Interreg
EUROPEAN UNION
2 Seas Mers Zeeën
SHINE
European Regional Development Fund

Method to set up energy efficient district renovations (houses in private ownership)

v.1 | 13 November 2020

V 2 | February 5 2021

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SHINE

European Regional Development Fund

Sustainable Houses in Inclusive Neighbourhoods (SHINE) brings together 14 partner organisations from 4 member states. The project's overall objective is to reduce carbon emissions in residential dwellings. The project is co-financed by Interreg 2 Seas and the European Regional Development Fund.

Visit our website: www.2seas-shine.eu

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Introduction

Residential dwellings are a major part in our GHG emissions, so major reductions are possible by retrofitting homes. Shine wanted to accelerate the hesitant process of the participating regions on adoption of energy efficient and renewable energy technologies in the retrofitting of residential dwellings. Renovating by the district approach increases the critical mass and makes a long lasting social embedding possible.

The overall objective of this project was to reduce carbon emissions in residential dwellings. By working directly with the residents in a bottom-up approach, the energy consumption in (deprived) districts will reduce.

You're reading a report and evaluation of the methods the different partners in the Shine project used in guiding renovations in houses in private ownership, on the one hand for maximum carbon reduction for the lowest possible cost and on the other hand, to get as close as possible to achieve the Nearly Zero Energy level (Enerphit level).

The districts in Shine differ in social context, but also in housing stock. The approaches are tested in different circumstances, so that the robustness and transferability of the methods can be demonstrated.

This report contains information about one of the work packages within the Shine project. To make it comfortable for you as a reader (it is redundant to read the other manuals if you're only interested in these outcomes), we start with some general information of the project and the districts.

The emphasis in this work package are houses in private ownership. Within the Shine project a similar approach is used for houses in property of the project partners, you can read the outcomes in the report 'joint menu of renovation options'. The

methods used to set up a participation process in districts as an instrument to lower the threshold for districts renovations, are published in the report 'Community engagement.
The Shine project also worked on need-driven local networks of building professionals, methods and results can be found in the report 'Method to identify the needs of local building professionals'.

Use our methods!

This report gives you an overview of the approaches, methods, tools and services used by the partners in the Shine project to guide renovations in houses in private ownership. We encourage you to take a look into our experiences and use what seems to suits in your district, for your target group, for your housing stock.

Shine is more than this!

This manual is the report on 'Method to guide renovations in a district approach and to guide renovations to get as close as possible to NZE'. But Shine is more than what you get in this report. Please take a look in the reports.

For local authorities or social housing companies:

- Tools to start up a participation process with a bottom-up approach.
- Method to guide families of the districts by energy experts.
- Method to guide renovations in a district approach and to guide renovations to get as close as possible to NZE.
- Method to identify the needs of local building professionals.

For building professionals:

- Joint menu of renovation options.
- Cross-border living database of building challenges.

- Publication of the renovation process.

For community- and welfare organisations:

- Tools to start up a participation process with a bottom-up approach.
- Method to guide families of the district by energy experts.

The challenge

A lot of private owners still don't renovate their properties to higher energy standards. To tackle this problem, Shine elaborated joint methods e.g. district renovations: in a district, properties are in the same conditions and owners inspire and persuade each other to carry out investments. Project partners in Shine tried to remove the barriers of the owners to invest in their houses by guidance to determine the needed measures (without creating lock-in effects) and organising group purchases to find reliable building constructors. The aim of these district renovations is to implement the most efficient energy saving measures. Project partners tested the elaborated method in different circumstances. This method will be disseminated and implemented in other districts (after the end of Shine).

The other method used in Shine is the guidance of owners in the renovations of their houses as close as possible to the NZE level. How to realise this level in newly built houses is well known, much more challenges exist in the case of renovations. Shine elaborated a joint method: a renovation assistant was introduced to assist owners from planning phase to delivery in their renovation process. Owners need to go on the market for an energy audit, an architect, constructors …. The renovations assistant guides the owners throughout this process. The function of renovation assistant will be transferred to the building industry.

The districts

Shine is a project in the Interreg 2 Seas Programme. Project partners are situated in the Interreg 2 Seas area, covering coastal areas of England, France, Belgium (Flanders) and the Netherlands, the 2 Seas area is connected by the Channel and the North Sea.

In this Shine work package following partners are involved:

- Intermunicipal Organisation of the Campine-Region (IOK) (BE),
- City of Sint-Niklaas (Sint-Niklaas) (BE),
- Thomas More Kempen vzw (Thoms More) (BE),
- Hastings Borough Council (Hastings) (UK),
- Kamp C (BE),
- Clavis (NL),
- Parc naturel régionales des Caps et Marais d'Opale (Parc Opale) (FR).

All of the partners worked in one or more districts, or in their whole region.

