



EnergyMeasures

Tailored measures supporting energy vulnerable households

D4.3

Initial report on behaviour change initiatives amongst energy poor households



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








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About EnergyMeasures

EnergyMeasures is working to address energy poverty in seven European countries, namely: Belgium, Bulgaria, Ireland, Netherlands, North Macedonia, Poland and the United Kingdom. The project comprises two complementary and synergistic strands of work.

The first strand involves working with energy poor households to improve their energy efficiency through a combination of low-cost measures, and changes in energy-related behaviours and practices. Recruited householders will be provided with low-cost energy measures and empowered to change their energy-related behaviours and practices through an approach that takes account of existing housing conditions and is reflective of their lived experience.

The second strand comprises working with municipalities, energy authorities, housing associations and other relevant actors to assess how current multi-level institutional contexts affect efforts to alleviate energy vulnerability in the participating countries. This knowledge will be used to develop and support the implementation of policy and practice measures which will address structural issues that combine to trap households in energy poverty.

Through this work the project contributes to reducing participants' vulnerability to energy poverty, while at the same time cutting household energy consumption and associated GHG emissions.

For more information see <http://www.energymeasures.eu>

Description of the deliverable and its purpose

This document provides an introduction to, and an overview of, the energy-related behaviour change components of the household engagements within the EnergyMeasures project. The deliverable provides an overview of the type of energy efficiency and energy curtailment behaviours from which the recommendations for participating householders will be based. Then a short context and summary for the (still in early stage) behaviour change initiative in each country is presented and discussed.

Glossary

DCC	Dublin City Council
DoA	Description of Action
EPS	Expanded Polystyrene
ESRI	Economic and Social Research Institute (Ireland)
FEBEG	Federation of Belgian Electricity and Gas Companies
GAA	Gaelic Athletic Association
MABS	Money Advice and Budgeting Service (Ireland)
NGOs	Non-governmental organisations
SEAI	Sustainable Energy Authority of Ireland
SILC	Survey on Income and Living Conditions
VREG	Energy Regulator in Flanders, Belgium
WP	Work Package

1 Introduction

The EnergyMeasures project is working to implement coordinated household energy engagement programmes and address structural issues surrounding energy poverty in seven European countries (Belgium, Bulgaria, Ireland, Netherlands, North Macedonia, Poland, and the United Kingdom). For this purpose, the project is working with energy poor households to improve their energy efficiency through a combination of low-cost measures, and changes in their energy-related behaviours and practices. In each of the countries, energy poor and at-risk households were identified and recruited to participate in the project. These householders were provided with small energy measures and facilitated to change their energy-related behaviours and practices through an approach that both took account of the nature of the housing units and is reflective of the lived experience of the householders.

This document, focusing as it does on the behaviour change initiatives of participating households as of the end of April 2022, supplements project deliverable D4.1 (Saridaki *et al.*, 2022) which provides an overview energy consumption monitoring at the same time. The deliverable comprises five sections, this brief introduction outlines the context of the report and provide a brief overview of its content. The second section comprises a note of the approach adopted for behaviour change, while the third section considers recommendations for energy-related behaviour change. Section Four of this document¹, details the country level perspectives on behaviour change. For each country a brief context is outlined, behaviour change recommendations discussed and a note on measurement presented. Section Five provides a short summary and concluding statements based on the work presented.

2 Note on approach

As will be seen in Section Four, the household engagement on energy-related behaviour change is at different stages in the participating countries. The recruitment delays arising from Covid-19 and the varying impacts of, and responses to, the pandemic means that while some partners are well progressed in providing recommendations for changes in practices and behaviours, others are at an earlier stage in the process. There is widespread recognition of such changes to address rising energy use and its climate effects (Heimlich and Ardoin, 2008; Moloney, Horne and Fien, 2010). However, the introduction of effective behaviour change interventions is dependent on our understanding of energy conservation behaviours. The design of behaviour change plans can prove a challenge because it may be neither practical nor possible for householders to address all relevant behaviours as part of an intervention, due to the varying circumstances and motivations underlying each individual behaviour.

The general approach to integrating behaviour change in engaging energy poor households was outlined in project deliverable D1.2 (Dunphy *et al.*, 2020). As detailed in D1.2, energy conservation behaviours can be categorised into three groups comprising once-off *Efficiency Behaviours* that may

¹ Section 4 present only summary details of household recruitment and engagement. Additional details of the (as of end April 2022) and an overview of experiences of energy poverty in the participating countries can be found in D4.1.

necessitate occasional actions, *e.g.*, appliances purchase or structural changes. There is a cost, however Karlin *et al.* (2014) note that such behaviours generally produce longer-lasting effects and do not result in lost amenities. These can be sub-divided into high-cost and low-cost measures. *Curtailment Behaviours*, no-cost (or very low-cost) energy-saving behaviours requiring repetitive efforts (and arguable decreased comfort) to produce energy savings, *e.g.*, turning off light switches, lowering thermostat settings. While the energy-saving potential of curtailment behaviours is generally considered less than that of efficiency behaviours (Gardner and Stern, 2002), they can be effective when coupled with small measures and tailored to circumstances, and as Karlin *et al.* (2014) posit the varied nature of energy behaviour requires that effective intervention strategies be diverse in their nature. A third (perhaps less acknowledged) category is that of *Maintenance behaviours*, the maintenance and repair of energy-using appliances to improve their performance and efficiency.

