that is applied in these two neighbourhoods (chapter 3). This arrangement makes clear which buildings are **comparable** in appearance and original quality, so that solutions (measures) based on repetition can be applied there.

#### D. Inventory

Because of the extent of the area, it has been divided in four quadrants. The approach for each quadrant is the same. The following maps have been drawn up for each of the quadrants:

##### - *Homes and complex layout*

Each building is ordered according to the same **appearance and realization**. If we look at a professional manager they would call this division a **complex**. We order this by repeatability at the solution. This can imply that one group of homes with a huge variation, will be regarded as one denominator. (for example, in the private sector).

##### - *Construction period*

we distinguish a number of construction periods. These construction periods are linked to changes in (Dutch) legislation. In the Netherlands, we usually follow the lower limit when building, which means that stricter legislation has a direct effect on the implementation in homes.

##### - *Roof layout*

We make a distinction between flat roofs and sloping roofs, the latter group being subdivided into roofs under which a living space can be created (steeply sloping), and roofs where only storage space can be realized.

##### - *Façade layout*

For the facade, we make a distinction between front facades, where a complete facade can be placed in as a whole, and facades where masonry predominates. With masonry facades, frames are placed in the facade, instead of the complete fronts.

##### - *Access in high-rise buildings*

In particular, the question of whether it concerns a portico or a gallery access is interesting here. With a portico it usually concerns six to eight households, with a gallery flat it sometimes concerns 100 households that have to go through one front door. This asks for a different approach on a social and technical level.

##### - *Construction type (high-rise/low-rise)*

The building height determines quite a bit in the implementation. In houses **up to 4 storeys**, one can still carry manage with temporary facilities. If it concerns complexes with more than four storeys up to eight or twelve storeys high, the implementation requires good preparation and the same solutions as with low-rise or medium-storey buildings cannot always be applied, regardless of the apparent similarity between components.





The type of ownership is not yet included in the above classification. In the future it is wise to add this data to GIS files, and then the ownership can also be related to it.

### E. Chances for replicability

**Various classifications** can be made for the neighbourhoods. Arrangements of solutions are based on year of construction and type, but mainly linked to parts of the houses (components) such as roof and facade. This arrangement enables the municipality to make its **own choices** regarding the approach of a neighbourhood. Think of all pre-war homes, but also all homes with a flat roof, built between 1965 and 1974. The nature of the solutions can therefore vary. If you select generically, for example by year of construction, the solutions are different than when you organize specifically, such as with a flat roof between 1965-1974. This has to do with the role that the municipality can have or wants to take. A municipality cannot intervene in a competitive market, without being bound to restrictions.

But with the classification the municipality can get their actions **in the right order** and make sure the needed boundaries are met. This order enables the municipality to take the following actions, for example:

- Send information **brochures** to a specific group of residents, based on the age of their home, for example a folder with the five most common sustainability measures;
- Sending a **folder** with concepts about the renovation of the roof, aimed at homes that are expected to require roof renovation within 5 years;
- Sending an overview of (local) **implementing parties** (selected in advance by the municipality in accordance with tender rules) who can apply these roof solutions in the district.

In the above summary, the role of the municipality is shifting, from just providing information to a more active role in offering solutions. However, many other forms are possible. Also consider the role of the **energy coaches** who are already active, or the role that the Woonwijzer has (see Deliverable 3.6) at this moment in cooperation with the municipality.

One of the problems is the role that the municipality is allowed to take. This is also addressed in D4.5. but as a public service the municipality cannot **favour** one party above another. For example they cannot simply ask three contractors to do the work in the area, but that has to go through an official tender.

The question that arises is if the municipality is the HUB or that the HUB has an **own entity**, that actually can perform those actions. Perhaps in the revenue model, it is even possible that people pay a certain amount for the advice. If the HUB is a public function that will be undesirable. In Valencia the Energy Office is paid for by the government but is not part of the government. Although transparency is still needed, they are more flexible towards actions.

For property owned by housing corporations or private homes (usually part of a owners association), renovation will be carried out by those organisations. But for homeowners sometimes a connection can be sought with the housing associations to fulfil this role of coordination and advice. It is not inconceivable that the same type of property is the subject of discussion, but with different owners. If there is not such entity in place like a housing association, **the HUB can take that place**.



## F. Actual chances

Based on the analyses of Prinsenland and Het Lage Land, a number of possible measures and arrangements are listed below. Such a list could be drawn up much more extensively, but we have tried to give a good overview:

- Prinsenland and Het Lage Land consist for 20% of houses built just after the war. 17 % of this concerns stacked construction (1,860 homes). These are the older homes in the neighbourhood, where probably the most maintenance interventions are needed.
- The largest part of the two neighbourhoods was built between 1965-1974 (44%, 4,749 homes), the lion's share of this area is **stacked buildings** with four storeys.
- The period 1946-1964 is interesting, when looking at age. The average age of these buildings is now 65 years. That means that the **maintenance cycle of 60 years** is approaching (individuals like to postpone replacements, so the intervention moment only comes after 60 years). In Prinsenland it concerns just one complex (but of 700 homes), in Het Lage Land it concerns 1,500 homes. This is an **opportunity**.

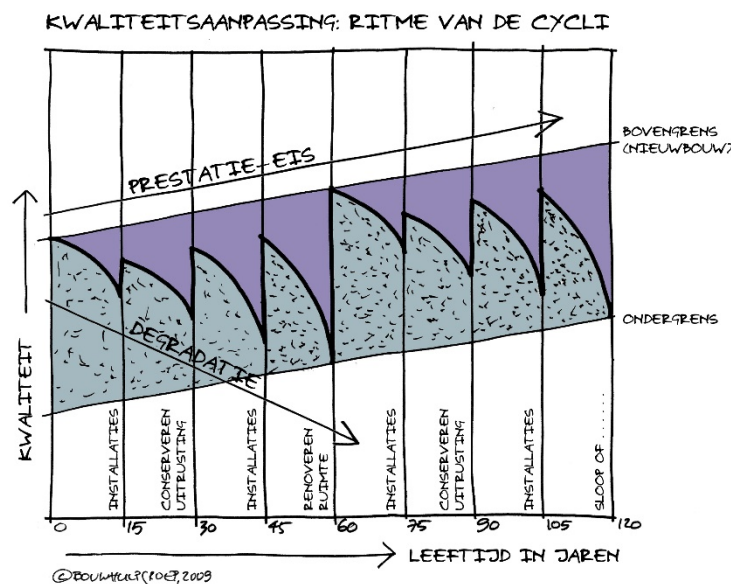


Figure 25: Rhythm of use and maintenance of a building throughout 120 years

- Surprisingly, there are also many new homes, 31% (3,385) built after 1992, while both Prinsenland and Het Lage land are known as a 'typical sixties neighbourhood'. The fact that the homes are relatively young does not mean that there is nothing that can be done to make them more sustainable. The houses were built under the Building Decree 1992, which means that all parts have a minimum  $R_c$  value of  $2.5 \text{ m}^2\text{K/W}$ . And so additional steps can be taken here with minor adjustments. Think of the additional insulation of (flat) roofs, which is needed after about 30 years. So an enormous potential arises at this moment. Especially when looking at the task the municipality is looking for: preparing all buildings for medium temperature district heating.



- 15% (1,680) of the houses built after 1992 are **low-rise buildings**. These homes are now approximately 30 years old, which means maintenance work is on the way, including replacement of the flat roof. In these homes, the municipality could actively inform residents about the possibility of additional roof insulation, combination with a green roof, or combination with a roof structure.

- In the two districts there are 4,246 houses that have a **façade construction (39%)**. The average size of each of these complexes is 200 homes. In addition to the stacked houses, there are more than 400 single-family houses with such a front. Façade constructions are suited for a complete overhaul. Based on the repetition in the neighbourhood and the repetition within complexes, a standard solution can be set up for this, where people can join or not. This can also be the solution applied by the housing association in its possession, so the market potential gets even bigger and contractors will compete for the job.