A small overview:

Intermunicipal Organisation of the Campine-Region (IOK)	6 districts in the Campine Region (Flanders)
City of Sint-Niklaas (Sint-Niklaas)	1 district in the town centre (Flanders)
Thomas More Kempen vzw (Thomas More)	Knowledge partner (support other partners) (Flanders)
Hastings Borough Council (Hastings)	1 district (England)
Kamp C	Entire Campine Region (Flanders)
Clavis	2 districts in Terneuzen (Netherlands)
Parc naturel régionales des Caps et Marais d'Opale (Parc Opale)	(France)

Demographics and housing stock is very divers in the different districts. An overview:

	Demographics	Housing Stock
IOK district 1	Somewhat older population (44% older than 60 years). Mix of upper and lower middle class.	All houses are very similar. Built between 1932 and 1970. Not many houses were already renovated.
IOK district 2	Older population (73% older than 60 years). Mix of upper and lower middle class.	All houses are very similar. Built between 1962 and 1970. Not many houses were already renovated.
IOK district 3	Older population (50% older than 60 years). Mix of upper and lower middle class.	All houses are very similar. Built between 1981 and 1990. Not many houses were already renovated.
IOK district 4	Older population (54% older than 60 years). Mix of upper and lower middle class.	All houses are built between 1961 and 1990. In some houses were already some retrofits undertaken.
IOK district 5	Very diverse population regarding age and income.	All houses are built between 1961 and 1990. In some houses were already some retrofits undertaken.
IOK district 6	Very diverse	All houses are built

	population regarding age and income.	between 1961 and 1970. In some houses were already some retrofits undertaken.
Sint-Niklaas	Rather young population (only 16% older than 60 years). Large range in income, family units, origin.	Most houses are terraced houses. Majority built before 1945 and a lot of them have heritage value (main style is art-deco). In some houses were already some retrofits undertaken. 56% in property.
Hastings	One of the most deprived areas in the South East of England. 17% of households are living in fuel poverty.	83% apartments. 71% built before 1919. 50% privately rented. 50% of the apartments does not meet fire safety standards.
Kamp C	Very diverse	Very diverse
Clavis	Diverse population regarding age: 53% older than 45 years. Mix off upper and lower middle class.	80% of housing stock built between 1945 and 2000. 68% private houses, 32 % rental houses.
Parc Opale		

How to guide renovations (houses in private ownership) in a district approach

In search for candidates

Different methods were used to set up a bottom-up approach in the districts. An overview is the object of the report 'Community engagement.

A small overview of the methods used by partners by starting up a participation process with a bottom-up approach:

- Information meetings
- Heatwalks
- Door by door visits
- Studytrips to inspiring examples

Energy audits in houses

What's in a name

An energy audit is a profound review of the energetic and sustainable state of a building, performed by an external consultant. The result is an extensive report indicating the possible energy saving measures with maximum carbon reduction for the lowest possible cost. Surplus attention is put on behaviour, technical supplies, energy consumption and awareness.

Sint-Niklaas is the only project partner in Shine who worked with the energy audits. As surplus the residents are also offered a second meeting with the advisor, to run through the report and exchange ideas, so inhabitants can make the right (sustainable) choices in their renovations process.

An external consultant makes a home visit (on demand of the owner). During the 1,5 house visit, the consultant asks a lot of questions, give tips and make a report after the visit.
The report includes the following information[1]:

1) A detailed description of the current state of the dwelling:
    - Structure of the building: stability, humidity problems, condensation, heating, insulation, lightning, warm water, ventilation, cavity … to see if future investments are achievable;
    - State of technical installations and supplies: to see where investments on energy use are demanded;
    - Energy performance of the building;
    - Presence of dangerous fluids;
    - Future situation and risk analysis, after execution of investments : air density, acoustics, heat comfort during summer
    - And – if applicable: the cultural historical value of the building, and what cityplanning demands.
2) A detailed description of electrical supplies and analysis of use and behavior of inhabitants:
    - Detailed analyses of gas-, water-, electricity-, gasoil-use;
    - Description of age of supplies and use of them.
3) An extended renovation strategy:

[1] A blank energy audit report – used in Sint-Niklaas – can be found in the annexes.

- Overview of urgent problems and how to solve them, in order to make future energy saving measures possible and avoid lock-in effects;
- Overview and grow path of the proposed measures in order of urgentness, feasibility and energy profit leading towards energy savings;
- Overview of small investments and/or behavior change in order to save energy;
- Estimation of renovation cost for proposed investments in awareness of existing grant regulations;

4) Overview of grants.
5) Offer of a second home visit to encourage again to start the renovation process.

The content of the audit and the report evolved during the first months of the Shine-project: extra information was mentioned during the house visits and in the report, new webtools were used (e.g. a tool by the Flemish government to make sure if solar panels are useful on the roof). Later on in the project, information leaflets about investments the inhabitants were willing to do, were enclosed in the report. Therefore it was very useful to have a very profound contact with the external consultant. Most of the energy audits were performed by one consultant. As the project went on, he knew the district and the Shine-project very well and could mention some opportunities.

Sint-Niklaas interviewed the external consultant for an article in the city magazine (November 2019), some quotes:

- “every renovation advice is customized work”
- “the report is a tool for residents willing to renovate: a guideline for small investments with a lot of impact on the one hand and a roadmap to make the best choices for the future, when thinking about the bigger investments on the other hand”

Results

In Sint-Niklaas, 168 energy audits were executed.

Inhabitants were asked in an online questionnaire to give an overview of investments executed after the energy audit (only 55 out of 150 responded).

Overview of investments:

These numbers are seriously underperforming, since a lot of non-responders also did investments, as could be concluded from talking to them.

	Executed between 01.09.2016 and 28.02.2020	Planned to be executed between 01.03.2020 and 31.08.2020	Planned to be executed after 31.08.2020
Roof insulation	11	6	5
Cavity wall insulation	9	1	6
Energy efficient heating system	9	1	5
Loft insulation	3		1
Solar panels	7	2	2
Floor insulation	4	1	1
High performance glazing	12	5	8
Ventilation	2		
Warm water	9		
Heat pump		1	
Green roof			1

What worked

The energy audits are offered for free in the Shine project. This takes away the financial barrier for inhabitants who don't have the means to do it their selves.