The general approach forwarded in Dunphy *et al.* (2020) describes a multi-step approach in undertaking an energy-related behaviour change intervention, as outlined below.

- The initial step (usually during registration) involves the collection of personal details and preliminary information about the household.
- Step two is the gathering of information on energy related practices and behaviours, this is achieved through *e.g.*, a semi-structured interview or guided conversation (during the first household visit or remote contact) wherein the householder is enabled to describe their relationship with energy.
- Through consideration of the collected information, step three is where the energy advisor develops specific behaviour change recommendations for the householders reflective of the way that they relate to and interact with energy.
- Step four is the presentation of the tailored behaviour change plan (along with the small measures that also form part of this project's offering. It is important at this stage to gain agreement on the recommendations so that the participants 'buy into' the programme.
- The fifth step is the provision of ongoing support for the participants through *e.g.*, periodic contacts, social media updates, discussion forums, newsletter, WhatsApp groups, *etc.* Finally, following the conclusion of the intervention it is useful to gather information to ascertain the level of uptake of the recommended behaviour changes and the factors that influence success or failure in the adoption or otherwise of the energy related behaviours and practices.

While of course there are variations and specification in the approaches used in the different engagements, the above general approach represents the core approach to behaviour change in the project. The following section outlines some examples of recommendations made within the project on (changes to) energy related behaviours and practices.

3 Recommendations for energy-related behaviour change

A key part of the EnergyMeasures approach is the provision of advice on behaviour changes to both conserve energy and to use energy more efficiently. This advice is tailored for the households and the nature of their energy consumption. This involves choosing a collection of changes to energy-related behaviours which appropriately reflects the specificities of their circumstances. Examples of recommended energy-related behaviour changes are outlined in the tables below. These tables are derived from the portfolio of recommendations prepared for use in the Irish context – however there is of course a great deal of overlap with recommendations proffered in the other participation countries (*Note: the illustrative costs savings were based on cost before the Russian invasion of Ukraine and the subsequent energy crisis, accordingly the savings are likely to be far greater as the price of increases*).

Table 1: Examples of recommendations related to heating and light

Recommendations	Detailed Description
Turn down room thermostats	By turning down the thermostat by as little as one degree (<i>e.g.</i> , to 18-20°C in living space and 15-18°C in bedrooms), savings of an average of 10% on heating consumption can be achieved.
Turn the radiators off in rooms that are not in use and when going to bed	Turning heating off an hour before going to sleep or before leaving a room could see potential savings of up to €18 per year. By turning off the radiators in unused rooms entirely savings of up to €10 per room per year can be realised. Close doors to unused rooms will conserve heat.
Optimising lighting use	<p>Maximising use of daylight by arranging furniture effectively <i>e.g.</i>, locating desk near window to enable reading.</p> <p>Cleaning windows and not using curtains and blinds will maximum daylight penetration.</p> <p>Holding off on switching on lights until needed, making use of so-called task lighting (to avoid lighting the entire room), and turning off the lights when not needed (<i>e.g.</i>, after leaving a room), will all save/reduce the cost of lighting.</p>
Use radiator foil	Using radiator foil behind radiators will minimise heat loss through external walls, by reflecting heat – saving up to €12 per year.
Regularly bleed radiators	Releasing air trapped inside radiators by so-called ‘bleeding’ them with radiator valve keys, greatly improves the efficiency of heating systems – leading to warmer homes and lower energy bills.
Avoid putting furniture or laundry in front of radiators	Moving furniture (and laundry) out of the way of radiators will allow heat to radiate out into rooms. With this measure savings of approximately €15 per year are possible.
Prevent draughts around doors and windows	Checking windows, and doors (including keyholes) for draughts of cold air and plugging them will make a difference to comfort. Placing insulating film around windows and doors could result in a saving of up to €6.50 per m ² .
Take care of boiler	Regularly servicing boilers ensure they run at optimal efficiency. If very old, consider having it replaced with a more energy-efficient model. This measure could allow you to save up to €400 per year on your energy bills.
Install de-humidifier to avoid damp build-up instead of using the air conditioning	By using dehumidifiers to extract moisture from the air in a home, the build-up of damp and mould will be prevented. Using dehumidifiers will also make the air temperature feel a bit cooler, which could reduce the need for air conditioners.

Table 2: Recommendations related to washing and bathing

Recommendations	Detailed Description
Run washing machine only with full loads	Making sure that washing machine are full will mean reduced number of washes and could save approximately €10 per year.
Wash clothes at a lower temperature	Washing clothes at a lower temperature (or using the eco setting) will use less energy and could save up to €7 per year (depending on number of washes, and the age of machine)
Air-dry laundry rather than tumble drying	Air-drying clothes outside whenever possible will reduce the use of the tumble dryer, which can be very energy intensive. Air drying two loads per week instead of tumble drying would save up to €100 per year.
Optimise water heating	Fitting insulation (lagging jacket) around hot water tank ensures that water heat is retained, saving up to 30% of water heating costs. Adjusting the water temperature on a combi-boiler or hot water tank to 65°C will stop energy waste by preventing overheating of water.
Shower rather than bath	Taking a regular shower in place of a bath will reduce energy consumption by four-fifths.
Minimise time in the shower	Using shorter showers saves both water and energy – for a household of four, reducing shower time by one minute could save up to €200 per year.
Avoid power showers	Using regular showers rather than power showers will save a significant amount of hot water and associated energy – for a 5 min shower this could mean savings of up to 90 litres of hot water.