- 2,283 houses with a facade are from the period 1965-1974. This original facade was developed under the regulations of the Model Building Regulations. It has (in its original state) an insulation value below 1.0 m<sup>2</sup>K/W, which makes it difficult to add insulation, other than a complete renovation. Replacing glass with HR++ glass helps, but it also has its limits. Adding a new front is a drastic, but helpful approach. Showing these possibilities will open up the eyes of people that are not considering options at this moment (but need to do so in the future).

- Despite the many multi-family houses, there are also **terraced houses**. 232 of these have a house with a 'steep pitched roof'. These are roofs whose space underneath is often suitable for a room. Sometimes that is already a living room, sometimes not. For these homes, a roof replacement is an opportunity to create extra living space (for example with a fixed staircase and a dormer window).

- There are a total of 5,774 homes with a building height of more than four storeys, of which 4,000 are in Het Lage Land. These homes should be approached **collectively**. Through the corporation, or through an Association of home owners.

- Given the large number of **flat roofs** in the district (more than 10,000), combined with the need for climate adaptation, the application of grass roofs is an option to solve multiple problems simultaneously. Even if it is only the application of suitable roofing material so that green roofs can be used later. It is possible that bundling subsidies (if any) for sustainability (CO<sub>2</sub> reduction) and climate adaptation (water retention) will make it a feasible solution for residents. Residents must then be made aware of the possibilities.

- In the two districts, 56% of the houses have a **masonry** facade. This applies to all homes, including high-rise buildings (> 4 floors). These complexes are usually owned by a housing corporation or a Home Owners Association / condominium (in Dutch VVE). The role of the

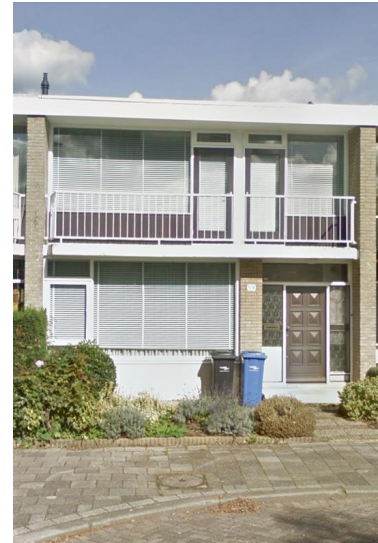


Figure 26: Example of flat roofed single family dwelling, with a facade construction

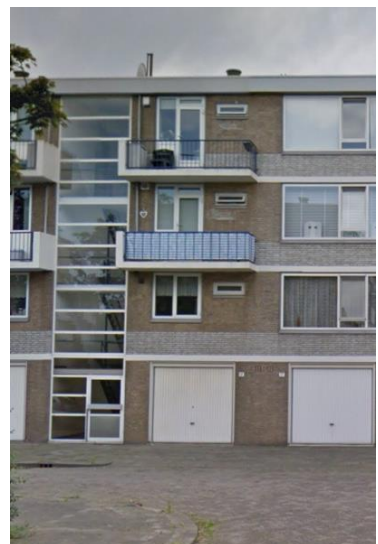


Figure 27: Example of multifamily apartment building with masonry facade and flat roof.

municipality can be a facilitating role in this, for example by linking several HOAs to each other<sup>28</sup>.



Figure 29: Flat roof, prior to renovation measures



Figure 28: Renovation of flat roof; adding insulation and solar panels

- The arrangement on components offers the possibility of solutions on a **larger scale**. However, there are a number of complexes that are already large in their entity. These complexes can be used as a starter motor for the district. Depending on the ownership, it is also possible, for example, to look at how a housing association has already solved this (in the past) or will solve it (in the future) and use that expertise.

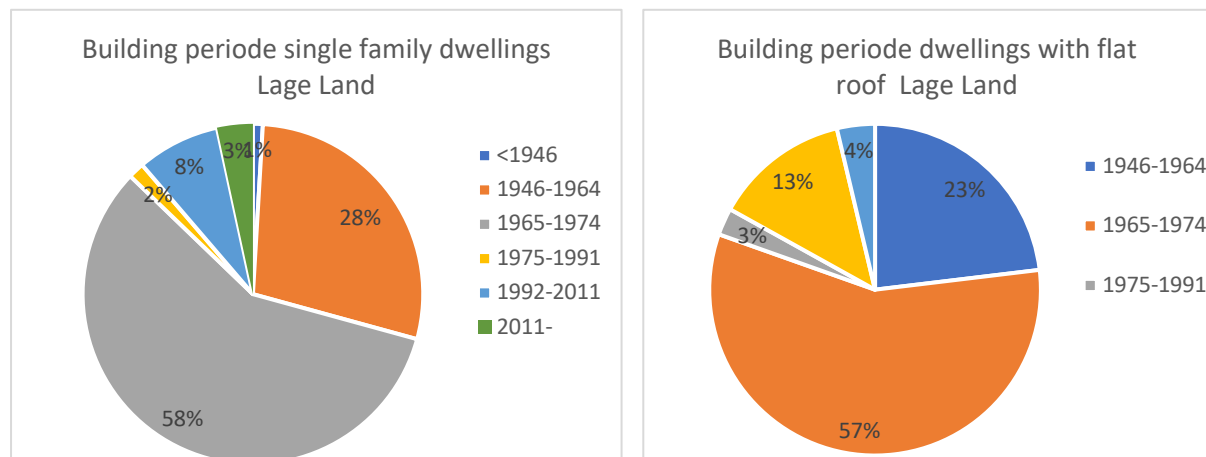


Figure 31: Example of data derived from the typology study Lage Land

- The vast majority of Het Lage Land was built between 1965-1974 (3,680 houses). Of these, 2,277 are more than 4 storeys, of which the distribution is 1/3 of a porch entrance and 2/3 of a gallery entrance. This means that many of these homes have access to the gallery. From the perspective of accessibility, these homes are not always suitable for all residents (people who need a walker or wheelchair). The gallery often also forms a thermal bridge. A chance from the viewpoint of **accessibility and social aspects**, the gallery can be isolated and made accessible

- Of the 14,100 homes, 84% have a flat roof. It is obvious to provide solutions that address this. 13% of the total are single-family homes with a flat roof.

<sup>28</sup> (<https://www.bouwhulp.nl/actueel/verduurzaming-vve-complexen-hovenbuurt-zoetermeer>).

- 55% of the houses have a masonry facade, with a focus between 1965-1974 and the houses after 1992 (both approximately 20%). The facade from 1992 has a minimum insulation value of 2.5 m2K/W. Possible adjustments are only to put something in front of it on the inside or on the outside. These are expensive interventions with limited (energetic) improvement. The frames and glazing are also in need of improvement in the near future. This is different for the masonry facades from the period 1965-1974. They are almost 60 years old and originally not isolated. With cavity insulation, a limited insulation value can be achieved. However, if the facade is, for example, in need of joint repair, it may be considered to apply external wall insulation.

As indicated, the list above is not inexhaustible. With the developed **data set**, many more cross-sections of the district can be made, both globally (the number of porch houses (3,301x) and specific, (number of terraced houses from before 1946 with a masonry facade and a sloping roof (14x)).

### G. Conclusion on replicability

Previous classification, analysis with probabilities and the list of (prior) examples show how the step towards measures can be taken from classification. It is a matter of choosing how the groups of houses (or the residents of the houses) can be approached. **Data** from the neighbourhood (income, personal interest, etc.) can play a role in this, but the ambition of the municipality also plays a role in this. Moreover, the question is what role the municipality wants or can to take on. If the municipality takes a restrained role, more is expected from the residents themselves, and this needs to be taken into account when selecting the homes and the areas. In terms of the type of model it becomes more an Advice model and not a support or implementation model.