The consultant plans the home visits together with the inhabitants, on a moment when it suits them. This was also possible in the evening hours and during the weekend, so nobody had to take a day off at work.

Most of the energy audits were performed by one consultant. He knew the district very well, as the project went on.

Before starting the energy audits, there was a very open meeting with the organisation. Input and experiences from both parties were taken into account. This made it possible to build up a very reliable foundation on the engagement of the consultant and the organisation.

A profound contact with the consultant (and the organisation he works for) made it easy to uptake new features in the audits and the report.

The report of the energy audit could be sent by mail or by post for people who don't have an email address.

What didn't work

A second home visit was offered, but this wasn't so popular (only 10 out of 150 = 6%).

Tips

- Make the external consultant and the organisation he works for a real partner in the project. A lot of trust has to be put in the relationship.
- Offer the audit for free.

- Ask a copy of the report, sometimes inhabitants lost their version, it is rewarding to be the 'helpline'. This is also a moment to talk again and offer help in their renovation process.

Learned from other project partners

As more and more inhabitants had their energy audits, questions in the renovation process were growing. We learned from Kamp C and introduced a kind of renovation assistant.

Methods to reach residents of the districts in a more efficient way, were exchanged with other project partners. As a result we started to announce the appearance of our 'Warmest Neighbourhood'- promotion team with leaflets, before starting the door by door visits.

Project partner Hastings learned from Sint-Niklaas about the energy audits and will use them in a project that will be followed on from Shine, for whole house retrofit.

Learned from other EU projects

From the See2do (www.grensregio.eu/projecten/see2do) project Sint-Niklaas learned more on how to engage inhabitants and the content of the audit report. Also the use of thermographic info was taken into account.

Self-scans in houses

What's in a name

A self-scan is an accessible questionnaire developed by each of the project partners. The self-scan is to be completed by the owners (with or without the help of a volunteer or consultant). As result the possible energy saving measures are cleared out. The self-scan is also a starting point in the renovations process of the owners.

In Hastings e.g. the self-scan was developed to be given out to residents who were at risk of living in fuel poverty and were then used to prioritise access to the Warm Homes Check Service (i.e. to get a visit by an energy surveyor).

Results

Different project partners performed self-scans[2]

- In the Campine Region (IOK) 137 self-scans were filled in by the inhabitants of the 6 districts.
- In Hastings 71 self-scans returned through the Warm Homes Check service. There is no information on the actual adaptations made as a result of the self-scans.

Self-scans resulted in following investments in the Campine Region of IOK:

	IOK
Roof insulation	23
Cavity wall insulation	11

[2] A blank report of the different self scans used in the Shine project can be found in the annexes

Energy efficient heating system	3
High efficient glazing	11
Solar panels	1

What worked

The self-scans in the IOK area were sufficient to get a better view on the state of the house (in contradiction with the experience of the project partner in Hastings). We had the feeling that the residents were enough informed with the brief report they received after the self-scan to make a good decision on which retrofit measures they wanted to undertake. Our assumption that more detailed studies in every house wouldn't give much more information than a simple self-scan seemed to be correct. This was demonstrated in the districts where some houses were visited by an expert from Kamp C (see further). The outcomes of these visits were the same as the outcomes from the self-scan. Nevertheless it was useful to do some expert visits in districts where the houses were built in the same way by one builder. For example to check if the cavity wall was suited for cavity wall insulation.

What didn't work

The self-scans in Hastings proved to be ineffective. Although a number were completed, none were completed by owners who had the means to carry out retrofit improvements on their own (in contradiction with the scans in the IOK area). The people who completed the self-scan did not have the money to undertake work, so no direct carbon saving measures were introduced. They did provide a good referral into the Warm Homes Check Service however. The Warm Homes Check Service is a service (funded by

health) that helps people who are living in fuel (energy) poverty and who cannot afford their energy bills. The service provides advice on welfare benefits as well as energy saving measures.

We assume the self-scans in the IOK districts worked, because in the Campine region only owners who had plans to carry out renovations filled in the self-scan. Since the self-scan served as a sort of registration form to participate in the district renovation.

Tips

Use contractors who are experienced with vulnerable clients. This is a skill that the contractor can use for future retrofits.

An individual approach is really crucial to persuade residents to invest in energy saving measures in their house. It is not enough to give general information. But even when you give an individual support, there remain a lot of barriers that can hold back residents to invest, so you should not aim to high. In districts where more than 10% of the residents invest in energy saving measures, it is a success if we look to our own experiences and compare to other projects.

Heatwalks are a very interesting and useful way to trigger people to think about their energy consumption and possible energy saving measures for their house.

A lot of awareness raising in the IOK region was done by informing the residents about their energy consumption and possible solutions to lower their energy consumption. Part of the solution was investing in energy saving measures, but another part of the solution was making behavioural changes. People were encouraged to follow their energy consumption on a monthly basis since investigation shows that people save 9% energy consumption on average when they start to follow their energy consumption regularly.

Learned from other project partners

IOK started with heatwalks because other project partners as Hastings and Parc Opale told us about their good experiences with this technique.

IOK exchanged methods with the other project partners to reach residents of the districts in a more efficient way. As a result we came to the method of placing information stands in the district, make contact with organisations active in the district, sending residents a letter and then perform door by door visits to residents that did not response to any of the other communications.

Clavis learned from Ieper and Thomas More that it takes a lot of energy to get private owners to take energy saving measures, mostly they haven't the needed amount of money available. The payback time of the investments is in most time more than 6 years.