Table 3: Recommendations related to food storage and preparation

Recommendations	Detailed Description
Defrost freezer regularly	Defrosting the freezer (c. every six months) to ensure less than 5mm of frost build up makes for more efficient running. Too much ice build-up makes for less space where frozen food should be and may result in the freezer door not being able to close properly.
Position fridge in a cool place away	Moving the fridge away from any heat source (e.g., other large appliances or direct sunlight) reduces its workload and minimises electricity consumption.
Close the fridge door	Closing the fridge door promptly after getting food will reduce its energy demand. For every 10-20 seconds that the door is open fridge takes 45 minutes to cool down to its original temperature. Being careless with the fridge door can waste up to 120 kWh per year.
Cool food before refrigerating	Cool hot food before placing into your fridge or freezer to reduce energy demand.
Don't open the oven	Similarly, keeping the oven closed when in use significantly reduces the cost of cooking. About 20% of heat is lost when you open the oven.
Increase oven performance	Regularly cleaning the oven reduces cooking time. Replacing a worn or damaged door also increases oven efficiency.
Optimise use of oven	Turning off the oven for the last 5-10 minutes of preparation time reduces energy consumption as the cooking can be achieved using residual heat.
Optimise use of hobs	Using the appropriately sized pot for the food means heat is applied where it is needed – while using the correct size ring for pot prevents energy waste.

Recommendations	Detailed Description
	<p>Placing lids on pots prevents heat loss and speed up the cooking process; while using only as much water as needed to cover food reduces energy use.</p> <p>Turn off the rings when the food is almost cooked and use the residual heat to finish cooking.</p>
Use energy efficiency cooking appliances	<p>Using microwave ovens for smaller meals instead of conventional oven, as they use far more energy efficient.</p> <p>Using slow cookers to prepare larger meals is also very efficient as they consume as little as 150 watts per hour at a low setting.</p> <p>Similarly, air-fryers can be used to prepare many foods for up to half the energy of conventional ovens.</p>
Defrost food in fridge	Letting frozen food defrost in the fridge is preferable than using microwave ovens as it is safe, uses no energy and helps keeps the fridge cool.
Bulk preparation	Preparing food in bulk can really minimise energy consumption. This involves planning meals in advance, cooking meals together and in far as possible cooking all elements at once.

Table 4: Recommendations related to electrical appliances

Recommendations	Detailed Description
Use energy monitor to know energy appliances	Using electricity monitors can help users to understand domestic electricity consumption and identify potential appliances to target for reduced use.
Minimise use of dishwasher	<p>Reducing use of dishwasher by only running the dishwasher at full capacity, will reduce energy consumption and save costs.</p> <p>Note that dishwashing is more efficient than hand washing as it uses less than half the quantity of hot water (although, washing small amounts by hand is preferable than partial loads).</p>
Optimise dishwasher operation	<p>Reducing the temperature (<i>e.g.</i>, by using eco-settings) will significantly reduce energy consumption, as water heating accounts for up to 80% of its energy demand.</p> <p>Operating dishwasher to run off-peak (<i>e.g.</i>, overnight) will reduce the load on the grid during peak times and could minimise costs (if using a night rate or smart meter).</p>
Minimise water heating for hot drink preparation	Boiling only as much water as needed when making coffee or tea. Not over-filling kettles (based on a conservative 4 x uses a day) can save c. €15 per year.
Turn appliance off when not in use.	<p>Leaving appliances on when not in use can be quite wasteful – common examples include TV running as background noise for a pet, or computer when going to lunch.</p> <p>While standby mode is better than fully on, it can still be quite wasteful as appliances still use 10-20% of operational energy use when on standby. Switching off completely (<i>e.g.</i>, by using ‘standby killer’) can yield the savings of up to €50 per year.</p>

The NGO Energiebox (with which the Dutch EnergyMeasures partners are collaborating) has many years' experience providing energy advice to households. Their follow-up surveys undertaken six months after engagement provide some insight into the type of advice most followed. As shown in Table 5 below, there is a striking variation in the level of uptake of different recommendations

Table 5: Indicative up-take figure for energy recommendations provided by the Dutch NGO Energiebox

Recommendations	Uptake amongst households
Limit standby consumption	53%
Set the fridge/freezer to the right temperature	46%
Replacing lighting with LED lamps	43%
Apply radiator foil	40%
Take shorter showers	39%
Turn off unnecessary lighting	34%
Placing draft strips	29%
Wash at lower temperatures	27%
Turn down heating at night	27%
Close curtains at night	22%
Defrost freezer	17%
Dry laundry outside	15%
Lower heating during the day	15%
Have the boiler/central heating properly adjusted	14%
Clearing radiators from curtains	11%
Replace old appliances	10%
Using water-saving shower head	10%
Clearing radiators from furniture	9%
Degrease microwave	9%
Placing letterbox brush	9%
No follow-up on any of the given advice	5%
Removing dust behind refrigerator	2%
Pipe insulation	1%

The following section presents country-level overviews of the implementation of behaviour-change initiatives as of the end of April 2022.