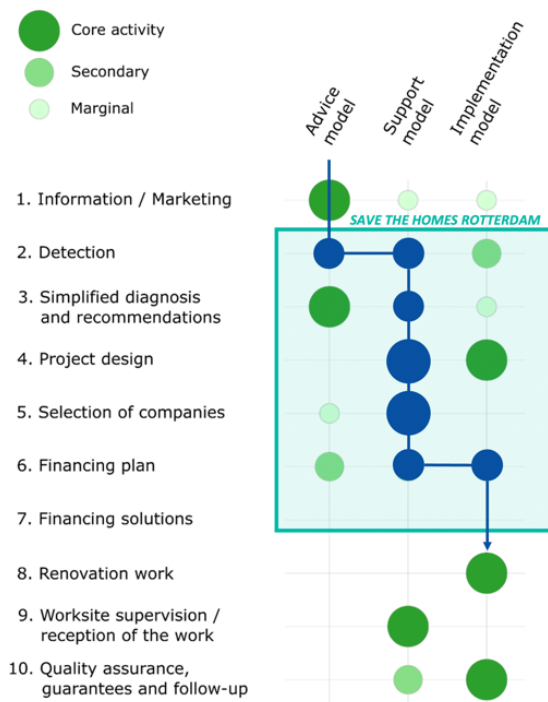


Figure 32: three different functions of a HUB, based on Millin / Bullier and the coverage of Save the Homes



If the municipality wants a **progressive and active role**, they can work at the lower end of the market (participating model), precisely because the municipality is investing extra in this, a support model of the IRHS is more likely to be adopted. This connects to the role the local authority wants. In the open government-model (see deliverable 4.5) this is elaborated on. The **chosen policy** is therefore decisive. This is a difficult step, because the policy is still under developed and can be influenced by elections.

Within Save the homes the search for the best fitting role continues and shifts in time. And reordering two neighbourhoods provided the Municipality of Rotterdam with tools to act, not linked to this policy and enough room to make fitting plans.

Considering the needs of the national government, municipalities must play a facilitating role. With the results of this analysis, the Municipality of Rotterdam can initiate follow-up activities in the neighbourhoods, thereby fulfilling that facilitating role. By arranging the neighbourhood in a clear layout, supply and demand can be brought together before starting to plan a renovation. The menu, concepts and leaflets are instruments to facilitate the HUB functionality.

## H. Barriers

Within save the homes we concentrate on setting up a HUB that focusses at step 2 till 7 (see figure 27). Although we know that the renovation work and the **supply side** is important as well. The current market in the Netherlands is flourishing, that bringing in companies **as a part of the HUB** is difficult. So the aim at this moment is to help citizens to make a choice for sustainable solutions and guide them through that process of choosing what is **needed**, what is **possible** and how to **finance** it. After that step it becomes important to get contractors involved, or people who can do the jobs. That can be organized by **quotations** or by putting a **collective** together and then ask for quotations. In both cases it is up to the market to react and place an offer. Maybe in the future, if the HUB is up and running parties see the advantage of the HUB (mainly a continuous stream of projects) that they will commit to the HUB and be part of it (and even pay a kick back fee). But at this moment it feels like the HUB should pay contractors to even bring out offers.

Therefore we are also looking at education and staff training. There is already a **shortage of labour** in the building sector in the Netherlands (we are lacking 36,000 people) and the energy transition puts an extra load on the market of another 36,000 people. For Rotterdam that means a need for two times 1,500 people. A lot of these people will come to work in renovating homes. Deliverable 3.6 mentions the initiatives that already are being taken in Rotterdam. But these are for the long-term employment opportunities. But based on the solutions that are being offered in the HUB, we can establish the amount of people needed to fulfil the work and depict what kind of competences these people have to have. For example, if we know that in Rotterdam flat roofs need to be renovated, we know that we need more roofers and carpenters than plumbers. This information can be used in the **staff training**.





## 6 Available financial offers

The initial idea of save the Homes started with two main barriers: a **lack of finance** and a **lack of labour**. All other aspects needed in a customer journey are present, but not completely developed, not tested in full use, or not incorporated within one approach that allows individual house owners to do a renovation. Integral Home Renovation Service should bring an integral solution. Workpackage 3 goes into detail about this. For detailed discussion we would like to refer to these deliverables.

The two problems, finance and labour, are not solved yet but within this program they are addressed in several ways. Deliverable 3.6 focusses at the work execution and staff training. It does not bring the solution, but opens doors for the first small steps for more trained labour in the home renovation, and in the end more trained people that can do the job needed. On the level of finance both demonstration cities have their **own approach**. Each citizen can follow its own trajectory, of contacting a bank and trying to apply for a loan. Whereas some constructions could be in place that provide specific loans for energy efficient measures. A special group is formed by condominium owners. They have to apply as a group for the financing of the loan. In Rotterdam there are special constructions for them to apply for.

### 6.1 Valencia

Concerning the demo cases it looks that there is a huge difference between the two cities. In Valencia there is budget available for the HUB, and consensus on the role of the municipality. Therefore, an **Energy Office is in place** and people can come to this place for advice. The region of Valencia directs money towards the Energy Office, so it can be manned, and they fulfil the much-needed role for advice. But the difficulty, however, is that when people want to make changes in their home, there is no finance available. There is some subsidy, but for the needed interventions a larger amount is needed, that is not easily accessible. This is the same problem Save the homes started with.

On the labour side, there are enough **small enterprises** in the Valencia region that can do the job, but because the lack of finance the actual number of renovations are small.

Because the financing of the office is a smaller problem (nevertheless, see D3.3) than the financing of the renovation works, D2.6, 3.4 & 3.5 conclusion are of great interest for its analysis and exploitation by the Citizen hub services, trying to convince customers to undertake the needed renovation. Following, some highlights from the financial analysis:

- Even when many grants are available in Valencia region for residential building renovation, all the focus and interest from homeowners was on the conservation and accessibility works, coming from **urgent situations**. There is a lack of renovation culture in the area, and more if you look into the energy side of the renovation. In this context, grants for energy renovation were not spent, while other programs were insufficient.
- On the other hand, **private funding** aligned with energy savings was inexistent, and even if a few products were on the market, they were targeting single family buildings, due to the easiness to get agreements. The main role of financial entities to be exploited can be their capacity to finance through the contractor, so they overcome the distrust of the customers to get a loan, and the multiplicity of interlocutors for the condominium: **is the contractor who offers a financing plan**, in direct exchange for the renovation works, and in one unique contract action.





- **New grants program from the EU Recovery funds** are trying to overcome these issues by offering very high rates of direct funding (up to 80%), creating the renovation agent actor to manage all the process and simplifying the application by asking just for a responsibility statement for starting the works. But main achievement is the inclusion of the conservation and accessibility works in the eligible costs, so by paying just a bit more, the building obtains their primordial objective, and the energy savings, as in the example below:

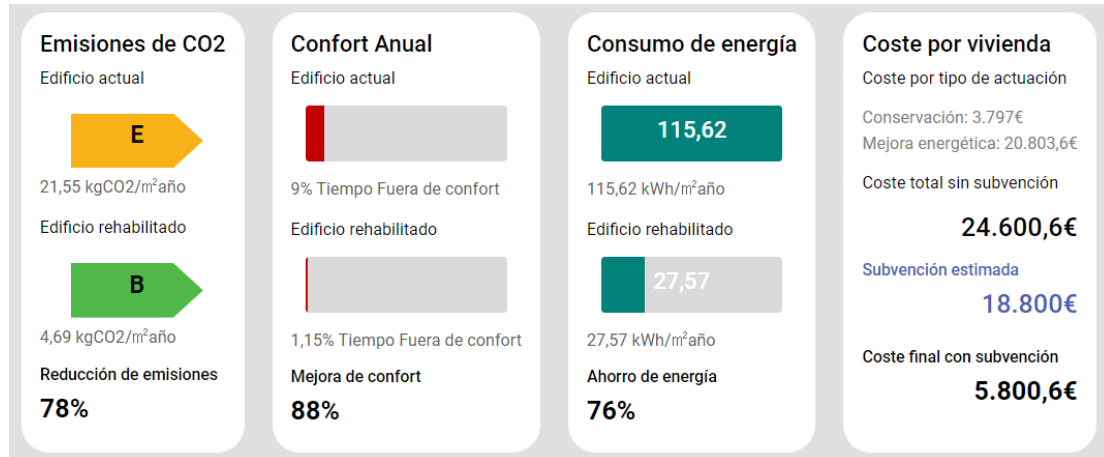


Figure 33.- Scenario 09 with accessibility costs included

There you see how accessibility cost were around 4.000€ per dwelling. Now, adding external insulation on the roof, floor and ETICS systems in the façade, changing windows and installing photovoltaic generation in the roof, the building gets their elevator, saves up to 76% energy and improves thermal comfort for around 6.000€ per dwelling.

