Interreg
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SHINE
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Joint Menu of Renovation Options

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Version

Contributing partners	PP4 - OCMW Ieper PP5 - Brighton & Hove City Council (BHCC)* PP6 - Amicus Horizon (now Optivo)** PP7 - Hastings Borough Council PP9 - Habitat du Littoral PP12 - Zonnige Kempen PP13 - Association pour la Recherche et le Développement de Méthodes et Processus Industriels (ARMINES)* PP14 – Clavis PP16 – Optivo (was Amicus Horizon)** Please note: *Hastings Council and ARMINES were contributors to the partner meeting workshops but did not carry out retrofits. ** Amicus Horizon together with another Housing Association (Viridian) joined to become Optivo in May 2017.
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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.

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Introduction

Buildings are responsible for approximately 40% of energy consumption and 36% of CO2 emissions in the EU. Currently, about 35% of the EU's buildings are over 50 years old and almost 75% of the building stock is energy inefficient, while only 0.4-1.2% (depending on the country) of the building stock is renovated each year. Therefore, more renovation of existing buildings has the potential to lead to significant energy savings – potentially reducing the EU's total energy consumption by 5-6% and lowering CO2 emissions by about 5%.[1]

The SHINE project

SHINE is an Interreg 2 Seas funded project which is innovative due to its 'bottom-up' approach. In the past, renovations were carried out with a top-down approach which meant that end-users were not engaged. By setting up a participation process (a 'bottom-up' approach) in a district, inhabitants have been more involved in the renovation process. The importance of engagement and close communication with residents throughout the retrofitting process, along with resident lifestyle and behaviour, are key factors in achieving high performance retrofit.

Joint Menu of Renovations

In the Project Programme, a joint menu of renovation options was outlined as a deliverable for the project partners of WP4. The renovation options in the menu offer building solutions that will deliver the most cost effective, energy efficient and long-lasting impact. The list has been composed during thematic work groups. The partners have been testing various options during their pilot schemes. Following evaluation of the pilots the menu has been adjusted. This menu of renovation options will be disseminated to

[1] Source: https://ec.europa.eu/info/news/new-rules-greener-and-smarter-buildings-will-increase-quality-life-all-europeans-2019-apr-15_en

other organisations and groups be implemented in and beyond the 2 Seas area.

A common problem in the past was that the expected results of energy efficient renovations weren't reached, especially in the rental market. The aim of Work Package 4 (WP4) has been to describe a joint method of district renovations combined with setting up a participation process with a bottom-up approach. In WP4, the partners aimed to improve renovation standards in several districts. Those involved are funded by social housing providers, local authorities and public agencies. The level of investment has been set to achieve maximum energy efficiency while remaining cost effective.

Objective: The partners sought to deliver a joint menu of renovation options that will achieve the most cost effective and long lasting impacts.

The renovations have been carried out using a district approach and has several advantages:

- the dwellings often have a similar archetype and age;
- setting up a participation process (see WP1) is easier to complete in a specific neighbourhood.

All buildings renovated will return to social ownership and be rented to low income households. The strength of this cross-border cooperation is that the detailed method can be tested in a significant number of pilot schemes and under different conditions to allow them to be replicated. Some retrofit solutions are complex due to the age of the properties and because they are often located in conservation areas. Partners aimed to address these challenges by finding cross-border solutions.

Methodology

The partners sought to develop a joint approach to investment and to develop a method for district renovations combined with setting up a participation process with a bottom-up approach. The aim was to develop a new method which would ensure the expected results were reached.

Planning

Partners agreed to define what each district required in the form of different types of renovations. The work was carried out at partner meetings through an iterative process of adding measures until a 'master list' was created. At each partner meeting, discussions were held in workshops to determine which measures were most energy efficient, cost effective and technically achievable. Partners fed back their experiences of retrofits and discussions took place on which options worked well which measures should be avoided on the basis of cost, ease of installation etc. This list became the final Joint Menu of Renovation Options.

Once the works commenced a couple of additional measures were identified that were not originally included in the list.
These were:

- Weather Compensators (Brighton and Hove Council)
- Replacement window surrounds (Optivo)

SHINE Joint menu of renovations master list				
Measure	**Description of upgrade**	**Energy improvement/savings**	**Benefits**	**Barriers**
Upgrade lighting to LED	Replace all incandescent screw-in lightbulbs with screw-in LED bulbs to match the performance of the previous bulb. Often light fixtures also need replacing.	Up to 50% energy saving.	Fewer changes of lamps. Lower bills. Low maintenance.	Access to properties can be an issue. Whole fittings to be replaced where lamps incompatible.
Draught proofing	Includes chimney balloons, door draught excluders, fittings around window frames. Secondary glazing also included in this category.	Varies depending on measure	Raises ambient temperature of the home by reducing circulation of cold air.	Installing multiple small measure can be time consuming for a small energy uplift.
Cavity wall insulation	Includes blown	Saving: Around 200	Relatively low cost	Quality control is

	mineral fibre, polystyrene beads or granules and urea formaldehyde foam.	euros saving on fuel bills per year.	measure with good energy increase.	essential to avoid cold breaks.
Internal wall insulation	Suited to solid wall homes. Rigid insulation board (plasterboard backed with rigid insulation) or stud wall (mineral wool batts).	Saving: Up to 400 euros per home per year. Energy efficiency 200-400 kgCO2/year	High increase in energy efficiency e.g. SAP points	High cost for installation - around 8,000 euros to install,
External wall insulation	External wall insulation involves fixing a layer of insulation material to the wall, then covering it with a special type of render (plasterwork) or cladding. The finish can be smooth, textured,	Savings of up to 400 euros per home per year Energy efficiency 200-300 kgCO2/year	High increase in energy efficiency e.g. SAP points	High cost for installation – around 13,000 euros to install

	painted, tiled, panelled, pebble-dashed, or finished with brick slips.			
Virgin loft insulation	300mm of rock wool roll	Savings of up to 100 euros per home per year. 5-10% reduction in energy consumption	Increase in energy efficiency e.g. SAP points. Occupant comfort improved.	Occupant belongings in loft space. Instances where no loft hatch present.
Loft insulation top up	Add to existing insulation up to 300mm of rock wool.	Savings of up to 100 euros per home per year. 5-10% reduction in energy consumption	Increase in energy efficiency e.g. SAP points Occupant comfort improved.	Occupant belongings in loft space. Existing insulation may be defective. Instances where no loft hatch present.
Single glazed windows to double	Single glazed units, often wooden, replaced with UPVC units.	Reduced heat loss – windows/doors make up 40% of heat loss.	Increase in energy efficiency e.g. SAP points	Planning restrictions High relative cost