Learned from other EU projects

IOK learned from See2do (use of thermographic info) (www.grensregio.eu/projecten/see2do) and Triple A (one stop shop) (**www.interreg2seas.eu/nl/triple-a**).

Group purchases of energy saving measures and renewable energy

What's in a name

'Buying by the dozen is cheaper', that is what is assumed in a capitalistic market system. But nevertheless in a group purchase, this effect is only one of the benefits that can be achieved. By bringing people together to go together on the market of building professionals, the biggest benefit is that they are better informed and supported by the coordinator of the district renovation. In

this way people can ask building contractors the right questions and judge - in a better way - the offers that were received.

Inhabitants are requested to show interest in buying energy saving measures. A local market survey is set up. After a local market survey, a steering committee of district residents judges the bid in order to make a selection. Inhabitants are free to make use of the offer. They are sure of the trustworthiness of the contractor and the well execution of the measures.

Sint-Niklaas and IOK used existing group purchases and communicated about them, provided information sessions about the topic, provided moments to show interest and provided moments on talking about the offers of the contractors.

Clavis has as well dwellings in property, as dwellings they let. When they're renovating dwellings in their own property, the moment is used as an opportunity to offer the neighbours the chance to engage the contractors at the same price.

Results

	Topic	**Numbers of interest**	**Numbers of investment / change of energy supplier**
Sint-Niklaas (in Shine district)	Better glazing	38	2
	Roof insulation	24	3
	Wall insulation	20	1
	Loft insulation	6	0
	Green energy 2017	69	37
	Green energy 2018	62	40
	Green energy	55	32

	2019		
	Green energy 2020 (still ongoing)	28	
Sint-Niklaas (for the whole city)	Green energy 2017	3416	1844
	Green energy 2018	3098	1958
	Green energy 2019	2755	1597
	Green energy 2020 (still ongoing)	1382	
IOK (in districts in the Shine project)	Roof insulation	14	11
	Cavity wall insulation	7	4
	Energy efficient heating system	4	3
	Solar panels	3	3
	Wall insulation	2	0
IOK (for the whole Campine region)	High energy heating systems 2017	525	126
	Wall insulation 2018	401	96
	Roof insulation 2019-2020 (still ongoing)	303	
	Green roofs 2019-2020 (still ongoing)	204	
	Solar panels 2017		
	Solar panels		

	2018		
	Green energy 2017		
	Green energy 2018		
Hastings	Loft insulation	40	40
	Cavity insulation	40	40
	Central heating	40	40
Clavis	Upgrade lighting to LED	0	0
	Cavity wall insulation	2	2
	Internal wall insulation	0	0
	External wall insulation	0	0
	Better glazing	0	0
	Gas central heating upgrade	0	0
	Roof insulation	2	2
	Solar panels	0	0
	Mechanical ventilation	0	0
	Smart thermostats	0	0

What worked

Sint-Niklaas and IOK used existing group purchases to encourage inhabitants to take part in the procedure. The critical mass is bigger, prices can be lowered and it's less time consuming.

Hastings has good experience with a good contractor who was aware of the client's needs. All the residents were elderly and the contractor spent a significant amount of time with them carefully explaining what works were going to happen and then following

the installation of the heating system how to use the heating controls.

Clavis worked with the contractor, to inform the residents about grants which could be asked for several measures.

What didn't work

The group purchases in the IOK districts could persuade some residents to undertake action and carry out energy saving measures, but a lot of residents were discouraged by the high costs of these measures. A group purchase gives a slight cost reduction, but in many cases it isn't sufficient to make it really attractive for residents to invest.
IOK tried to overcome the investment barrier by offering an energy loan for €15,000 that is available from the Flemish Government, but it seemed that this wasn't enough to persuade inhabitants to make the investments.

Clavis had little response, main reason also here was the cost of the investments.

Identifying funding for the group purchase in Hastings was particularly difficult (although it was a barrier Hastings overcame). Changes in grant funding nationally meant Hastings could not rely on previously available ECO funding so 'creativity' was needed with how to approach different funding providers. For instance the funding for the cavity wall insulation was not available until heating at the building had been installed.

Group purchasing needs significant time from the municipality and voluntary groups.

A lot of (legal) support is needed.

Tips

- Encourage to take part in existing group purchases, to enlarge the critical mass.
- Be aware of a lot of (legal) procedures.
- Make sure your organisation is ready for a lot of (administrative) work.

Control after renovation if the proposed carbon reduction has been achieved

Did we achieve the proposed carbon reduction? Shine controlled this by collecting the energy saving measures implemented in the houses and by calculating the carbon reduction based on some key figures. With this control an evaluation can be made if the method is effective and durable (in various circumstances) in order to transfer it to other districts.

A questionnaire was sent to the participants, asking them, among other things, which shell parts have been post-insulated. More specifically, they were also asked about the type of insulation material and its thickness. Using the following formula, the amount of energy (Wh) saved could be calculated.

Q = (U before renovation – U afterrenovation) * A * Degreedays * 24

The U-value (W/(m².K) is the thermal conductivity of the shell part, it is a value that reflects how good the insulation is. The lower this number, the better the insulation value.
A stands for the surface in m². A degree day is a unit of calculation to easily include the temperature in calculations, particularly in energy consumption calculations. A degree day is relative to a reference temperature, usually the one at which heating is no longer required. The number of degree days depends on the region and can be found on the following website: https://www.degreedays.net.