- Finally, also private financing is available to complete the cost of the energy renovation works (**financing the difference between the grant and the total cost**), with interesting conditions.

## 6.2 Rotterdam

In Rotterdam at least the point of individual financing is solved or made smaller. There already was a possibility for a loan, but that only was eligible for actual renovation measures, not for maintenance. And in most cases the renovation is a mix of **maintenance and energy improvement**. In 2021 the ETF (Energy Transition Funds) was introduced in Rotterdam. A **revolving fund** ranging from 2,500 to 65,000 euro (different products) that people can use when doing at least 1 energy measure and 1 home improvement with a total budget of about 30 millions Euros. This makes sure that on the individual financing side the problem is diminished. Of course, people still have to be able to pay for the loan, but if a person wants to renovate and can pay for it, but does not have the money at this moment, a solution is **available**. But the problem in Rotterdam lies at the **organisational level**. Despite several actions and initiatives, there is not one place, office, or even digital place where people can get information or help towards a solution. The function of regional energy office lies with WoonWijzerWinkel and there is a website by the municipality ([www.duurzaam010.nl](http://www.duurzaam010.nl)) that describes results and where people can find some advice. There still is no consensus on who this role should take, how most citizens can be reached and what is needed to speed up the transition.

One of the uptakes is that perhaps the market should provide in that, because it is the gateway to their products. And that directly connects to the other dilemma Save the homes started with: labour. In 3.6 this will be elaborated on. But in the Dutch market, the contractors all have a full agenda, and primary focus lies at new built. In this market just a few companies look towards





renovation, let alone renovation of individual households. That these enterprises will open up the market, for example by running a HUB, is just an illusion.

To conclude, we can state that in Valencia, there is money to run the HUB, but there is no money for the actual renovations. As where in Rotterdam there is money available for the renovation, but not for running a HUB. Save the homes offers Alex Energie some start capital to get up and running. And Energie voor Rotterdam has got budget to set up an exploitation of solar roofs, so the revenue can go towards the energy cooperation, like Alex Energy. The result is that in both cities it is still hard to reach the sustainability goals.



## 7 Routing of the customer journey / advice

The discussion was often held whether the HUB should be **digital** or **physical**. In Deliverable 2.3 as well as in deliverable 4.5 this issue was addressed. The conclusion was that **both forms** have their own purpose. So both communication channels are valuable, online and offline.

The main value of physical advice, is that it goes towards people's own situation, where they can ask questions about their own problems and fitting solutions. More generic advice sometimes comes across as 'unreliable' and 'ill-fitting'. But, in the spirit towards 2050 the capacity is nowhere available to do this all in private. Even if all these task would last just 1 hour, then still in Rotterdam as well as in Valencia each city would have to provide 315.000 hours of advice! That would be 36 years of non-stop talking per city!



Figure 34: steps of the initial customer journey from the Grant Agreement

So we need to look at different ways to inform people of the possibilities for sustainable renovations. When we look at the customer journey explained in WP 2, this relates mainly to the onboarding. However this part of the customer journey starts at the moment that there is already some knowledge on what to do. In every day practice a lot of people do not know that there is a sustainability issue, or what possibilities are available for home improvement. So in the light of **communication strategies** and marketing theories<sup>29</sup> it is wise to start before the onboarding phase, with a phase to activate people. Then the focus of the Save the Homes project lies at **conversion** towards actual doing something, and ending with the execution of the measures. In figure 23 it is visualised what needs to be done before people are willing to inform themselves, and the link between activation, conversion, and execution. The customer journey then becomes a funnel, in which people are targeted and re-targeted on the topic of sustainable renovation. Each step having its own number of conversions. As a simple rule we use a 20% conversion between both phases. This means that for the city of Rotterdam, where 550 homes need to be reached, 2,750 conversions are needed, which means that 13,750 activations are needed. For Valencia where the goal is set on 1,250 executions, the conversions need to be 6,250 and the activations needed is over 31,250. These numbers cannot be managed just manual, digital support is needed.

<sup>29</sup> For this approach we looked at the hierarchy-of-effects theory.

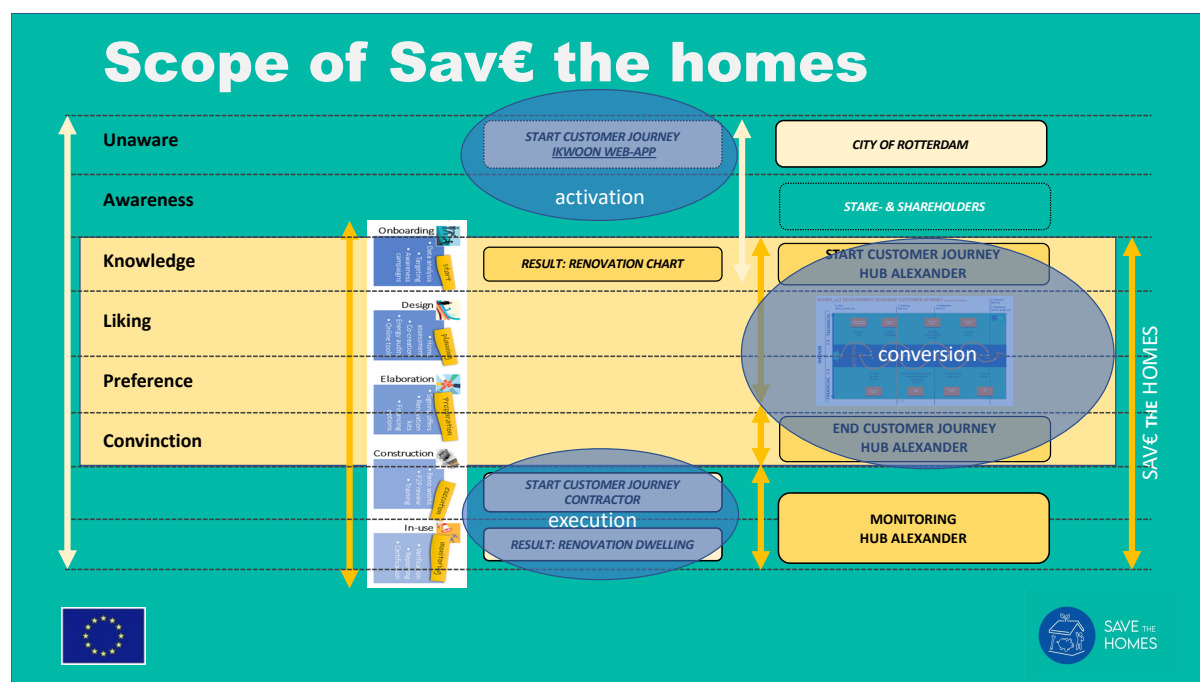


Figure 35: Broader perspective of the scope of Save the Homes, including the steps of activation, conversion and execution

## 7.1 Ikwoon

An important tool for organizing bottom-up renovation in the neighbourhood is the **Ikwoon application**<sup>30</sup>. Particularly during demand development, where as many people as possible must be approached to create a (bundled) demand. The best route for making homes more sustainable is to take a seat at everyone's kitchen table and talk about the possibilities. The only problem is that we don't have the time, the people, and the money to organize this. For the whole of the Netherlands, that is more than 7 million talks. But fortunately, nowadays everyone has a mobile phone with which we can organize this kitchen table conversation more easily, at a time that suits the individual. 'Ikwoon' is a web application, developed by BouwhulpGroep (2020) that helps showing homeowners interesting sustainability options **that suit their home** (based on big data) and living situation (based on individual, digitally asked questions). In this app, after completing several questions about their home and housing requirements, people will immediately see the **smartest, fastest, and cheapest** solutions to make their home more sustainable. In addition, with Ikwoon, occupants respond to their own housing needs. For example, do you want to make an extra bedroom in the attic? Or would you rather live on the ground floor? These are examples of suitable moments to immediately make your home more sustainable. This way you live more comfortably and more sustainably all at once! Ikwoon is available online for all residents in the municipality<sup>31</sup>. This tool was experimented with in municipality of De Bilt in the Netherlands. In Save the Homes this outcome will be used to engage people in the district of Prins Alexander. The action is mainly focussed at getting people from unaware and aware towards knowledge and even liking.