4 Behaviour change realisation

4.1 Belgium

4.1.1 Belgian engagement context

There are two organisations involved in recruiting and engaging households in Belgium, namely: APB Kamp C (knowledge centre for innovation and sustainable building) and SAAMO (non-profit organisation working with communities for positive social change, inclusion, and equality). Thus far, Belgian recruitment has been targeted in the municipality of Turnhout located in Flemish province of Antwerp, with a target to recruit 500 households (250 for each of Kamp C & SAAMO). Efforts to date have been focussed on collaboration with, and referrals from, the city/region of Turnhout and the OCMW the public centre for social welfare in Turnhout. There have been substantial challenges associated with recruitment in the initial half of the project, not least because of the Covid-19 pandemic and its knock-on implications. At the end of April 2022, 35 households have been recruited in Belgium. Despite low numbers, SAAMO and Kamp C have been working very hard to try to come closer to their target. The collaboration with key organisations and the city is needed now more than ever.

4.1.2 Behaviour change recommendations in Belgium

The approach we are implementing in Belgium when proposing behavioural change to householders is not authoritative but rather as neighbourly, helpful advice. After introducing ourselves, we try to immediately be open and direct: *“We are not selling anything, we are just here to offer advice and some useful goodies.”* The initial part always comprises icebreakers and small-talk about the composition of the family, their routines and habits. The coaches always offer titbits of their own: *‘I also have a teenager that spends hours under the shower...’* and *‘We also try to cook large amounts in the oven to save for the next day...’* are common ones. People are, however, never comfortable talking about having problems with paying their bills and we are careful not to sound standoffish. The message is not *‘use less energy to save money’* but rather *‘be aware that it is possible to increase comfort AND be more efficient (less energy consumption) if you adapt some habits’*.

The strategy followed by SAAMO and Kamp C for energy-related behaviour change centres around **the ‘Woonmeter’²**, which is an ideal conversation gadget, visually very easy to understand, while being informative. *‘Did you know that humid air is much harder to heat?’* or *‘Did you know it is better to ventilate your home for 10 min with wide open windows, morning and night, than leave them the whole day in a tilted position?’* Most times we are allowed to go around the house. When we notice something, such as mould around the doors or windows or dampness on the glass, it gives us the opportunity to go into more detail on these subjects, with tips and tricks. *‘Here you could place the*

² The Woonmeter is a simple thermo-hygrometer designed for socially vulnerable families. It is an energy savings tool that teaches users you to deal with energy consciously, helping with moisture and mould and increasing feelings of comfort.

home meter to check when you need to ventilate this area/room. A booklet is currently being finalised, where households will note down not only their energy readings for gas and electricity, but also the tips that were checked off in the first home visit, as a hands-on reminder/diary.

Figure 1: Examples of resource folders provided to Belgian participants



Four pamphlets have been developed (see e.g., Figure 1) with the titles: 'using hot water wisely'; 'saving your energy by adjusting your habits'; 'ventilating is something you can learn' (home meter & ventilation); 'heating your home without breaking the bank' (home meter & thermostat). The impact of the titles is unfortunately a bit lost in the translation! These pamphlets are used to guide the conversations and are integrated in the survey, completed after every visit. The following list contains behaviour change measures that have been most eagerly welcomed by households:

- Ventilating is healthy and can save money. Opening windows twice a day reduces the moisture in the air. Drier air is easier to heat!
- A lot of energy (= money) can be saved by a well serviced boiler.
- Tackling draught with strips around windows or doors and using heavy curtains where strips are not possible, will increase comfort.
- A well-programmed thermostat can make a difference. It is more energy efficient (=cheaper) and more comfortable to heat longer at a lower temperature, than for short periods of time in high temperatures.
- Installing an eco-shower can save many litres of water (and therefore energy for hot water).
- Eliminating standby use in appliances with a one button multiple socket strip.
- Optimising efficiency of appliances e.g., placing fridge at least 10cm from the wall; filling-up the freezer; always washing full loads; Bull preparation of meals; etc.

- Insulating pipes, shortening curtains in front of radiators, *etc.*

Most households have expressed a willingness to take up a number of measures. They are aware of the limitations of their homes and their budget but are by no means blind to the effect that energy poverty has on their overall health and sense of well-being.

Additionally, the energy advisors are working to increase knowledge and raise awareness of householders on issues such as energy contracts; changing tariffs and suppliers; night-time rates; smart meters; peak load penalties. This includes warning on the poor value energy contracts aggressively pushed by predatory agents. The Belgian partners also refer households to other services as appropriate. Examples include the region's *Energiehuis* for renovation advice: a step-by-step plan for many renovation investments (what to do first and how to apply for grants, *e.g.*, insulation of the attic floor, skylights, outer shell, floor insulation for comfort, *etc.*); the *Housing & Energy Office* of the Turnhout city region supports you with questions about grants and loans³.

4.1.3 Measuring behavioural change

A record is kept of the recommendations given to each household, during subsequent contacts we will revisit this list and ask the householders to give us feedback on their success. In this way we will explore if the proposed behaviour change was successfully undertaken and if extra support was required. This review will also identify the nature of any barriers faced by the householder and if they consider that they are likely to maintain the behaviour change.



Figure 2: EnergiID web platform

The Belgian partners have also formed a group on EnergyID, a social platform built around energy monitoring, aimed at individuals and organisations who want to keep track of their energy and water consumption and easily manage it. Groups are a way for local initiatives to follow the performance of multiple records. This enables them to provide the owners of those records with specific advice.