			Occupant comfort improved.	
Single glazed doors to double	Single glazed units, often wooden, replaced with UPVC units.	Reduced heat loss – windows/doors make up 40% of heat loss.	Increase in energy efficiency e.g. SAP points Occupant comfort improved.	High relative cost
Single glazed windows to triple	Single glazed units, often wooden, replaced with UPVC units.	Reduced heat loss – windows/doors make up 40% of heat loss.	Increase in energy efficiency e.g. SAP points Occupant comfort improved.	Planning restrictions High relative cost
Single glazed doors to triple	Single glazed units, often wooden, replaced with UPVC units.	Reduced heat loss – windows/doors make up 40% of heat loss.	Increase in energy efficiency e.g. SAP points Occupant comfort improved.	High relative cost
Upgrade of double glazing	New double glazed units installed. Thermal efficiency restored by	Reduced heat loss – windows/doors make up 40% of heat loss.	Increase in energy efficiency e.g. SAP points	Less efficient than triple glazing

	upgrading argon gas in between panes and resealing units.		Occupant comfort improved.	
Upgrade heating controls	Providing occupants with more area based control over heating. E.g. thermostatic radiator valves, portable room thermostats. Also updated with smart heating controls such as Switchee.	More control allows occupants to heat rooms more efficiently. Unused rooms can be heated less intensively to make savings	More efficient use of heating system and more control to end user. Increase in energy efficiency e.g. SAP points. Smart thermostat can be used to test boilers leading into colder months.	Data protection (Switchee sensors) Compatibility with existing systems and access to Wifi
Hot water cylinder insulation	Insulation jacket (80mm) wrapped around hot water cylinder.	Reduced heat loss from hot water stores.	Cheap measure for reasonable efficiency increase. High increase in energy efficiency e.g. SAP points	None

New boiler upgrade	Replacing boilers with newer, more efficient models (preferably A-rated). Usually along with upgraded settings (TRVs etc.)	Greater efficiency per kWh meaning lower energy bills	Consistent heating throughout home. Reduced maintenance costs. Better controls for occupants to manage usage.	Disruptive if new radiators required.
Gas central heating upgrade	Replacing inefficient heating systems (electric storage, LPG, etc.) with gas combi boilers	Cheaper fuel source and access or heating/hot water from one system. Significant improvement in SAP rating depending on system replaced.	Reduced energy bills and usually less issues with settings as population are familiar with usage.	Gas heating not in line with future proofing homes. Potential need for new gas infrastructure to external of building which pushes up cost.
Floor insulation	Insulating suspended floors using Q-bot. Remote controls device that sprays material	Reduced heat loss through floor space. Increased SAP rating. Up to 16% reduction in	Reduced energy bills, comfortable living space and improved SAP.	Cost of measure is high in relation to SAP increase. Approx. 6000

	upwards, insulating the void.	carbon usage.		euros for 1-2 SAP point increase.
Roof insulation (room in roof)	Insulating lofts used as habitable rooms.	Significant savings in carbon and on energy bills. Saving 500-700 kgCO2/year depending on property type.	Occupant comfort is improved significantly. Improved SAP ratings.	Measure can be complicated and is fairly disruptive to occupant.
Solar PV	Solar photovoltaic panels installed on roof space. Electrical current fed into building services and appliances via an inverter.	Potential to offset electricity costs significantly.	Significant increase in SAP ratings. Costs now more reasonable as more installers in industry.	Planning restrictions. Seasonal effectiveness Occupants that are out during the day cannot use energy without added battery installation which doubles cost.
Solar thermal	Solar panel that heats	Potential to provide	Significant increase	Maintenance costs

	liquid directly from sunlight, feeding into buildings heating/hot water systems.	renewable heating which reduces carbon intensity of building.	in SAP ratings. Costs now more reasonable as more installers in industry.	must be considered.
Mechanical ventilation	Ventilation systems powered actively by electricity.	Help to stabilise airflow and feed warmer air consistently around buildings – preventing isolated cold areas. This can reduce energy consumption.	Reduce potential for condensation/mould growth. Increased occupant comfort.	High added cost to retrofit projects. Occupants known to turn off due to noise. Increased electricity usage.
Solar gain (glazing)	Passive heating of property – solar power enhanced by window area. New developments can be designed to incorporate this.	Passive heat so south-facing rooms require less heating. Reduced cost of utilities.	Naturally warmer homes in colder months. Low-no capital cost.	Risk of overheating in summer months.