<sup>30</sup> <https://app.ikwoon.io> developed by BouwhulpGroep

<sup>31</sup> <https://jouwhuisslimmer.nl/de-bilt/>

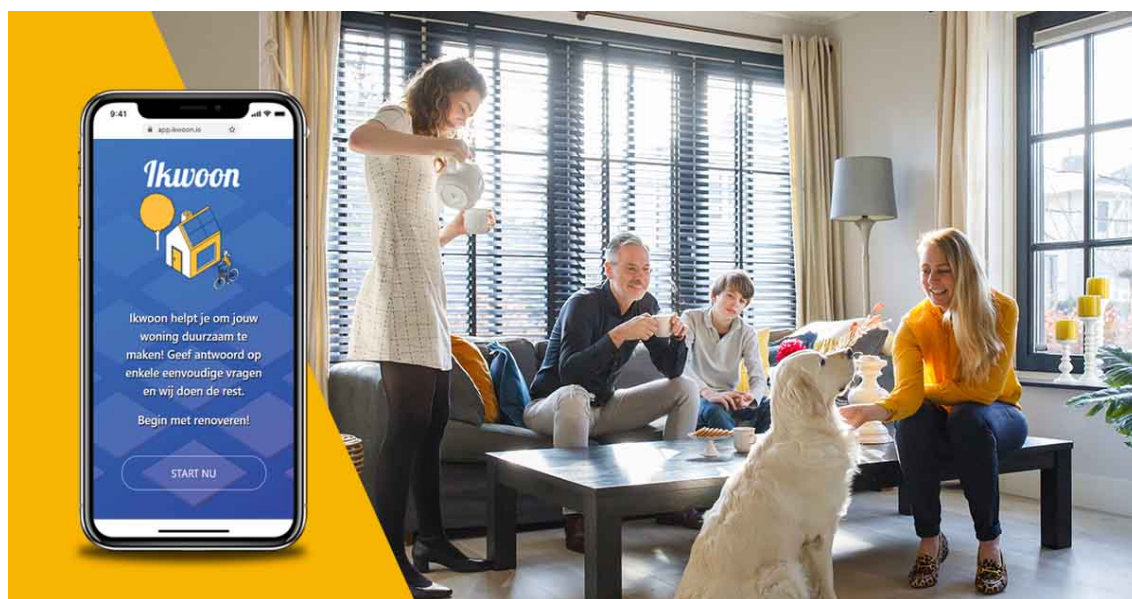


Figure 36: Webapp available by mobile phone



Figure 37: Video (in Dutch) <https://www.youtube.com/watch?v=9QoFZPP2SC4>



Figure 38: Banner in the hall of municipality De Bilt



## 7.2 Energy office Valencia

According to previous tasks, the new service to be implemented in the Energy Office is a one-stop-shop concept encouraging citizens to undergo an energy renovation in their homes and buildings, by assisting them through the whole renovation journey. Homeowners are provided with a **comprehensive support service throughout the entire process** of renovating their homes. This service is free of charge and can be applied on a full/partial basis (from just looking for funding options or support in the application of grants, to help from the beginning to the end of the renovation process). This service/tool not only saves management costs, but also time, as it centralises all necessary information for all parties involved and puts them in contact with each other.

This experience is in parallel being replicated by the 5 pilot municipalities first signatories of the XALOC network of housing services, along the Valencia Region territory, supported by centralized services enabling a coherent answer to the similar problems faced by all the region citizens.

The solution to the current **fragmentation** of the retrofitting market in Spain is the centralization of all available services and resources associated with retrofitting on a digital platform, bringing together all the agents involved in the renovation process. This tool would make it possible to solve some of the critical points at present:

- Although there is a wealth of information and tools available for energy efficiency and retrofitting, users are faced with the situation of **not knowing** how to discriminate/filter it -in the case of being aware of the existence of such sources.
- There is a great **lack of knowledge about (new) financial** products specifically for energy retrofitting. This platform would contribute to their dissemination and transparency.
- There is also a **lack of knowledge related to the requirements**, compatibilities, etc. on the incentives available for housing retrofitting. There is a clear need to remove the complexity of procedures and streamline them in terms of time.

There is a lack of **trust** in construction workers. The existence of directories that include them based on certain requirements/skills, with the possibility for homeowners to leave feedback on them, can help to expand the search for workers from the current word-of-mouth to a digital scale, facilitating the decision making of homeowners.



## 7.2.1 Support through the entire process

After studying the demand and supply sides (T 2.1, 2.2 and 2.3) and the resources and tools available (T2.4 and 2.6), design the solution packs (2.5) and adapt the StH customer journey (T3.1) to the local context by designing an implementation strategy (T3.2), the pilot platform functionalities are defined in this task (considering also parallel findings on the business model design activities in T3.3 and 3.4).

<b>Stop 0 - ON-BOARDING</b>				
	<b>AWARENESS</b>	<b>INTERACTION</b>		
<b>demand</b>	friendly solutions & checklist best practices, regulations, grants, FIs	citizen school workshops		
<b>supply</b>				
<b>Stop 1 - EVALUATION</b>				
	<b>SELF EVALUATION</b>	<b>ASSISTED EVALUATION</b>		
<b>demand</b>	friendly tool	personal appointment		
<b>supply</b>		EPC design tools, solution templates		
<b>Stop 2 - DESIGN &amp; FORMALIZATION</b>				
	<b>DESIGN</b>	<b>SELECTION</b>	<b>FORMALIZATION</b>	
<b>demand</b>	technical solutions & checklist	registries & lists	contract templates	
<b>supply</b>				
<b>Stop 3 - REALIZATION</b>				
	<b>TRAINING</b>	<b>ASSESSMENT</b>	<b>MEDIATION</b>	<b>QUALITY ASSURANCE</b>
<b>demand</b>	micro-training	workplan checklist	citizen school personal appointment	follow-up report & questionnaire
<b>supply</b>	evaluation for registries & lists	workplan template		
<b>Stop 4 - VALIDATION</b>				
	<b>FEEDBACK</b>	<b>COMPARISON</b>	<b>MONITORING</b>	<b>CERTIFICATION</b>
<b>demand</b>	satisfaction/ complaints/ sharing questionnaires	friendly tool, EPC 2 best practices	before-after 2 best practices	best practices
<b>supply</b>				

Figure 39.- Valencia platform functionalities and tools available or needed

This theoretical framework is now rooted into the daily work of a customer service office, by interviewing the office staff and managers and reviewing their existing protocols for the other offered services.





### D3.7 – Save The Homes

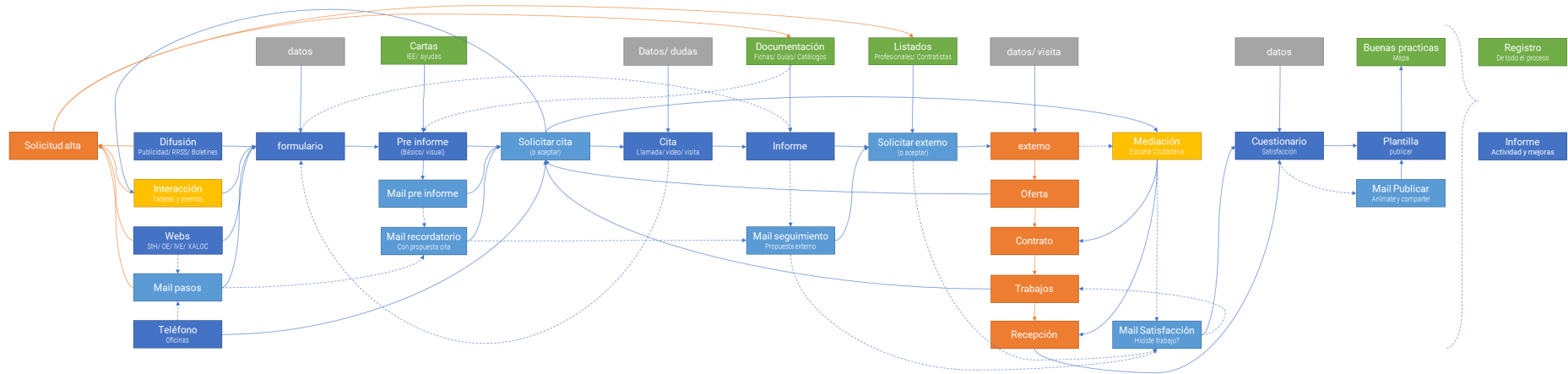
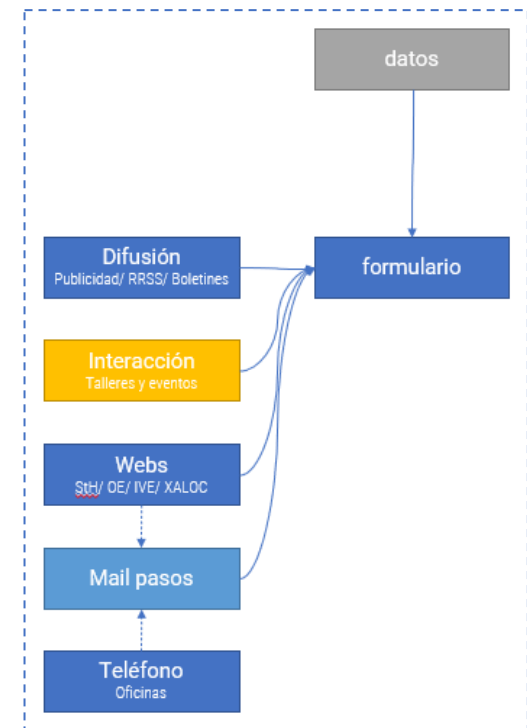