³ New in Belgium: 0% renovation loans specifically aimed at low-income households are now available to tenants

4.2 Bulgaria

4.2.1 Bulgarian engagement context

The Bulgarian household engagement is led by Municipality Energy Efficiency Network, EcoEnergy. The engagement activities are focussed in Gabrova municipality (centered on a medium-sized town in north-central Bulgaria) and Burgas municipality (centred on Bulgaria's fourth-largest city located on the Black Sea) with the active support and involvement of the local municipal authorities Obshtina Gabrova and Obshtina Burgas, and the Center for Energy Efficiency EnEffect⁴. This engagement in Bulgaria is focussed on older multi-family residential buildings, with a target of 600 participating households. At the end of April 2022, some 434 households were recruited in Bulgaria (245 in Gabrovo and 189 in Burgas).

Although a large proportion of households in Bulgaria own their homes, living conditions in many of them are significantly lower than the European average. About 48% of the Bulgarians live at risk of poverty and social exclusion. Overall, there is an acute shortage of social housing and no increase in state subsidies or lending is planned. In addition, low economic status, the lack of a control and sanction system and insufficient market penetration of professional housing management services lead to systemic under-maintenance of many dwellings.

Figure 3 below shows a building on the Blvd. 71-75 Mogilyov in the city of Gabrovo, in which participating households reside. The elements of the building envelope are in extremely poor condition, with many of the homes unable to maintain an adequate temperature in winter, and the appearance of mould on the walls of the homes is a common sight. For heating, most flats use the services of the local district heating company, and there are some that have given up the centralised heating and have installed air-conditioners.

Figure 3: Multifamily residential building in Gabrovo.



⁴ Each of which are formally involved in the project as linked third parties of Municipal Energy Efficient Network EcoEnergy.

A total of 81 people live in the building, Figure 4 shows the first meeting with them, where the EcoEnergy team was introduced by municipal officials. After we presented our goals and offered help to improve the building's energy performance by preparing a detailed energy audit including specific recommendations for improvements, which is the first step to participate in the second phase of the National Program for Energy Efficiency, the residents unanimously decided to join the initiative, signing a common condominium protocol on the covers of the parked vehicles. This is what we count as our biggest success so far, as we have managed to get the individual owners to act together to improve the building they live in.

Figure 4: Meeting with building residents in city of Gabrovo



Given the COVID-19 restriction at that time, the results of the analyses and specific recommendations were summarised and presented to some of the residents, but only a few months later at an organised training event, the hall provided by the municipality of Gabrovo could hardly accommodate those willing to learn more about how to reduce their energy and fuel bills and how to create a more comfortable and healthier living environment for their families.

Figure 5: Meeting with Gabrovo residents on how to reduce energy bills (once restrictions were lifted)



In such an environment, behaviour change in the sense of '*turn the temperature down by 1°C and you will save energy*' is not an approach that would have an effect, as many households do not reach the required temperature during the winter months. More general solutions are therefore needed to truly fight the energy poverty and one of them is the deep renovation of the existing multi-family residential

buildings. However, for this to happen, all individual owners in these buildings need to be on the same page, and this is proving to be a serious challenge. That is why the EcoEnergy team set out to bring people living in these buildings together, explain how they should renovate their buildings and what the benefits would be, which are far from just about reducing energy costs, but also about improving living comfort and a healthier environment.

4.2.2 Measuring behaviour change

Based on their long term experience in developing energy audits and Energy Performance Certificates of buildings, EcoEnergy's experts made a detailed assessment of the buildings of the participating households analysing the energy consumption data, the condition of the building envelope and the building systems, prepared energy models and specific recommendations for both changes in occupants' behaviour and possible energy-saving measures that could significantly reduce energy consumption. This, of course, would not have been possible if the individual apartment owners in the building had not banded together to gather the necessary information and make their homes available to the energy experts for inspection. The expected energy savings from the specific energy efficiency measures were calculated and residents were presented with a clear picture of how their fuel and energy bills would change as a result of their implementation.

Currently, two of the eight buildings involved in the project have energy audits completed and the rest are in the pipeline. Communicating with citizens and building trust in energy experts is key to motivating them to act together to achieve better energy efficiency in their homes and improved living conditions in buildings. Unfortunately, it is the lack of a communication strategy at national level and the long-standing distrust of central government that is one of the reasons why energy efficiency remains misunderstood by end users. Talking to people face-to-face, sharing best practices, demonstrating the negative health consequences of poor building condition and lack of knowledge have proved to be the keys to motivate them to think and act together to reduce energy costs and improve the comfort of their homes.

4.3 Ireland

4.3.1 Irish engagement context

The household engagement activities in Ireland are focused on the cities of Dublin and Cork, with a target of 650 participating households. Energy Action CLG are leading the engagement in Dublin (target of 500 households), where their primary target group are elderly people living in single-family, owner-occupied houses in Dublin City and its environs. Energy Action is recruiting by leveraging its existing networks. UCC are responsible for engaging households in Cork city and surrounding areas (target of 150 households). They have two main target groups, disadvantaged communities, which the university has traditionally engaged in outreach programmes, and elderly communities, which so often suffer from energy poverty. At the end of April 2022, 175 households were recruited in Ireland (90 in Dublin and 85 in Cork).