UFH low temperature flow (underfloor heating).	The low temperature of UFH (about 35°C) can allow a boiler to operate at higher efficiency.	This system allows boiler to operate at 98% efficiency, compared to only 88% with systems requiring a higher flow temperature, such as radiators.	Warm homes at cheaper cost.	Can be expensive to install. Must be installed by a specialist.
Connections to heat networks	Heat networks provide a central source of heating for multiple dwellings	Energy efficiency can vary depending on type of heat network. Communal ground source or air source heat pumps likely to be most efficient	Can be more efficient than individual heating systems	More cost efficient when installed at new build stage
Weather compensators	Control function which maintains internal temperatures by varying the flow temperature from	The warmer it is outside the lower the flow temperature, and that of the heat emitter(s),	Reduces energy costs and carbon emissions	Not suitable for all heating systems.

	the heat generator relative to the measured outside temperature	whilst still maintaining comfort conditions.		
Replacement Window surrounds	Replacement window surrounds replaced to achieve better insulation	Replacement window surrounds improve air tightness and increase energy efficiency	Reduces risk from asbestos in materials and reduces draughts.	Slows down replacement window programmes due to asbestos checks
Efficient electric heating upgrades	Installation of innovative heating systems powered by renewable energy sources and electricity. For example - ASHP/GSHP, high heat retention storage heaters, etc.	More efficient use of fuel source and in some cases considered renewable.	New systems provide occupants with state of the art heating controls. Greater efficiency and significant improvements in SAP score and EI score.	Can be expensive to end user if necessary fabric measures are not included in project. Will be more effective if/when electricity production is decarbonised.

				Users are often unfamiliar with technology which requires good education as part of project.

The list includes all measures being carried out by the partners. However not each measure was used by all partners.

Implementation

Broken down by the number of planned and implemented measures per partner, the table appears as follows:

Joint menu of renovations	**PP4 IEPER**	**PP4 IEPER**	**PP5 BTN**	**PP5 BTN**	**PP6/16 OPT**	**PP6/16 OPT**	**PP9 HAB**	**PP9 HAB**	**PP12 ZON**	**PP12 ZON**	**PP14 CLA**	**PP14 CLA**
	Plan	**Actual**	**Plan**	**Actual**	**Plan**	**Actual**	**Plan**	**Actual**				

Upgrade lighting to LED			0	339	130	152	3	0			0	50
Draught proofing			250	215					6	0		
Cavity wall insulation	24	0			4	6			6	0	0	50
Internal wall insulation											0	50
External wall insulation									6	0	8	8
Virgin loft insulation	22	22					6	6			8	8
Loft insulation top up					5	5						
Single glazed windows to double	60	20							6	0	0	75
Single glazed doors to double					4	4						
Single glazed												

windows to triple												
Single glazed doors to triple												
Upgrade of double glazing					50	67	18	18				
Upgrade heating controls			250	239	20	26						
Weather compensators			100	78								
Hot water cylinder insulation												
New boiler upgrade	4	4	250	317	6	8			6	1		
Gas central heating upgrade					0	1			6	1	0	70
Floor insulation									6	0		
Roof insulation (room in roof)									6	0	8	8

Solar PV											8	8
Solar thermal												
Mechanical ventilation									6	0	8	8
Air source heat pumps												
Smart thermostats					100	100			6	1	8	8
Solar gain (glazing)									6	0		
UFH low temperature flow												
Connections to heat networks												
Weather compensators			100	78								
Replacement window surrounds					50	67						

Efficient electric heating upgrades					2	2						

Findings from comparisons of studies and renovations

Archetypes

There was minimal commonalty between the archetypes selected for renovation. Partners showed that although older properties were selected for the retrofits, the style of construction varied considerably between partners. Even within the selected districts of each partner, the range of different archetypes was significant. As part of Optivo's work for SHINE, a study of different archetypes was carried out in the St Leonards area in Hastings. The result showed that were 20 building archetypes in the area. See *Figure1*.

Examples of building types are shown below.

Adamy, Habitat du Littoral

Damrémont, Habitat du Littoral

St Leonards, Optivo *Bellamy, Clavis*

This experience meant that it was not easy for partners to compare works in specific archetypes. It was therefore decided that comparison of retrofits would be achieved by looking at the types of installations rather than the types of property.

Figure 1

Property Type	C	Property Type	C	Property Type	C	Property Type	C
BungalowCavityMai nsGas	No	HighRiseFlatCavityM ainsGas	No	LowRiseFlatCavityM ainsGas	Yes	TerraceMed/LargeC avityMainsGas	Yes
ConvertedFlatCavit yMainsGas	No	HighRiseFlatSolidEle ctric	Yes	LowRiseFlatSolidMa insGas	Yes	TerraceSmallCavity MainsGas	No
ConvertedFlatCavit yMainsGas	Yes	HighRiseFlatSolidMa insGas	Yes	SemiCavityMainsGa s	No	TerraceSmallCavity MainsGas	Yes
ConvertedFlatSolid MainsGas	Yes	HighRiseFlatSystem MainsGas	No	SemiCavityMainsGa s	Yes	TerraceSmallGranit eMainsGas	Yes
HighRiseFlatCavityE lectric	Yes	LowRiseFlatCavityMa insGas	No	TerraceMed/LargeC avityMainsGas	No	TerraceSmallSolid MainsGas	Yes

Resident engagement

Most partners had similar approaches when it came to engaging with residents. These were as follows:

- Letters, emails and phone calls for initial contact
- Home visits
- Pre installation events and road shows for energy advice
- Resident liaison while the works were being carried out
- Post installation satisfaction surveys

All partners agreed that these approaches were integral to ensuring that behaviour change took place alongside the installations.

Residents meet the contractor at an event at Bristol Road Community House, St Leonards UK

Discussions between partners generated new ideas and information sharing. For example Optivo referred Zonnige Kempen to Brest, a partner on another Interreg NWE Project (CAN). Brest has been investing in a Bricobus, a vehicle that takes tools and building materials to residents so they can carry out their own minor renovations with some supportive training.

Monitoring and reporting

Most partners' deliverables are being monitored. The most common method is to use an Energy Performance Certificate (EPC). Whilst this was valuable on a district wide basis, comparisons between member countries were not possible as EPCs differ nationally. This is largely due the differences found in the way energy was rated within each property. 100% predicted usage will come from EPCs.

Early on in the project, **the partners agreed to collect real energy use data from a minimum of 20% of properties involved in project.** This involves collecting data based on real consumption figures rather than estimated figures that can be obtained from EPCs.