Figure 40.- energy renovation service workflow for Valencia pilot

**Fout! Verwijzingsbron niet gevonden.** describes the whole workflow as designed, with its linear intention, but drawing all the potential loops and catching all the risks for dropouts, by implementing follow-up manual or automatic actions. This will also be addresses in D4.5 Described one by one, **dark blue** boxes correspond to documents and tools, **light blues** correspond to interactions with the customer, **yellow** to group interactions, **green** to centralized resources, **grey** to customer inputs or contributions, and **orange** to actions outside the citizen hub:

#### A. Touchpoints from stop 0 to 1: onboarding

- **Dissemination** channels are one-way punctual actions of publicity, social networks messaging or newsletters explaining the Citizen hub services, friendly solutions & checklist, best practices, regulations, grants, FIS, embedding an easy **questionnaire** to encouraging customers to start taking action
- Also, StH, energy Office, IVE, XALOC network or other partners **websites** should contain this **awareness information** and a link to the **questionnaire**, and enable **contact mechanisms**, being e-mail addresses or phone numbers
- Both **e-mail and phone** will ask for a functional e-mail address in order to send a **welcome letter explaining the whole customer journey and service**, and connecting to the **questionnaire**
- Finally, **events and workshops** organized for interaction by the citizen hub will explain and/or use the **questionnaire** to engage customers with the initial actions of a renovation process.





*Figure 41.- From stop 0 to 1*



## B. Touchpoints from stop 1 to 2: evaluation

- **Questionnaire** is the backbone of self-evaluation, it automatically provides **basic, visual report** including a pre-calculated estimation of actual energy performance and comfort, potential renovation options with results and cost, access to available grants, and considering also conservation or accessibility works. It also links to the scheduling mechanism, form or phone, to get customers to the **personal appointment**.
- The **pre-report** is also sent by e-mail if customer fills their address. This e-mail also leads to the **scheduling mechanism**.
- There is another way to get a pre-report, being an owner of a building under the obligation to perform the building Evaluation Report (IEE -older than 50 years) or having asked for (and not got) grants in previous years. Regional government will drive an engaging campaign by **sending their customized pre-reports**, including information to contact the Citizen HUB.
- If scheduling mechanism is not used in 1 week, and **automatic reminder** proposing a meeting will be sent. This will be repeated 3 times. Automatic reminder will also be launched if customer didn't react to the welcome letter.
- **Scheduling mechanism** will allow to book a **personal appointment** (call, videocall or meeting at the citizen hub) with Citizen hub staff, redirect customer to a **workshop** or to a **mediation session**. A first call to the citizen hub can also derive into a scheduling a personal appointment.

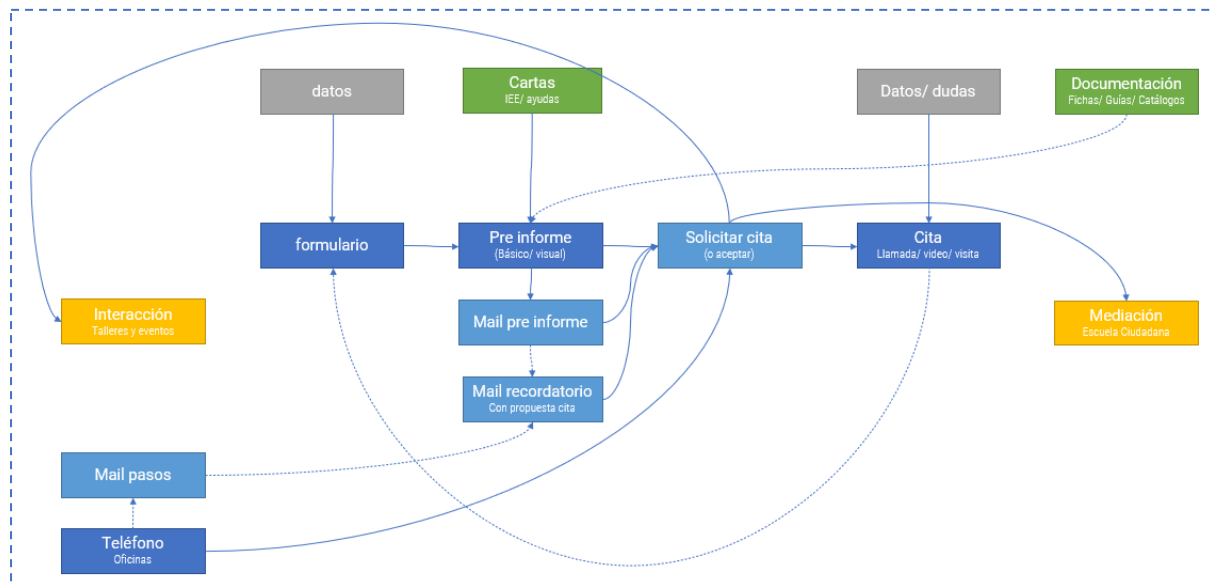


Figure 42.- From stop 1 to 2

## C. Touchpoints from stop 2 to 3: elaboration

- The **personal appointment** is the centre of this stage: a trained staff member will discuss possibilities and solve doubts of the customer, guiding their decision making from the technical, environmental, social and economic point of view, one on one. This can result in assisting back with the initial questionnaire or building a more complete/ customized/ technical **report**. Customer can come back to this point from almost any stage of the process, always through the scheduling system.
- Customized **report** is built on technical documents, official guides and commercial catalogues according to the customer building specificities and should lead to the **selection** of a validated professional: designer, manager, installer or contractor.
- The **selection tools** are supported by public administration. Access, contact and selection is free (and free-willed) for the customer and access for professionals is validated by the accomplishment



of a set of requisites, a dedicated training, or a successful evaluation test. Citizen hub staff can help understand descriptions, but decision relays on the customer.

- Contacted **professionals** are supposed to get extra inputs from the customer, if report information is not enough for them to build an **offer**, explaining all the services included and its costs.
- Ideally Citizen hub would provide a template for easy comparability, but in its absence, customer can **ask for an appointment** to solve any doubt about it, or even meet three-way in mediation, in order to make a decision, choose one offer and sign their **contract** (again, template would be ideal).
- In this moment the Citizen hub can lose contact with the customer and their renovation works, and therefore is crucial to set a proper **follow-up mechanism**:
  - If customer never accepted the automatic reminder proposing a meeting, the fourth week the reminder will propose to ask help to a professional and give access to the selection tools, including three random options.
  - If customer does not ask for a professional after 1 week from receiving their report, same automatic reminder linking to the selecting tools and proposing three random options will be sent.