Promotion of energy-related behaviour change in the Irish participating households has followed a bottom-up approach where householders take charge in defining the energy-related behavioural changes that they would like to undertake in their homes. This tailored behaviour change plan initiates during the first household contact when the energy advisor considers with the householder the physical and technical aspects of the dwelling and discusses the main energy-related activities and issues. At the end of this discussion, a draft of the bespoke plan that includes low-cost measures and energy related behavioural changes is prepared with input from the householder.

Using information gathered during the first household visitation, the energy advisor produces a brief report detailing the energy analysis undertaken for the dwelling, and the list of the behavioural changes arising from the consultation with the householder. Then, a second household contact is organised so that the householder can analyse the report, and to discuss with the householders the no-cost and low-cost energy conservation and efficiency measures most appropriate for them, resulting in a final bespoke household behaviour change plan for agreement. The plan usually contains no more than ten energy-related behaviour change suggestions including a relevant mix of efficiency, curtailment, and maintenance behaviours so that the householder can focus on the actions that are more feasible and can have the largest positive impact.

4.3.2 Behaviour change recommendations in Ireland

Participating households in Ireland have been more willing to adopt efficiency behaviours than curtailment behaviours. Efficiency behaviours, or once-off behaviours that require the installation of low-cost measures (*e.g.*, replacing incandescent lamps with LED lights) have been widely welcomed as the programme allowed participants to free access to such measures. However, curtailment measures, which are no-cost energy saving behaviours that require repetitive efforts from householders to produce energy savings such as turning off light switches, lowering thermostat settings, and closing curtains, have (not unexpectedly) been more difficult to introduce in everyday practices.

For instance, lighting up a fire in the evenings is still a very common tradition in households in Cork. Because people are unable to keep the house adequately warm, they localise warmth by lighting an open fire or a stove in the living room. This is done particularly in the evenings when families can gather to watch television. Rising energy prices, have strengthened this practice since traditional solid fuels (turf, wood, and coal) can be more accessible and their prices have not risen as much as other heating sources such as gas and oil. As a deeply ingrained tradition that is now used as a coping mechanism by many in energy poverty, changing this behaviour has been therefore not been prioritised as part of the programme.

There were other curtailment measures that were more welcomed by householders, but not without suspicion. For instance, dampness and mould are a big worry for people living in Ireland which has a humid maritime climate. Therefore, people are prone to heating all their dwelling, including rooms that are not in use so that this dampness can be avoided. This behaviour can have a significant impact on an energy bill of an individual living by him or herself in a large house. For instance, Mark, a 75-year-old pensioner, who lives in a nine-room house has all the radiators on even though he only uses three rooms in his daily routine. The house used to be inhabited by his three children that are now living in other dwellings. However, even though the number of inhabitants in the house has changed, he didn't modify his behaviour. Therefore, as part of the programme, householders are being advised to turn off the radiators in rooms that are not used in their day to day lives, and instead, are asked to ventilate these rooms for at least 10 min every day. Participants have demonstrated curiosity about this suggestion but have only agreed to follow it as a temporary measure to assess its effectiveness in reducing energy costs without causing dampness or mould problems.

Curtailment measures that have been more welcomed include changing washing machine settings to 30 degrees and reducing the number of minutes clothes are dried in the tumble dryer. For instance, Laura mentioned that she only thought that bacteria could be killed at 60 degrees and therefore used to wash all her and her grandchildren's clothes in this setting. The energy advisor suggested changing this behaviour and setting white clothes at 40 degrees and the rest of the clothes at 30 degrees and assessing the difference. She realised that there wasn't much difference in the way clothes were washed between 60 and 30 degrees and now agreed to wash all her clothes at 30 degrees.

Another relevant behavioural change was the reduction of chest freezers in the households to significantly reduce their energy bills. Britta, a householder living in a large house in the countryside explains that she needs a second chest freezer due to the need for freezing space when her children and grandchildren come to visit her during the holidays. We suggested turning off temporarily the second chest freezer while she was by herself as a measure to reduce her electricity consumption. Similarly, John, agreed to turn off the second-hand chest freezer that he had purchased recently, but that he suspected was using a significant amount of energy in his house. Indeed, two months later, he reported that he had saved 60 euros for the next bi-monthly bill and attributed this saving to the curtailment of the freezer.

An energy-related behaviour change that proved popular among householders was the suggestion of turning off their ovens ten minutes before the end of the cooking time. Furthermore, householders were advised to open their ovens right after to make use of their residual heat. Many householders mentioned their love for baking and therefore welcomed this measure with excitement. Efficiency behaviours welcomed by householders included the use of draught excluders and seals for windows and doors, as well as the use of energy-saving bulbs, radiator foil, moisture absorbers and dehumidifiers. Examples of other advice and referrals include the following:

Switching Suppliers: A GAA Club⁵ referred the case of an elderly man in energy poverty to the project – he was carrying a heater from room to room. Energy Action visited the 83-year-old man and helped him switch suppliers. This resulted in a lower tariff and a €200 credit to his account, for a small penalty of €50 for breaking his original contract. A widowed lady (67) was similarly assisted by Energy Action. Household energy consumption was a good deal lower than the average and the woman was in fact in so-called hidden energy poverty. At the energy advisor's suggestion, the householder contacted her supplier of 34 years to request a better rate⁶. However, even though she was very disappointed in their offer, and said she wanted to change supplier – three months on she still has not switched her supplier, which illustrates the challenge in changing energy-related behaviour and practices.