The installation of photovoltaic panels will greatly reduce electricity consumption; people produce a lot of energy themselves. Depending on the installed peak power, orientation and gradient, the annual energy yield in Wh can be calculated.

Replacing an old boiler with a new one will lead to energy savings because of the much better efficiency.
All these elements and calculations were listed in an excel file and this way the total energy saving in kWh is calculated.

Then the amount of CO2 saved can be calculated. For this, we used the following constants :

- for fuel oil : 264 gCO2/KWh
- for natural gas : 202 g/KWh
- for electricity : 644 g/KWh

These are the CO2 emissions used for Flanders.
These will be different in the other countries, depending on the energy mix (based on the primary sources of energy).

An example:
A wall has a U-value of 1.2 W/m².K for the renovation, by installing insulation the U-value drops to 0.3 W/m².K. The total insulated wall surface is 120 m². Via www.degreedays.net, we find 1770 degree days for the period from 1/8/2019 to 31/7/2020 for our region. This gives us an energy saving of :

(1.2 - 0.3) * 120 * 1770 * 24 = 4587 kWh.

The fuel used is natural gas with CO2 emissions of 202 g/kWh, which means that there will be 926 kg less CO2 emissions.

Installed PV panels with a capacity of 4000 kWh give us a reduction of (4000 kWh * 0.644 kg/kWh) of 2.57 tons of CO2.

An old boiler with an annual efficiency of 70% will be replaced by a new condensing boiler with an annual efficiency of 98%. This results in a saving of 28% on the boiler's energy consumption.

Results

Many people are interested in renovating, but it is very difficult to make an inventory of all the works carried out during this project. Some owners already had renovation plans for some time and implemented them immediately. Many residents however need more time to make a decision because it was their first introduction to the results of the audit and they need more time to think about the renovation.

We note that only 5% of the Elisabeth district wanted a second visit. This is also noticeable in the completed surveys in which we ask for information about the renovations carried out. On the basis of the surveys received and completed, we can calculate that the renovation work actually carried out, results in a CO2 saving of 18 tonnes on an annual basis. A small gain, for which the main reason is that there is only little information about the works carried out.

It is therefore more logical to start from the audits. In the Elisabeth district in Sint-Niklaas, 168 audits have been carried out. Houses date from before 1945 and some renovation works have already been carried out in several buildings. We have taken into account the Tabula project where a type of house dating from before 1945 is defined. Furthermore, we have taken into account the Flemish objective for 2050, namely that each dwelling has an energy consumption of less than 100 kWh/m² (almost energy-zero dwelling).

All this results in a CO2 saving of 506 tons and this is only for the Elisabeth district in St-Niklaas.

In the IOK region, the same calculation was made, based on the Tabula project and on the Flemish objective 2050. The difference is that residents had to complete a self-scan with a list of renovations they wanted to carry out. A professional audit was also carried out in several buildings.

Here too, almost no data are known about works carried out. Calculations are based on works that can be carried out in the future.

With the current data here we notice a CO2 saving of 655 tons of CO2.

Together with the Elisabeth district, this represents a total CO2 saving of 1161 tonnes of CO2.

What worked

The audits and self-scans have proved their worth. However, face-to-face contact is important because this is the best way to achieve the most and best results.

A survey via e-mail does not give the desired result because there's very little response.

What didn't work

Conducting a survey at the end of a project via e-mail does not yield any results. One would have to make another home visit to be able to list the results. But the homeowners have the information they needed and that's where it stops for them.

A saving in kWh doesn't tell the homeowners that much, they have no idea what a kWh is. It is better to express the savings in euros.

Learned from other project partners

What we have learned from other project partners is the approach to audits. This was a very instructive experience.

Learned from other EU projects

TABULA-Project :

Tabula stands for Typology Approach for Building Stock Energy Assessment

The objective of the project was to create a harmonised model for European building typologies, in particular residential buildings. The developed national typologies, model the energy use (heat supply) characteristics of residential buildings. The set of typologies represent different construction periods and building sizes. The results of the building typologies are compiled and presented in the TABULA webtool (http://webtool.building-typology.eu/), which is the data source for scenario analyses, one of the other key outcomes of the project. These scenarios can support policy makers, at regional, national or EU level on the

level of savings achieved by renovating each of the selected building typologies. The webtool is offered in two versions: "standard version" and "expert version". The first version gives access to all information but the calculations are prepared in the background. The expert version of the webtool gives direct access to the underlying data used by the standard webtool version. All available building and system datasets can be freely selected, combined and viewed in detail. The TABULA webtool is available for 15 countries.

How to educate building professionals to renovation assistants

This chapter of the report is not ready yet. We will upload a new version in the coming weeks.

How to guide renovations (in private ownership) to get as close as possible to the NZE level

Assistant meetings with owners during the design phase

What's in a name

The design phase is the phase where the most important decisions are made to have a successful renovation. Owners will rely on an external expert to carry out an energy audit and have to assign an architect for their renovation. The renovation assistant (see before) assists owners with advice and help them to interpret the results of the energy audit.

Kamp C is the only project partner in Shine who worked with 'assistant meetings' to get as close as possible to the NZE level. A few of them were executed in Sint-Niklaas.

In the first phase Kamp C went, together with IOK on a search for private owners willing to renovate. In this first phase the home owners could count on a visit of an architect-advisor of Kamp C. During this house visit, the advisor made a report.
For the house visits in Sint-Niklaas, Kamp C worked with the organisation who does the energy audits for Sint-Niklaas (instead of with IOK).