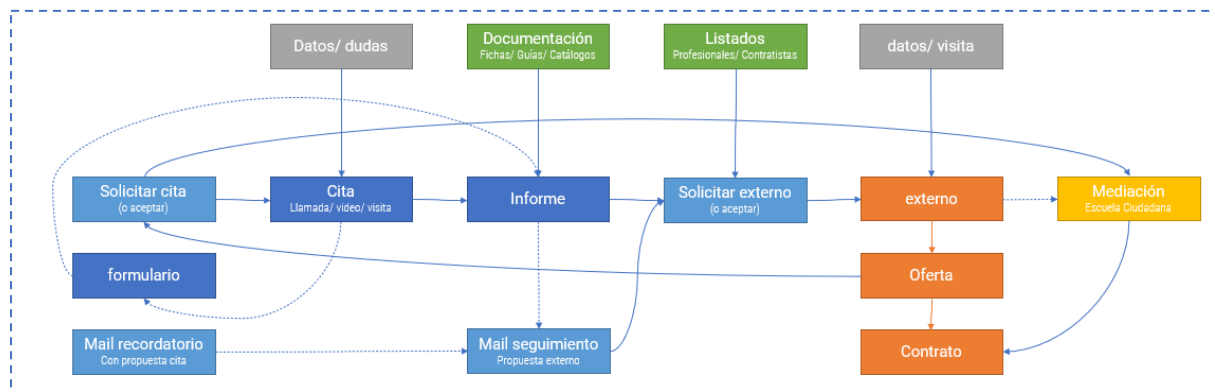


Figure 43.- From stop 2 to 3

#### D. Touchpoints from stop 3 to 4: realization

- The core of this stage the **renovation works**, performed by an external actor from the citizen Hub. Ideally the Citizen hub would provide templates for periodic reporting of renovation works, but in its absence, the citizen hub acts indirectly, trying not to lose contact with the customer by being present through different follow-up mechanisms:
  - After a month from a mediation about an offer or contract, an **automatic reminder** will ask about the renovation works, offering to schedule an **appointment or a mediation** if any problem or doubt has arisen (keep in mind that customer can always go voluntarily to the scheduling system, but this way we push for feedback), and connecting to a **satisfaction questionnaire** (in case the works are finished)
  - Same **reminder** will be launched a month after asking for a professional with no more news from the customer
  - Same **reminder** will be launched a month after sending the reminder proposing to select a professional with no more news from the customer
  - This action will repeat three times before considering the **dropout**.
- Customer knows that before finishing the renovation and receive the works, can ask for an appointment or mediation. If they do, the Citizen hub will know that the works are finished and sent them the **satisfaction questionnaire**, but, if it is not the case, previous follow-up mechanism should work instead.

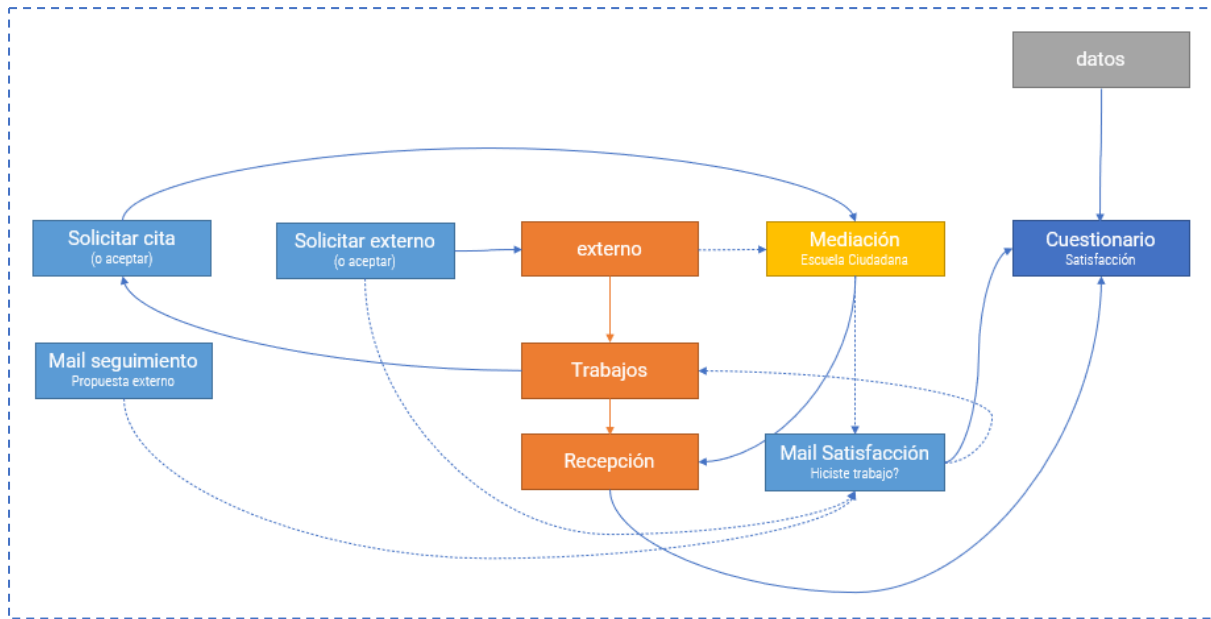


Figure 44.- From stop 3 to 4

**E. Touchpoints from stop 4 (and back to 0): validation**

- The **satisfaction questionnaire** is for the moment the main component of this last stage, where customer will again input some need data and help improve the protocol, the services and the solutions provided on one hand, and on the other hand, will be asked to **share** their experience.
- The **sharing template** will allow the customer to publish very easily their experience in the **best practices** map, which in turn, will contribute to the dissemination activities in stage 0.
- The whole process is being registered for further analysis, improvement or replication
- The annual activity is summarized by each citizen Hub for evaluation and improvement.

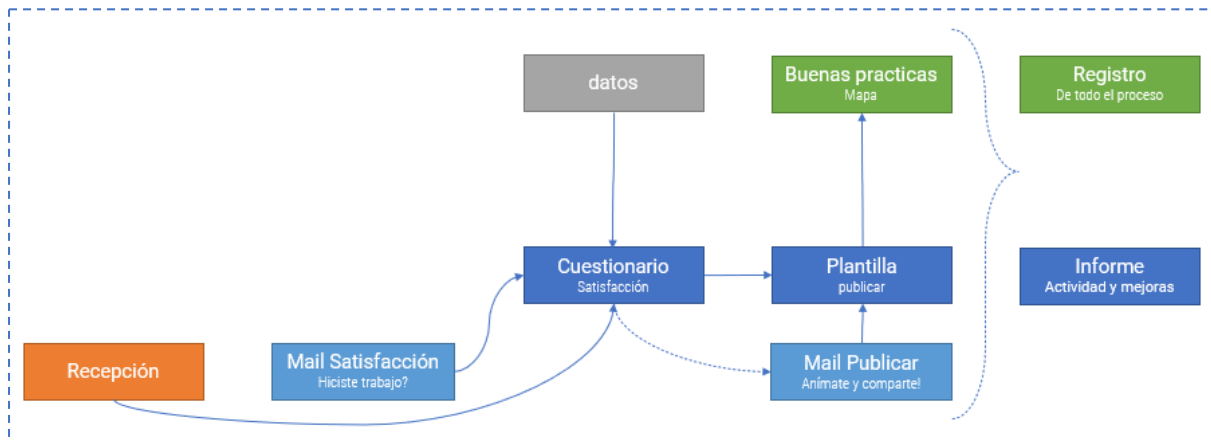


Figure 45.- From 4 (and back to 0)

As a final remark, keep in mind that in real life workflows, limits between stages, stops and steps are not so clear, functionalities are repeated, results fail, and one must go back, or just some steps are skipped or some functionality nudges the access to many other, in different stages, this is, the renovation process is not such a linear process as we are depicting. Nevertheless, this protocol tries to foresee all the potential loops and back and forth events and will be as is tested and evaluated during WP4 and WP5 activities, where it will result in a final functional protocol for the Valencia region citizen hubs network.



## 7.2.2 Platform functionalities to be implemented

Although, as seen in section 5 and 6 some resources are already available, some others are to be implemented. During the first half of the project, and according to activities performed, some of them have already been implemented and are in testing phase:

### F. renovEU: a friendly tool for self-evaluation

RenovEU<sup>32</sup> is an online tool designed to make a personalised pre-diagnosis of residential buildings placed in Valencia Region with the aim of promoting and making known costs and benefits of energy renovation.