Referral to social programmes: An elderly traveller⁷ couple were referred from the Money Advice and Budgeting Service (MABS). The couple who had a lot of medical issues were living in 12-year-old social housing, which they had moved into just a year previously. The principal problem identified was the severe coldness of the house's two bedrooms, which were north facing and poorly insulated. Energy Action referred the case to the local municipality and lobbied for the drywall insulation as a resolution, which was agreed by the authorities. The Irish partners have also encouraged households on a routine basis to apply to Sustainable Energy Authority of Ireland (SEAI) programmes for energy upgrades. UCC and Energy Action support the householders by explaining the programmes and guiding them through the application process.

4.3.3 *Measuring behavioural change*

To measure the extent to which the householders have adopted the agreed energy-related behaviour changes detailed in the bespoke behaviour change plan, the energy advisor will liaise with householders over the duration of the project to track progress and identify challenges. Ultimately, a follow-up questionnaire will be used to gather information from the householder, examining which behaviours have been successfully adopted, which ones have not, and to detail, what were the barriers or challenges that were hindering the adoption of individual energy-related behaviour changes.

⁵ The Gaelic Athletic Association (GAA) is a sporting and cultural organisation, focused primarily on promoting indigenous Irish sports. It has a membership of over 500,000 through clubs in every community in the country.

⁶ Previous experience indicates the suppliers usually provide cash of €150 and a better unit rate for customer retention.

⁷ Travellers (Mincéirí) are a socially marginised traditionally semi-nomadic ethno-cultural group originating in Ireland.

4.4 The Netherlands

4.4.1 Dutch engagement context

Dutch household engagement is led by Gemeente Eindhoven the municipal authority of the city of Eindhoven in south Netherlands. They are assisted in these activities by two fellow Dutch partners Duneworks and Het PON & Telos. With a population of c. 240k, Eindhoven is the largest city outside the Randstad conurbation. The municipality has approximately 11,500 households who are counted as having minimal means. The target for recruitment is 400 households – at the end of April 2022, recruitment in the Netherlands had reached the half-way point with some 200 signed up.

The energy coaches in Eindhoven often hear of the shame that householders feel. It appears that hiding that you are poor or that you have payment problems with your energy bill has become normal for many people. Within the participating households in Eindhoven, it is observed that energy poverty often occurs with those people who have a small social network from which to seek support – including *e.g.*, single people, and particularly single-parent families. Unsurprisingly, many of the participating households have low incomes and reside in social housing. Many of the dwellings are quite old dating before the 1970s and therefore of lower energy performance than newer builds.

Energy poverty amongst this group manifests itself in different ways – for some their (relatively) large energy consumption has led to arrears bills they cannot afford, while others self-ration energy so much that they are under-consuming (*e.g.*, choosing not to turn on the heating or to prepare hot meals anymore to save on energy bills) – so-called hidden energy poverty. The increases (and likely further increases) in energy costs arising from the Russian invasion of Ukraine will act to exacerbate the situation for the energy poor households and result in more households falling into energy poverty.

The households that are part of the project differ greatly. A common denominator is that for many people in energy poverty, life is very lonely. They live alone in the house with little contact with the outside world. A visit from the coach can either feel like a special occasion: something to celebrate, or something to dread. In many cases, the first contact asks for something else than a talk about energy saving. In order to build a good rapport, small talk needs to be made to comfort the householder. It can be about the pets in the house or other immediately visible significant things in the house (the awards on the mantle, the photos of the (grand)kids *etc.*). In one instance, the coach helped with mowing the lawn. Most of these householders are happy to have someone that is willing to listen to them. In many of the cases, during the initial conversation, many other problems these householders face, come up too. It can include anger or disappointment of the contact they have with formal institutions like the municipality, the bank, the insurance company, or the social housing corporation. In some cases, the solution to these problems can be quite simple and the coach can suggest to undertake some steps. Sometimes no solution is possible or needed, but just to be willing to listen and hear someone out, can make a big difference. In many cases, also reassurance is needed ('no, it is really no trouble to help you with X or Y', 'Of course, I would like another cup of coffee' and 'I am not in a hurry, let's talk about how you deal with the repairs on your window promised by the social housing

corporation'). After the mood is set, and sometimes this takes more than one visit, the coach can approach the subject of energy saving and behavioural change.

4.4.2 Behaviour change recommendations in the Netherlands

When the energy coaches visit a household, they bring a box with several small energy saving products. The box contains for example some LED lights, drafts strips and a shower timer. The energy box actually has two functions. On the one hand it helps to save energy, on the other it is a great opportunity to start a conversation about energy saving and energy-related behaviour.

The contents of the box as well as a questionnaire about various aspects of energy consumption are part of the conversation with the household. The energy coaches are specially trained to talk to households about behavioural change. In addition to explaining how the products from the energy box should be installed, they also discuss the influence that households can exert on energy consumption through their own behaviour.

The coaches engage in conversation with the householder and go through several main themes (such as heating, washing and appliances) in the interaction. Questions to current behaviour are being asked (e.g., 'how many times a week do you use the washing machine?', and 'at what temperature do you wash?'). Based on the given answers, the coach offers advice back (e.g., 'Did you know that washing at a lower temperature saves ...'). The advice is given in a friendly and natural way as a part of the conversation. It is also tailored to the needs of the household: if there is no dryer, and all washing is already air dried, this won't be a point of conversation – instead a compliment is given. Afterwards, as the conclusion of the visit, the behavioural changes that lead to the most savings are summarised.