This data has been collected from comparative bill readings. For example, Brighton and Hove Council have a dedicated officer who will carry out these bill reading comparisons.

In terms of measuring other impacts in the home:

Optivo has installed smart thermostats called Switchees. The Switchee is a new smart thermostat designed for social housing organisations. Optivo has piloted 100 Switchee to monitor energy use, fuel poverty risk and condensation and mould risk. Readings have been taken for the following:

- Electricity use
- Temperature – under and overheating
- Boiler operation
- Relative humidity
- Time to lose heat – insulation performance

- Fuel poverty risk
- Condensation and mould risk

Zonnige Kempen has installed a similar product. A SMAPPEE (intelligent datalogger for energy consumption) has been installed in some homes using a wall socket.

Completing retrofit works

The approach to completing works was very different and rules varied country by country. A case study has been prepared for each partner in **Appendix A.**

In summary the approaches were as follows:

OMCW Ieper – Completed works on older properties in a conservation area. EPCs were carried out before and after energy retrofit works were completed. Roof insulation was a priority to reduce CO2 emissions. The aim of the investment was to achieve 45% energy savings and less heating costs. Works completed included boiler replacement, double glazing and loft insulation. Cavity wall insulation was planned but could not be completed for technical reasons. **(see case study 1)**

Brighton and Hove Council – A large number of smaller measures were completed on social housing in Brighton. Measures have included boiler replacements, weather compensators, heating controls, draft proofing and LED lighting. Using an existing contractor where a relationship already existed helped to avoid delays. A dedicated role was created to support resident behaviour change through the provision of energy advice visits. **(see case study 2).**

Optivo – In total 210 homes were given 'whole house' retrofits using a fabric first approach. Multiple measures were installed to improved homes in St. Leonards to the UK Government's target of EPC Band C. In addition 100 Switchee smart thermostats were also installed to help Optivo monitor conditions within homes to avoid cold and damp. Alongside this work, a study was carried out to identify the main archetypes in St Leonards. The Study found that 20 different archetypes existed within the SHINE project area. **(see case study 3)**

Habitat du Littoral – Three separate sites were involved in the SHINE project. These were Adamy, Faidherbe and Damremont. The project idea was to find the best possible option to optimize the heating systems and building fabric based on needs and potential to reduce tenants' charges. Measures installed included LED lighting, virgin loft insulation, meters at tower height and heating control upgrades.
Works were carried out on three different building archetypes**.** **(see case study 4)**

Zonnige Kempen – A selection of potential homes was made (older poorly insulated dwellings). Six homes were selected as examples in Seringenhof 40. Works have just started after some delays. A contractor to do the works was selected in January 2020. There were some timing issues with the start-up of the renovation in Seringenhof. The partner financing of the renovation was dependant on the VMSW (Vlaamse Maatschappij voor Sociaal Wonen). They have complex administrative procedures that take sometimes years to get through. On top of that there was a change in personnel at Zonnige Kempen which also not very helpful is to speed things up to meet the deadlines. **(see case study 5)**

Clavis - Eight dwellings in Bellamy were selected for the SHINE work. This was part of a bigger city wide renewal project. Net zero energy pilot at a cost of 100,000 euros each. Core stock is based on rentability. The works are designed to make the scheme affordable and to provide a return on the investment. Resident engagement is an important element of the project**.** Progress was been made on 95% of the works before the contractor went out of business. An alternative supplier has been sought to complete the works. (**see case study 6)**

Summary and conclusions

Partner findings:

a. Technical benefits and issues, differences between partner countries

There were benefits for project partners to share technical information and best practice. Sharing ideas and practices at Partner meetings has proven to be helpful for each partner to complete their own works. Differences between regional governance and local funding support were highlighted by the project partners which made it difficult to draw direct comparisons. All partner countries had a different way of completing EPCs which made it difficult to compare sets of energy data.

b. Optimum model for the best approach to renovations

Each partner country completed work on different archetypes and it was agreed that partners would assess the benefit of the actions based on type of measures rather than by archetype. The most commonly adopted measures between the WP4 partners were: LED lighting, cavity wall insulation, loft insulation, heating controls and boiler upgrades.

c. How SHINE will inform future work

The project has set new standards for future renovation programmes For OCMW Ieper. a new Flemish standard will set higher standards for future renovations with a new energy policy from social services. In Brighton and Hove, the SHINE work has widened the thinking on future options e.g. district heat networks. Learning from the SHINE project has helped to streamline Optivo's ongoing retrofit programme in Kent and London. A further 130 retrofits have taken place in Kent based on the learning gained from the SHINE project. Future ‘whole house’ retrofits are also planned in 2020/21 in the Kent and London area. For Habitat du Littoral, the work has helped to find the best possible option to optimize the heating system based on needs and potential to reduce tenants’ charges. Zonnige Kempen found that there were able to a focus on behaviour change and well-being through the project. Clavis found that learning from residential and technical gains was useful and felt that resident engagement is a key part of the work.

d. Partner successes from SHINE retrofits

OCMW Ieper found a solution to a difficult planning issue for a home in a conservation area. To avoid a visual problem with the appearance of the building, a replacement lintel that was made from metal was clad with wood to ensure the final appearance matched the style of the home. This satisfied the requirements of the local planners.

For Brighton and Hove an existing contractor/ supplier was used so established relationship led to buy in from technical staff and led to prioritising by BHCC. Buying direct from contractor/technical supplier meant that the retrofit team didn’t need to get agreement for works. Tenants all wanted new boilers and the smart controls installed through the project have been well received due to the additional control function and the look of the thermostat/control. Internal role changes resulted in additional resources helped to achieve greater success as well as the ‘green’ agenda adopted by Brighton and Hove Council.

Optivo was able to retrofit 10 more homes than originally planned due to cost savings during the retrofit process. Learning from the CAN Interreg NWE project helped Optivo to streamline its approaches to retrofits in SHINE.

e. What barriers have you encountered?