The (50 page-) report described[3] the current situation of the dwelling and presents the steps that should be taken to obtain NZE-level. The sequence of steps are to avoid lock-ins. In an attempt to standardize the reports, Kamp C made an excel with pre-filled answer options and the possibility to fine tune it. This excel tool was also shared with other renovation coaches and with

[3] A blank report – used by Kamp C – can be found in the annexes

some of the volunteer energy experts. During the Shine project this excel tool was updated. The tool describes also the use of space, energy consumption (and performance), applied techniques, use of building materials and insulation, ...

Parc Opale had a different approach and developed a system called 'Auto-Réhabilitation accompagnée' (accompanied self-renovation or ARA). The principle is to give private owners of a rural built dwelling heritage, coaching by a craftsman to retrofit in an efficient way, using energy friendly materials.

ARA is an assistance tool enabling owners to renovate their private owned dwelling in accordance with industry standards, with the support of a professional trained to supervise the work. In order to ensure people take advantage of this arrangement, the project is partly participatory. A team of volunteers, keen to learn some renovation techniques, comes to give a hand. For a few hours, the site becomes a place for interaction, learning and fun.

Results

In Parc Opale 3 projects were followed.

In the Campine region more than 120 assistant meetings during design phase were delivered. In Sint-Niklaas 10 assistant meetings were delivered.

What worked

Home visits in design phase were a success.

The home owners were very enthusiast. The architect-advisors of Kamp C gathered a lot of know-how on different types of dwellings, on different types of home owners and on how to approach in a personal way the renovation process of private home owners. Not only the home owners gained information, also the professionals of Kamp C learned a lot.

Combining the professional approach and the approach of the volunteer energy masters, Kamp C could find a well fitted solution for every dwelling. They also discovered that interaction between volunteers and professionals has a lot of potential. A good tuning between these approaches has a lot of time-benefits for both approaches. It is handy if a volunteer has the possibility to refer to a professional if it becomes too difficult. And for the professionals the volunteer network could be a good pre-filter for efficient use of time/knowledge.

The use of an excel tool to standardize the advice: the tool is also being used by some volunteers (in a light-version). The tool was improved on the way within excel. Kamp C disseminated the tool to other (partner) professional advisors. There is lots of potential with the tool. Making an APP of it, improve the light-version, … the availability of time prevented us to improve it furthermore. We had positive reactions on the reports that came out of the tool. Even when it's that big.

The complicity, the exchanges, the advice provided by the craftsmen. Having a good knowledge of the history of the building was appreciated by the owners. Knowing the energy gain after work was motivating.

Study trips to inspiring projects were more suited for volunteer energy masters and people who wanted to renovate to NZE-level than for residents of the districts.

What didn't work

House visits during the design phase are very time-consuming.
So Kamp C changed the approach after 100 visits: home-visits were no longer automatically done for new candidate households. Instead, the households were asked to come to Kamp C for a first advice. This was sufficient in many cases, mainly because the

architect-advisors could rely on their experiences from the earlier visits.

One of the difficulties was: how to filter the interested households? Which households had actually the intention for deep renovation? Or did they only wanted a visit of an expert for smaller interventions? At first Kamp C thought to work with the parameter “available budget” but that was not possible. Some did not had the budget at the moment, but needed a complete renovation advise because they were going to spread the interventions in time, and needed a vision to prevent lock-ins. So Kamp C started to contact/visit all the households. Some were linked with our volunteer network of energy experts if there was no budget or intention to take measures. Also the opposite happened: households that first had a volunteer, but because of the nature of their question needed professional advice

Due to the funding available in Hastings and the urgency to provide heating for vulnerable tenants the works were not those that moved the property as close as possible to NZE.

Despite the expected success, Parc Opale had a hard time finding owners, and sometimes artisans available to support. Also, we would have liked to work with vulnerable people, who do not have the means to renovate their property.

Tips
A big lesson learned is that it is helpful to create a decent CRM.

The project requires anticipation. Communication is essential.
It would be even more necessary to train artisans to support owners.

Learned from other project partners

Hastings BC has learnt from Kamp C regarding the excel tool to standardise advice used. This has been used in the Warmer Sussex project.

Parc Opale learned that face-to-face advice is very important. Their project was a project of great importance. So Parc Opale wanted to test a large renovation with three owners. It lasted over a year for a project.

Nevertheless, Parc Opale continued the advices during the design phase and made the first recommendations to renovate a house (like Kamp C). Over a hundred people met our energy advisor.

Sint-Niklaas learned – in working with Kamp C – that it's easier to work with an in house advisor. Therefor the city engaged a 'renovation coach' in June 2019. A new renovation project on district level could be started with the lessons learned in Shine.

Learned from other EU projects

Kamp C merged the lessons learned from other projects and other partners in the excel tool. They had learning days with professionals about renovation advise and the customer journey.
f.e. See2Do (www.grensregio.eu/projecten/see2do) , Be Reel (www.be-reel.be), Triple A (www.interreg2seas.eu/nl/triple-a), …

Assistant meetings with owners during renovation

What's in a name

Home owners are assisted by a renovation assistant (see before) during the renovation. In order to get to the expected result (NZE level), it is important that constructions are carried out correctly. The renovations assistant gives information on how to choose

reliable contractors and checks if the constructions are carried out correctly and assist the owners during delivery of the construction.

Results

In the Campine region more than 187 assistant meetings during design phase were delivered by Kamp C. Not all of them actually took measures to renovate their dwelling as close as possible to NZE Level.