Figure 46.- welcome to renovEU

It analyses how the building is nowadays and how to achieve better thermal comfort and energy savings, complying with the requirements for obtaining aids from the **European Recovery Fund**.

On the first place, the tool is based on an analysis of the **residential stock** in Valencia region, its energetic behaviour with energetic and thermal comfort indicators. It includes the same typologies used for TABULA/EPISCOPE European project. For the Spanish Mediterranean area, there are four different categories, depending on the number of dwellings and the height of the building:

- Apartment block
- Multifamily house
- Single Family House
- Terraced House

It is also considered five construction periods, delimited by the different regulations regarding residential building construction:

- Before 1900
- Between 1901 and 1936
- Between 1937 and 1959

<sup>32</sup> (<http://renoveu.five.es>)



- Between 1960 and 1979
- Between 1980 and 2006

This classification originates a total of 20 typologies. The classification of a building in these typologies is carried out based on cadastre information for a location or coordinates (x, y) in terms of number of dwellings, number of floors and year of construction.

In addition, the six **climatic zones** that are in Valencia region (according to national regulation: CTE) have been added: B3, B4, C3, D2, D3, E1. This results in 120 starting typologies.

**Thermal installations** have also been added according to ERESEE, distinguishing 5 types of installations that are commonly found on residential buildings to supply it with typical energy demands. It has been considered individual installations for each dwelling, the predominant case in Spain, especially in the Mediterranean area. There are five combinations of installations to supply the building with Domestic Hot Water, heating, and cooling, considering energy-deficient installations, such as electric heaters, or the absence of systems, such as cooling devices. Choosing the most representative combination is done by the user of the renovEU tool. These five combinations are:

- Electric hot water tank for Domestic Hot Water (DHW), and electric heaters for heating service. No cooling system is considered.
- Conventional water heater powered by natural gas for Domestic Hot Water (DHW) service, and electric heaters for heating system. No cooling system is considered.
- Electric hot water tank for Domestic Hot Water (DHW) service, and split units for heating and cooling services.
- Conventional water heater powered by natural gas for Domestic Hot Water (DHW) service, and split units for heating and cooling services.
- Conventional natural gas boiler for space and water heating for Domestic Hot Water (DHW) and heating services. No cooling system is considered.

Installations, added to the constructive typologies and climatic zones, result in **600 starting (base) buildings**.

Next, the interventions and the calculation of energy savings have been defined when applied to the 600 base cases. The condition for the subsidy established in RD 853/2021 is always considered: reducing primary energy consumption by 30% and, in some climatic zones, also the annual energy demand.

The different **interventions measures** with the aim to reduce energy consumption defined for buildings are the ones defined in D2.5:

- Change of windows for high quality ones, including moving shadow elements
- Actions on the envelope, with interventions on façades, roofs, and floors improvements.
- Heat pump only for DHW
- Solar PV system
- Heat pump for DHW, heating and cooling

There are five initial combinations defining the **renovation scenarios**:

- Actions on the envelope + change of windows
- Change of windows + heat pump for DHW
- Installation's replacement, i.e., heat pump installation for HDW, heating and cooling
- Complete plan of action, i.e., envelope + windows + installations
- Solar PV system



With the aim to maximize the aid, other four renovation scenarios are considered, based on the four previous ones, and combining them with solar PV system. In this way, they access the maximum subsidy for all cases.

So, there are nine interventions that, applied to the 600 types of the initial buildings, give rise to **5.400 combinations to simulate improvements** using official software Cerma tool.

Next step is the **economic calculation**. It has been used IVE price database to quantify the cost of interventions. With the aid percentages established in RD 853/2021, the corresponding aid is calculated, provided that the energy saving requirements are met.

These economic aids are not only for energy rehabilitation. It's a condition to get the subsidy, but other interventions are possible. For this reason, the averages of the real costs of the requests for aids from previous years in matters of accessibility and conservation have been analyzed. So, when results are offered to the user, they can consider these costs together with those of improving energy efficiency.

During the design of the tool, an attempt has been made **to simplify in five steps a complex process** that contemplates energetic, comfort and economic parameters:

- The user begins by indicating the building location, linked to a climate zone;
- cadastre provides data about typology and the year of construction; and,
- finally, the user chooses the combination of installation that better fits to the building.
- It is obtained a “base result”
- to which improvements can be added, complementing them and calculate the percentage of aid in each case.

RenovEU is also aimed to professionals in rehabilitation building sector, since it is possible to obtain final documentation that offers supporting information about the improvements considered in the building.

#### G. CHC registry (including training & evaluation): to find a professional

The Valencia Institute of Building (IVE), with the support of the Valencia Regional Government (Generalitat Valenciana), has developed the “Registro para la Calidad del Hábitat Construido”<sup>33</sup>. This “Register CHC” is a **recognition scheme where citizens can find accessible, transparent and free information** through a website managed by the IVE and supervised by the Generalitat Valenciana, which reinforces public confidence and trust.

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<sup>33</sup> from now on, “Register CHC”, <https://registrochc.five.es/>



Figure 47.- welcome to the CHC register

The “Register CHC” contains the following three areas:

- Buildings
- Companies & professionals
- Products

**Professionals or companies** may register in the “Register CHC” as long as they meet the requirements set out in the area (detailed protocols are in place). In line with the objectives of the StH project, the “Companies and professionals” area includes requirements about the skills and experience of professionals. In general, their registration will be reviewed and renewed every 3 years. Complaints from citizens will be investigated and may result in the removal of the professional or company from the “Register CHC”.

At the moment, the following categories are included within this area:

- Construction companies specialised in renovation (from January 2022).
- Skilled professionals in the preparation of IEE (\*) reports (from February 2022).
- Others (in process)

(\*) The IEE is an evaluation report for residential buildings, required by the Valencia Regional Government, and compulsory for buildings over 50 years old. It describes the constructive characteristics of the building related to its conservation, architectonic accessibility and energy efficiency. Its objective is to point out the constructive, functional, safety or habitability deficiencies detected, in order to warn about them and provide guidance on the necessary measures to maintain the building in an adequate state.

#### H. Citizen School: participative mediation

After some steps on the **onboarding activities** such as events, workshops and personal appointments (not all of them related exclusively to energy renovation, but energy related), the energy Office put in place on February 2022 the new service for participation, mediation, learning from the field, changing ideas and solve doubts directly from (and between) the actors involved in renovation, and with the Office staff mediation.

Initiative was presented during the December-January workshops and newsletters, and interested persons were contacted to be part of the first Citizen School of Energy Rehabilitation, a working group

born with the intention of helping citizens and local installers, contractors or professionals to share and solve doubts and questions in relation to the energy renovation of dwellings. Therefore, first meeting had the following points:

- **Share news** from the call for aid for the rehabilitation of buildings and homes Next Generation
- Practically test the recently published RenovEU **pre-diagnosis tool** with real households
- **Reflect** on the Citizen School and the Save the Homes project: how can they help each other?

Session was held in person at the energy Office with a duration of 90 minutes and 4 participants, very interested in following and continuing the collaboration.

### I. Other tools & services: to fulfil the whole customer journey

Although some key pieces of the customer journey are already in place, analysis of the Citizen Hub needs points to the necessity of developing other tools, such as:

- **Powerful engaging tool → for customers:** centralizing easy to read information about best practices, solutions and their benefits, financial options, collaborating entities, etc... In this regard, a XALOX network portal is under development and will be available under the URL: <https://xarxaloc.es/>



Figure 48.- xarxaloc mock-ups

- **File/ customer manager system → for staff:** centralizing data about users, services provided, trainings, customer journey stages covered, questionnaires answered, etc... for statistics, analysis, learning, planning and improving the services
- **Templates for external simplified interaction → for supply side:** centralizing and harmonizing information provided to customers in order to be easily comparable and understandable. This can be forms for citizens to ask for tabulated or customized information; forms for suppliers to add an offer or a product aligned with the solutions catalogue of the Citizen Hub, or templates for providing quotations, work programmes, follow-up reports, etc...