OCMW Ieper selected some properties that are in a conservation area. Changes had to be made to account for local building styles due to planning rules. Renovations for cavity wall insulation could not be met due to technical issues.

In Brighton and Hove, the main difficulty came arranging appointments with residents and them being in at the time of the visit. This has impacted more on the home advice visits. The installation of weather compensators has not been possible in all cases due to the additional space requirements and also in high rises due access issues to install the external monitor.

The Optivo retrofit team found that access to some homes to finish the works proved difficult in some cases. Loft insulation works were hindered by residents not wanting to clear their roof spaces. The contractor required Optivo to conduct asbestos survey works on many of the properties where we were replacing windows or insulating walls and roofs. This caused some delays in completing the works and required window surrounds to be replaced. In a few cases asbestos removal was required. This process created additional costs that were not expected. There was some initial resistance from residents to the installation of 100 Switchee smart thermostats as the data measured include occupancy levels in the home. A signed GDPR agreement was needed from each resident before we could install the unit.

Zonnige Kempen has timing issues which created a barrier to implementing the start-up of the renovation in Seringenhof. For their own contribution in the financing of the renovation they depend on the VMSW (Vlaamse Maatschappij voor Sociaal Wonen). VMSW has complex administrative procedures that take sometimes years to get through. On top of that, Zonnige Kempen had a change in personnel which also not very helpful is to speed things up to meet the deadlines. The project required finding empty dwellings for moving the tenants. Attempts were made to find appropriate accommodation as close as possible to the project site so that the social connections between the neighbours were not lost due to renovation. For more information see case study 5 in **Appendix A.**

Clavis found that because their Investment was based on scenario analysis, the return on the investment may be some time in the future. They are waiting for market value to go up to justify their investment. The pilot will show whether this approach is viable.

f. Feedback from residents

OCMW Ieper received feedback from residents that the investments really improved the quality of life and the work achieved warmer homes for less money.

Tenants in Brighton and Hove are happy with the results from the SHINE project. The Council has a dedicated energy advisory service to ensure that information and support is provided alongside the supply of equipment.

Optivo has received a 90% positive feedback on the use of Switchee smart thermostats in their homes. A resident survey was sent to Switchee users via the device. Optivo also provided an energy advice service alongside the retrofit programme.

Clavis used smart meters used to engage residents. A study on retrofits was carried out to ensure a sympathetic fit with local architecture. The aim was to create social awareness.

g. Links to other work packages

All partners found the resident engagement work that fed into WP1 was useful for engaging residents for actual energy efficiency works.

h. Links to other EU projects

Some energy retrofits have been completed for the Interreg NWE project CAN (Climate Active Neighbourhoods). This work helped Optivo to streamline the surveys and subsequent retrofit works in the SHINE project.

Connections have been made between SHINE and another EU funded projects. Optivo referred Zonnige Kempen to Brest, a partner on another Interreg NWE Project (CAN). Brest has been investing in a Bricobus, a vehicle that takes tools and building materials to residents so they can carry out their own minor renovations with some supportive training.

Appendix A – Partner Case Studies

Case Study 1. PP4 – OCMW Ieper

Outputs			
Renovations	**Planned**	**Carried out**	**comment**
Boiler replacements	4	4	Works completed
Double glazed windows	60	20	Should be completed by the end of the project
Loft insulation	22	ongoing	Should be completed by the end of the project
Cavity wall insulation	24	0	cavity wall insulation planned but not carried out because technically impossible

Start up: All properties owned by OCMW Ieper – no problems with access.
Options: The aim was to set the standard of renovation as high as possible.
Method: EPCs were carried out in older properties. Roof insulation was a priority to reduce CO2 emissions. The aim of the investment was to achieve 45% energy savings and less heating costs.
Conservation area: Some properties are in a conservation area. An example is given of where changes that to be made to account for local building styles. A replacement lintel made from metal was clad with wood to ensure the final appearance matched the style of the home.
Engagement with residents: Feedback was that the investments really improved the quality of life and the work achieved warmer homes for less money.
Monitoring: Energy consumption is being monitored after the investments have taken place. Preliminary data shows a drop in usage.

Barriers: The main issue was with the homes in the conservation areas.
Targets: Renovations due to be met except cavity wall insulation.
Spin offs: The project has set new standards for future renovation programmes A new Flemish standard will set higher standards for future renovations with a new energy policy from social services.

Case Study 2. PP5 – Brighton & Hove City Council

Outputs			
Renovations	**Planned**	**Carried out**	**Comment**
LED lighting	0	339	
Draft proofing	250	215	Includes chimney balloons, glazing film and secondary glazing
Upgrade heating controls	250	239	
Weather compensators	100	78	
New Boiler upgrades	250	317	

Set up- Retrofits were limited to small measures. An existing contractor/ supplier was used so established relationship led to buy in from technical staff and led to prioritising by BHCC. It was decided to align many of the works to the planned boiler replacement programme as we have systems in place to plan and deliver these works including appointments making, we were also conscious that most householders would want an upgraded heating and hot water system so enhancements delivered through this route would be more easily delivered. The smart controls in particular have been well received due to the additional control and the look of the thermostat/control.