In fact - as the project went on - home owners could be divided in different categories concerning their renovation process in the period 2016-2020:

1. Long-term renovators: private house owners renovating in different stages. For different reasons like budget, time, other priorities, life time happenings, …
2. Short-term renovators: private house owners renovating in one (short) wave.
3. Want-to renovators: private house owners having renovating plans, but for all sorts of different reasons, did not start yet.
4. Silent renovators: private house owners with whom contact is lost after the contact in design phase, but most likely are renovating their dwelling on their own.

Sint-Niklaas had similar experiences, from the 10 households who had the visit during the design phase, only 4 went on to the actual renovation (2 of them were guided by an external organisation).

The approach in Sint-Niklaas differed from Kamp C, as Sint-Niklaas worked with an external consultant for the assistant meetings during renovation.

Kamp C counts an average of 3,6 contact moments for each dwelling during the renovation phase. With a range between 1 and 10 moments per dwelling.
These extra contact moments could be:

- Extra home visits,
- Extra visit at Kamp C,
- Contact by phone,
- Contact by mail.

Sint-Niklaas counts for each dwelling an average of 2 extra home visits, 5 contact by mail and an occasional phone call.

Assistant meetings during renovation resulted in following investments:

	Kamp C	**Sint-Niklaas**
Roof insulation	15	1
Cavity wall insulation	1	2
Wall insulation	12	6
Floor insulation	15	1
Energy efficient heating system	17	3
High efficient glazing	15	3
Energy efficient production warm water	8	2
Solar panels	6	

In Parc Opale tree individual houses have been renovated using the self-renovation system together with natural materials. They have benefited from instrumentation provided by the Institut des Mines et Télécom (IMT) in Lille-Douai. This instrumentation produces an analysis highlighting the weak points of the buildings. Sensors are installed before and after work to observe the performance achieved. This system also makes it possible to check the quality of the materials used, of the way they are used, and to diagnose any underperformance related to their use. This

mechanism has many advantages: it does not require a thermal expert, and it relies on a mobile, nonintrusive kit.

What worked

In Hastings, significant time was spent -in collaboration with project partner Citizens Advice 1066 - with the residents to overcome barriers of some residents not wanting improvement works to their property.

Kamp C interviewed the different type of renovators. Some interesting quotes:

- From a Long-term renovator who had a visit during design phase in the beginning of 2017: *"We had to drop the upgrade of our first and second floors (for the time being) due to costs that were too high. In April 2020 we start with our energetic renovation. "*
- From a Short-term renovator: *"The whole project ran from the submission of the first building permit in February 2017 to our move in July 2018. At that time we did not yet have a kitchen, bathroom furniture, interior doors or built-in cupboards. They came to install them at the end of September 2018. The works of the contractor started in July 2017. You can also renovate bit by bit, but we chose, because we did not have to live in the house at the time, to immediately make an end and go for the total renovation"*

Sint-Niklaas communicated a lot about the assistant meetings during renovation. More and more households who had an energy-audit (see before), but didn't apply for the visit in the design phase, became interested in assistant meetings during renovation. A decision was made to offer all of them the assistance by an external consultant, during renovation. Therefor a lot more investments in private owned dwellings were done during the Shine project. This concept was also used as the starting point of a new renovation project in district level.

What didn't work

Kamp C had issues with reporting the interventions. Kamp C has 4 architect- advisors in service. Sometimes a question of an household wasn't linked with the SHINE-project. If an household called by phone, they could be helped by one of the 4 advisors, sometimes not by the same advisor that managed the household earlier. Kamp C wants to be very approachable, so identifications aren't asked for every question that is asked. It is possible that some of the guidance is not tracked and therefor the average amount of contact moment is probably a little higher than the estimated 3,6 times.

A big lesson learned is that it is helpful to create a decent CRM.

Another difficulty Kamp C encountered: the timeframe for renovation is very different in each household. This made the approach during renovation very difficult. Kamp C did not reach a general approach. It remained individual guidance, suited for the private house owners and for the dwelling.

Tips

Use the moment when a national campaign is running and provide more assistance to engage private house owners to do their renovations better and more sustainable (or as the Flemish campaign says: 'Benovate').

Learned from other project partners

Sint-Niklaas learned from Kamp C about the importance of the independent, intermediary renovation coach.

Sint-Niklaas learned from Kamp C about the report of the assistant meeting during design phase.

Learned from other EU projects

Control after renovation if the proposed carbon reduction has been achieved

By collecting the energy saving measures implemented in the houses and by calculating the carbon reduction based on some key figures.

With this control an evaluation can be made if the method is effective and durable (in various) circumstances) in order to transfer it to other regions.

Results

The working method is the same as for the renovation of houses. However, in the case of a complete renovation to nearly zero energy, various techniques will have to be combined. During the project it became clear that this is not such an easy task for the owners.

An extensive energy audit was carried out on 18 houses. The starting situation was recorded during a first visit, consumption was requested, areas were calculated, U-values of walls were determined, and so on. Afterwards, possible options for the use of renewable energy were examined.

So we know the total energy consumption at the start, this is the so-called zero measurement. In the audit, we made proposals to arrive at an energy consumption of less than 100 kWh/m² (this is the Belgian objective for 2050). Nearly zero energy means an energy consumption of less than 30 kWh/m².

For these 18 dwellings, this meant an annual CO2 saving of 66 tonnes of CO2. It was therefore clear that we would need more dwellings in order to achieve the target of 410 tonnes.

Afterwards, the number of dwellings was increased. Only the energy consumption at the start was noted and it was calculated

how much the energy savings would be and how much the CO2 emissions would decrease if this house met the almost energy-neutral requirement (30 kWh/m²). The latter houses have not been subjected to an extensive energy audit.