Options - Many of the renovations have been carried out alongside Brighton & Hove's planned boiler replacement programme, upgrading old inefficient gas boiler with highly efficient A rated condensing combi boilers (Worcester Bosch 30i).
Method- As part of the programme we have been completing enhancements through the following; Installation of weather compensators which increase the efficiency of the boiler by an average of 3%, (78 of 100 installed to date). Installation of Worcester Bosch Easy controls. The smart internet connected heating and hot water thermostat gives householders better control. The smart control has the capacity to understand householders' presence and routines to more efficiently heat the home. (239 of 250 installed to date) Both the above enhancements comply with the Boiler Plus legislation introduced in 2018 which aims to increase the efficiency of domestic boilers to a minimum of 92% ErP. This legislation was introduced to reduce carbon emissions in line with EU wide targets. Renovations have also been carried out through draught proofing in homes. This draught proofing is made up of; Draught excluders around front doors Draught proofing around internal doors and window frames Chimney balloons Secondary glazing film The draught excluders were installed through a combination of home visits by our partner Brighton & Hove Energy Services Cooperative (BHESCO) and in 'Goody Bags' handed out to residents through 24 energy advice desks delivered across the city in 2019.
Barriers - There have been no significant barriers in delivering the project other than those encountered with carrying out any work in people's homes i.e. arranging appointments with residents and them being in at the time of the visit, this has impacted more on the BHESCO home advice visits. The installation of weather compensators has not been possible in all cases due to the additional space requirements and also in high rises due access issues to install the external monitor.
What helped- Internal role changes, green agenda in Council, buying from contractor/technical supplier, didn't need to get agreement for works, tenants all wanted new boilers, control of call outs for tenants.
Engagement with residents – Tenants are happy with the results. The Council has a dedicated energy advisory service to ensure that information and support is provided alongside the supply of

equipment.
Monitoring- Monitoring will take place through anecdotal feedback, bill readings, technical data and case studies.
Spin offs - Widened the thinking on future options e.g. district heat networks.

Case Study 3. PP6/PP16 – Optivo

Outputs			
Renovations	**Planned**	**Carried out**	**Comment**
LED lighting	130	152	
Cavity wall insulation	4	6	
Loft insulation top up	5	5	
Single glazed door to double	2	4	
Single glazed windows to double	50	67	
Upgrade heating controls	20	26	
Hot water cylinders	6	8	
New Boiler upgrades	0	1	
High efficiency electric heating	2	2	For off -gas properties
Window surrounds	50	67	

Set up- Optivo planned to carry out a fabric first 'whole house' approach to retrofitting its homes. The pilot scheme involved the selection of 200 homes in St. Leonards, East Sussex which required improvement to meet the UK Government's standard of EPC Band C

(RdSAP 69).
Options – It was decided to take a 'fabric first' approach to the retrofits so that the energy improvements were made to the building with heating equipment being a secondary factor in the retrofit works.
Method- In order to obtain the baseline energy rating for each home, around 480 properties received technical energy surveys to determine whether the work was required and to decide the types of measures necessary to reach the standard. A consultant called CIS (Climate Integrated Solutions) was appointed to carry out the surveys and measures were selected for investment. CIS also carried out work on different archetypes in St Leonards and produced a table of 22 different property types. Optivo selected Engie as the contractor who were required to carry out energy efficiency retrofits on a minimum of 200 of our worst performing homes in St Leonards. Optivo residents in the selected homes were sent a letter to introduce the appointed contractor and to tell them about pre-installation surveys which commenced in May 2018. Overall 210 homes were improved up to EPC band C through multiple measures being completed to the homes.
Barriers - Access to some homes to finish the works proved difficult in some cases. Loft insulation works were hindered by residents not wanting to clear their roof spaces. The contractor required Optivo to conduct asbestos survey works on many of the properties where we were replacing windows or insulating walls and roofs. This caused some delays in completing the works. In a few cases asbestos removal was required. This process created additional costs that were not expected. There was some initial resistance from residents to the installation of 100 Switchee smart thermostats as the data measured include occupancy levels in the home. A signed GDPR agreement was needed from each resident before we could install the unit.
What helped- Some energy retrofits have been completed for the Interreg NWE project CAN (Climate Active Neighbourhoods). This work helped Optivo to streamline the surveys and subsequent retrofit works in the SHINE project.

Engagement with residents – A resident engagement event was held at a community house in St Leonards to explain to Optivo residents what the work would entail. They were able to ask questions directly to Engie, who were installing the renovation works.
Monitoring - 'Before' and 'after' EPCs were carried out on the properties and the energy rating uplift was measured in RdSAP points. CO2 emissions were also measured based on the Environment Index data on the EPCs. Switchee smart thermostats were installed to measure the temperature, humidity and occupancy of the homes involved.
Spin offs – A further 130 retrofits have taken place in Kent based on the learning gained from the SHINE project. Future 'whole house' retrofits are also planned in 2020/21 in the Kent and London area.

Case Study 4. PP9 – Habitat du Littoral

Habitat du Littoral conducted works over three different sites. These were Faidherbe, Adamy and Damremont. Reports for each area are shown below.

Outputs			
Renovations	**Planned**	**Carried out**	**comment**
LED Lighting	LED lighting in shared area of DAMREMONT (18 floors)	0	Due Spring 2021
Virgin roof insulation	6	6	Completed September 2019
Heating controls upgrade	18	18	Completed June 2018
Meter at tower level	1	1	Completed in 2020

SHINE 1: FAIDHERBE

New lifestyle in a renovation project

1. Identification of the energy saving measure

Work Package	4 – Investment
Type of measure	Taking into account new lifestyles in renovation projects
Description	In forty years' time there has been huge lifestyle changes. The size of families is smaller though new stepfamily are more and more common, and the need of surface per resident increased (from 20 m2 per person to 40 m2 per person). Young adult tend to remain with their parents or decide to live together (house sharing). Those considerations should be taken into account in any retrofitting project which has an impact on room sizes, development of shared areas and use of every potential to optimize to use of housing in a flexible way.
Year of implementation	2017

2. Identification of the pilot building

2.1 General overview

OWNER OF THE BUILDING	Habitat du Littoral
COUNTRY	France
ADDRESS OF THE BUILDING	67 rue Faidherbe 62200 BOULOGNE-SUR-MER
INDIVIDUAL / COLLECTIVE	Collective
YEAR OF CONSTRUCTION	2020
NUMBER OF STORIES	1
NUMBER OF DWELLINGS	12
NUMBER OF	26

INHABITANTS	
ENERGY CARRIER FOR HEATING	gas

2.2 Building description

TYPOLOGY	Low rise apartment block		
CONDITIONED FLOOR AREA	4 1264.18 m²		
NUMBER AND SIZE OF DWELLINGS	ROOMS	SURFACE	NUMBER
	T5	114.82	3
	T2	48.40	7
CONSTRUCTIVE TYPOLOGY	Prefab wood frame walls		
WALLS TYPOLOGY	INSULATION	From the inside	
	INSULATION MATERIAL	Glass wool	
	TIGHTNESS	14.5	
	EXTERIOR TRIM	non	
CELLAR, BASEMENT	INSULATION	NOT CONCERNED	
	INSULATION MATERIAL		
	TIGHTNESS		
TYPE OF ROOF, TERRACES	INSULATION	Top of housing	
	INSULATION MATERIAL	Glass wool	
	TIGHTNESS	24	
TYPE OF WINDOWS	GLAZING	4+16+4 Window installed inside on the wooden insulation	
	FRAME	wood	

2.3 Previous refurbishments

YEAR	TYPE OF	PART OF THE	DESCRIPTION

	WORK	BUILDING IMPACTED	
NOT CONCERNED			

2.4 Building equipment

2.4.1 Heating

ENERGY	Gas
DISTRIBUTION	Individual
PRODUCTION	Condensing boiler
EMISSION	Radiators
MONITORING	Thermostatic valves
REMARKS	Energy performance rated B 63 Kwh/m2/year

HEATING EQUIPMENT	
NAME, BRAND	Sony Duval
TYPE	Low temperature boiler
START UP DATE	2017
POWER kW	24

2.4.2 Domestic hot water

ENERGY CARRIER	Gas
DISTRIBUTION	Individual
PRODUCTION	Condensing boiler

EQUIPMENT PRODUCTION	
NAME, BRAND	Sony Duval
START UP DATE	2017
POWER kW	24
TANK VOLUME	3L each (12) – micro accumulation

2.4.3 Ventilation

TYPE	Hygro b mechanical controlled ventilation
NAME, BRAND	Atlantic

SHINE 2: ADAMY

1. Identification of the energy saving measure

Work Package	4 – Investment
Type of measure	Improved Heating System
Description	The idea was to find the best possible option to optimize the heating system based on needs and potential to reduce tenants' charges.
Year of implementation	2017

2. Identification of the pilot building
   2.1 General overview

OWNER OF THE BUILDING	Habitat du Littoral
COUNTRY	France
ADDRESS OF THE BUILDING	11-18 Cour Adamy 43 rue Felix Adam 3-5 rue Hernest Hamy 62200 BOULOGNE-SUR-MER FRANCE
INDIVIDUAL / COLLECTIVE	Collective
YEAR OF CONSTRUCTION	1992
NUMBER OF STORIES	3
NUMBER OF DWELLINGS	54
NUMBER OF INHABITANTS	118
ENERGY CARRIER FOR HEATING	Gaz

2.2 Building description

TYPOLOGY	Low rise apartment block		
CONDITIONED FLOOR AREA	4 203 m^2		
NUMBER AND SIZE OF DWELLINGS	ROOMS	SURFACE	NUMBER
	T2	Between 56 and 58 m2	7
	T3	Between 61 and 87 m2	27
	T4	Between 81 and 106 m2	20
CONSTRUCTIVE TYPOLOGY			
WALLS TYPOLOGY	INSULATION	Internal isolation	
	INSULATION MATERIAL	Plastered bowl and expanded polystyrene bowl TH38	
	TIGHTNESS	13+40	
	INSULATION TECHNIC	collage	
CELLAR, BASEMENT	INSULATION	Of soffits and arcs	
	INSULATION MATERIAL	Projected wool	
	TIGHTNESS	30	
TYPE OF ROOF, TERRACES	INSULATION	Loft insulation	
	INSULATION MATERIAL	Glass wool	
	TIGHTNESS	30	
TYPE OF WINDOWS	GLAZING	Double glazing 4/12/4	
	FRAME	PVC	

2.3 Previous refurbishments

YEAR	TYPE OF WORK	PART OF THE BUILDING IMPACTED	DESCRIPTION
2016	Basement	Cellar	See above

	insulation		

2.4 Building equipment

2.4.1 Heating

ENERGY	Gaz
DISTRIBUTION	Collective
PRODUCTION	Low temperature boiler
EMISSION	Radiators
MONITORING	Thermostatic valves

HEATING EQUIPMENT	
NAME, BRAND	ATLANTIC
TYPE	Low temperature boiler
START UP DATE	2017
POWER kW	2*140

2.4.2 Domestic hot water

ENERGY CARRIER	gaz
DISTRIBUTION	collective
PRODUCTION	boiler

EQUIPMENT PRODUCTION	
NAME, BRAND	VARMAX
TYPE	Low temperature
START UP DATE	2017
POWER kW	2*140
TANK VOLUME	Instantaneous

2.4.3 Ventilation

DISTRIBUTION	Collective
TYPE	Box in Attic
NAME, BRAND	ALDES
DESCRIPTION	Self-adjustable

2.4.4 Building consumptions before and after

YEAR		2017	2018	2019
HEATING	In MWh	323	249	250
WATER		158	151	143

SHINE 3: DAMREMONT

Prioritize energy retrofitting measures in a complex building

1. Identification of the energy saving measure

Work Package	4 – Investment
Type of measure	Priorization of renovation measures when there is a wide range of constraints
Description	The building being particularly complex with 12 façades of different height, suffering from maritime winds, heat issue depending on where flats are located (18 floors max), with parts of the building in shade all the time and other with over sun exposition, it is crucial to prioritize work based on the ROI, impact on tenants and carbon reduction potential. It is particularly important with financial constraint.
Year of implementation	On going

2. Identification of the pilot building

   2.1 General overview

OWNER OF THE BUILDING	Habitat du Littoral
COUNTRY	France
ADDRESS OF THE BUILDING	4 rue Colonel de l'Espérance 62200 BOULOGNE-SUR-MER
INDIVIDUAL / COLLECTIVE	Collective