What worked

Carrying out the energy audits went very smoothly. The visit to the owners was instructive and several owners are willing to do a renovation to almost zero energy.

What didn't work

Nevertheless, it appears that few owners are actually carrying out a total renovation. Often the cost price is the basis and the owners want to spread this over several years.

Tips

The government should provide more incentives to motivate owners to have a near-zero energy renovation carried out. In Flanders there are beautiful projects such as BENOVEREN. Various premiums can be combined to give owners financial support.

Learned from other partners

Carrying out an energy audit to arrive at an almost zero energy house.

Keeping up the good work After Shine: What's next?

Implementing the method in new districts

To renovate 650 dwellings in the period of 5 years after Shine.

The use of local relationships in Hastings has led to the Warmer Sussex project. It is too early in this scheme to say it has been a success but the concept is positive. Potential for large scale whole house retrofit across the whole Sussex region (681.687 households). Links formed with other parts of the SHINE project to create capacity in the installer market.
The Warmer Sussex project which was instigated as a result of SHINE will continue past the end of the project. Warmer Sussex should become a self-funded service within 1 year (www.warmersussex.co.uk).

Work of the energy masters in the IOK region will be continued after the end of the Shine project. Their work is considered very useful for people who can't find the necessary information about energy saving measures. The partnership that was set up with Kamp C, will be further developed. Together with Kamp C, we will set up a system where every inhabitant of the region can ask his questions about energy or energy saving measures. Depending on the question, it will be answered by mail or telephone, or there will be an appointment at Kamp C or there will be a house visit by an energy master or an expert of Kamp C. This project was set up as a result of the successes and failures of the Shine project since we found out that there are a lot of people in need of extra information about energy and that many of them need an individual approach by for example an energy master. (Read more about this in the report 'Community engagement).

Sint-Niklaas has learnt lessons in Shine and uses the tips and tricks in a new renovation project on district level 'Sint-Niklaas

renovates'. The new project started in October 2019 in 3 districts. In a first stage, 100 energy audits are to be executed. Inhabitants who want to do a total renovation are guided by a renovation team (an architect who works together with a 'constructors team'). In this phase about 20 families will be supported. Households willing to do some small investments (take 1 or 2 measures) are also supported by a renovation assistant, as learned in the Shine project (assistant meetings during renovation). Sint-Niklaas is looking for means the implement this in their regular operations.

Parc Opale has edited new feedbacks about the different sites which benefit the SHINE ARA program: ACCOMPANIED SELF-RENOVATION.

Train building professionals

With the ambition to renovate 150 extra houses in a period of 5 years after Shine

Sint-Niklaas started the project 'Sint-Niklaas renovates', in order to guide the inhabitants in their renovation process, a renovation assistant is introduced. This person also gathers, leads and supports a 'team of contractors/ building professionals' in order to work with the latest methods and sustainable to come as close as possible towards NZE level. The project started November 2019 in 3 districts, about 20 families will be supported. Sint-Niklaas is looking for means to continue these projects in other districts.

Kamp C organized educational activities for building professionals. During the implementation of the project, the network operator in Flanders started rolling out the 'burenpremie' ('neighbourhood grant') and the BENOvation coaches. A BENOvation coach is an independent renovation expert, recognized by Fluvius (network operator). He / she guides households during the BENOvation and helps with the administrative work of, for example, requesting quotes or applying for premiums/grants. It does not matter

whether it is a total renovation or just insulation of, say, a roof. Households can call on a BENOvation coach via Fluvius. But there are a number of conditions. For example a BENOvation coach only starts when there are 10 BENOvers in the area. Fluvius provides basic training and information for these BENOvation coaches. If we link this to the results of the survey from WP3, we noticed that we mainly had to provide training for building professionals on innovations.

Kamp C organized different educational activities for building professionals. They were all set up in other projects where Kamp C is active.

1. Masterclasses about circular building in 2018. These were set up in the run-up to a circular tender for the industrial building "'t Centrum" See reports and presentations: https://www.kampc.be/innovatie/projecten/tcentrum/verslagen-presentaties
2. Co-creation sessions with building professionals in the ENLEB Interreg Vlaanderen-Nederland project. Kamp C also did online interviews with building professionals. For example an interview about cooperation in the building sector: https://www.youtube.com/watch?v=AjNrXgvRjxk
3. Inspiration sessions starting in 2021 in the project Build.Create.Innovate about bridging the gap between the creative sector and building professionals.
4. The C3PO (EFRO) project about 3D printing where Kamp C pioneers with building professionals and educational partners.
5. Kamp C is currently working with Pixii and Dialoog on an training series for first-line advisors on behalf of the Flemish energy agency. The main target audience are the advisors from the energy houses of local authorities.

Kamp C will keep on organizing educational and informational activities for building professionals and will continue to give

feedback on Fluvius to improve the roll-out of the BENOvation coaches.

Conclusion

The overall Shine will develop and implement a cross-border approach for district renovations, which paves the way for a wider uptake.

Districts in Shine differ in technical aspects but also in social context. Partners will look for cross-border similarities in their districts.

Based on these similarities, partners will set up joint approaches to increase the energy efficiency of the housing stock. Partners will test the approaches in a sufficiently large number of houses, in all participant member states and in different circumstances so that the robustness and transferability of the methods can be demonstrated. After evaluation the project partners will, with the help of the large network of observer partners, disseminate the methods in and beyond the 2 Seas area.

Project partners