YEAR OF CONSTRUCTION	1973
NUMBER OF STORIES	18
NUMBER OF DWELLINGS	146
NUMBER OF INHABITANTS	220
ENERGY CARRIER FOR HEATING	DALKIA (DHC)

2.2 Building description

TYPOLOGY	High rise apartment block		
CONDITIONED FLOOR AREA	10 443 m2		
NUMBER AND SIZE OF DWELLINGS	ROOMS	SURFACE	NUMBER
	T1		12
	T2		53
	T3		62
	T4		19
CONSTRUCTIVE TYPOLOGY	Reinforced concrete building And concrete panels		
WALLS TYPOLOGY	INSULATION	Insulating concrete	
	INSULATION MATERIAL	Béton armé + plaques en polyester Béton Armé + grès Cérame Maçonnerie Béton armé	
	TIGHTNESS		
	EXTERIOR TRIM	Air gap and metal siding	
	INSULATION TECHNIC	External thermal insulation	
CELLAR, BASEMENT	INSULATION	None, down to earth concrete	
	TIGHTNESS	20	
TYPE OF ROOF, TERRACES	INSULATION	polyurethane	
	INSULATION MATERIAL	Reinforced concrete (for all roofs except the terrace on basement) + polyurethane + macadam + gravel	

	TIGHTNESS	BA 0.15 densité 375 kgs/m2 10
TYPE OF WINDOWS	GLAZING	Double glazing
	FRAME	Wood and foil

2.3 Previous refurbishments

YEAR	TYPE OF WORK	PART OF THE BUILDING IMPACTED	DESCRIPTION
1995	Thermal insulation	Outdoor walls	
2015	Connection to DHC	Boilers	DHC with renewable energy
From 2009 to 2014	maintenance		

2.4 Building equipment

2.4.1 Heating

ENERGY	Gas and biomass (DHC)
DISTRIBUTION	Collective (colonnes montantes)
PRODUCTION	Substation connected to DHC
EMISSION	Radiators
MONITORING	Thermostatic valves + regulation globale en function de la temperature extérieure
REMARKS	

HEATING EQUIPMENT (collective connected to DHC)	
POWER kW/h	91

2.4.2 Domestic hot water

ENERGY CARRIER	DALKIA

EQUIPMENT PRODUCTION	
POWER kW/h	26

2.4.3 Ventilation

DISTRIBUTION	Collective
TYPE	VMC Collective Controllée Collective Simple Flux Autoréglable

Case Study 5. PP12 – Zonnige Kempen

Outputs		
Renovations	**Planned**	**Carried out**
Draught proofing	6	0
Cavity wall insulation	6	0
External wall insulation	6	0
Upgrade of double glazing	6	0
New boiler upgrade	1	5
Gas central heating upgrade	1	5
Floor insulation	6	0
Roof insulation (room in roof)	6	0
Mechanical ventilation	6	0
Smart thermostats	1	5
Solar gain (glazing)	6	0

Set up – A selection of potential homes was made (older poorly insulated dwellings). Six homes were selected as examples in Seringenhof 40. Works have just started after some delays. A contractor to do the works was selected in January 2020.
Options – The plan is to renovate the homes from the outside.
Method - Time consuming to move people - barrier, expensive, lost rent, year empty, communicate this to the tenants, difficult to convey why they should empty.
Monitoring - For installation of a SMAPPEE (intelligent datalogger for energy consumption) using a wall socket. EPCs are to be carried out before and after the works are completed. There will be a focus on behaviour change and well-being.
Barriers - There were some timing issues with the start-up of the renovation in Seringenhof. For their contribution in the financing of the

renovation they depend on the VMSW (Vlaamse Maatschappij voor Sociaal Wonen). VMSW has complex administrative procedures that take sometimes years to get through. On top of that Zonnige Kempen had a change in personnel which also not very helpful is to speed things up to meet the deadlines. Other issues besides the administrative struggle at VMSW: • Finding empty dwellings for moving the tenants. They tried to find appropriate accommodation as close as possible so that the social connections between the neighbours are not lost due to renovation. • The cost (money as well as the time investment) is an issue were they are looking for alternatives. In another project ENLEB, we are experimenting if it is possible to insulate the outer shell of the dwelling (roof, walls, windows and doors) without relocating tenants. • The electricity company has fused and changed names therefore the permission they had from the tenants to ask the data of their energy consumption is no longer valid and the work that has been done needs to be done again. • For installation of a SMAPPEE (intelligent datalogger for energy consumption) a wall socket is needed. Not installed at an accessible place in the older dwellings.
Things that helped - They have just recently started so the issues or building problems are still few.
Spin offs – N/A

Case Study 6. PP14 – Clavis

Outputs		
Renovations	**Planned**	**Carried out**
Upgrade lighting to LED	0	50
Cavity wall insulation	0	50
Internal wall insulation	0	50
External wall insulation	8	8
Virgin loft insulation	8	8
Upgrade of double glazing	0	75

Gas central heating upgrade	0	70
Roof insulation (room in roof)	8	8
Solar PV	8	8
Mechanical ventilation	8	8
Smart thermostats	8	8

Set up - Core stock is based on rentability. The works are designed to make the scheme affordable and to provide a return on the investment.
Options - Eight dwellings in Bellamy were selected for the SHINE work. This was part of a bigger city wide renewal project. Net zero energy pilot at a cost of 100,000 euros each.
Engagement – Smart meters used to engage residents. Study on retrofits being carried out to ensure a sympathetic fit with local architecture. The aim is to create social awareness.
Barriers – Investment based on scenario analysis. Waiting for market value to go up to justify investment. The pilot will show whether this approach is viable.
Monitoring – Smart meters are being used to monitor energy costs.
Spin offs – Learning from residential and technical gains. Resident engagement is a key part of the work.

Project partners