After the visit is over, the coaches create a personalised energy-saving report for the household. It contains advice that is tailored to the household in question and that, if followed, will lead to energy savings. This report is sent to the households and the advice given is simultaneously registered in the Energiebox Plus registration system, so that the energy coach can inquire at a follow-up meeting what has been done with it. There is a long list of advice available, with indicative savings (in euros) which have been calculated by Milieu Centraal (www.milieucentraal.nl).

When suggested behavioural changes are proposed to the householders during the visit, all advice and suggestions are put into the report so the household can read back at any given time. The reactions have been mostly positive. Because the advice is given during a conversation, at a friendly tone and as a suggestion instead of a command, the householders open up to the possibility of accepting these small suggestions. It either confirms that they are already on the right path with certain things or offers them small tangible and manageable steps to undertake.

4.4.3 Measuring behavioural change

Because the NGO Energiebox, has several years of experience in providing tailor-made energy advice (albeit not specifically to energy poor householders) there is an opportunity to benefit from this experience leveraging it for a successful approach for EnergyMeasures. There is, for example, an

extensive registration system in which advice for households is generated, and tools to enable more frequent contact with houses. In this way, they can monitor the progress that has been made and also identify topics that may need to be revisited or in other areas where some practical help is welcomed.

All participating households will be surveyed during the engagement to see which recommended measures have been adopted from those recommended (similarly to that undertaken by Energiebox as outlined on p. 13). Additionally, a number of households – selected in consultation with the energy coaches – will be interviewed after their programme has ended, to provide more detailed insights into which behavioural change advice worked and the reasons why (or why not). Finally, the Earn-E digital energy Monitor (see Figure 6 below) – offered to participating households – which shows real-time consumption on a smartphone is expected to provide additional insight into energy-related behaviour.

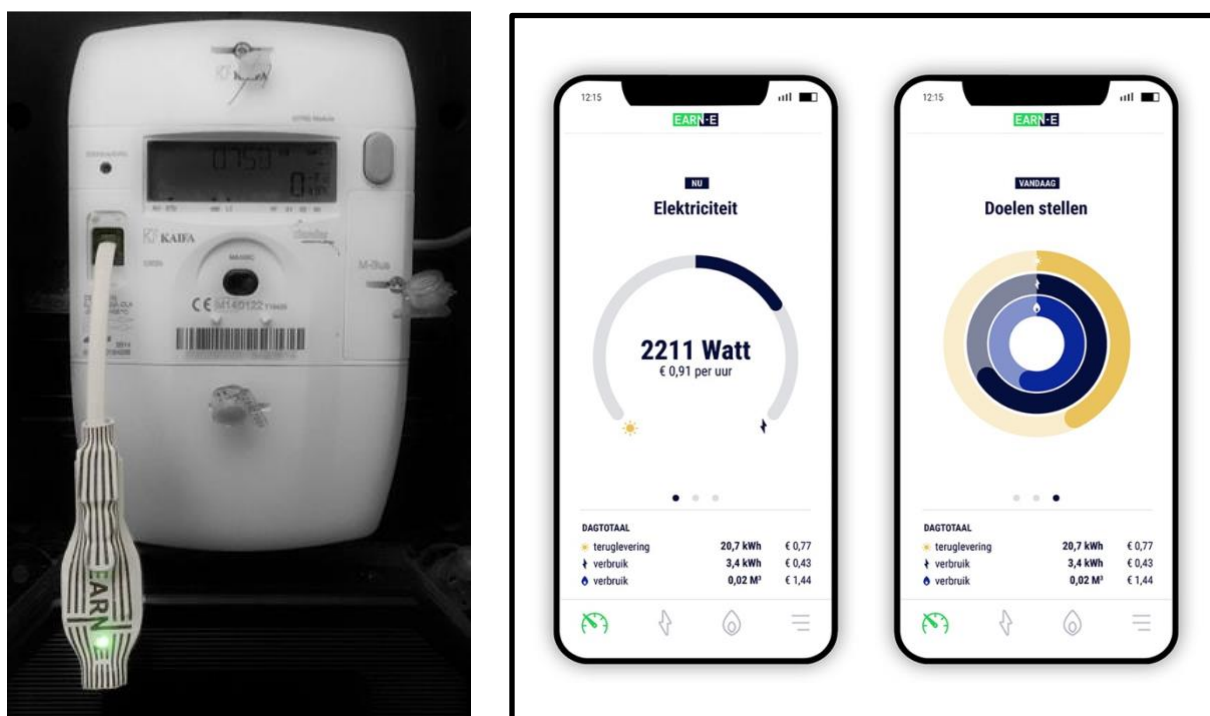


Figure 6: Earn-E digital monitor plugged in to an electricity meter (L), Earn-E smart phone application (R)

4.5 North Macedonia

4.5.1 North Macedonian engagement context

In North Macedonia, the household engagement activity is being realised by Habidom, a residential building management company. Habidom is a subsidiary company of Habitat for Humanity Macedonia and is licenced by the State Regulatory Commission for Housing. Energy poverty is widespread among North Macedonian households, due to a combination of high poverty rates; inefficient heating systems; low building energy performance; and high energy prices. The Macedonian activities are focused on households in the multi-family residential buildings managed by Habidom, principally but not exclusively on women-led households. The target for recruitment in North Macedonia is 600 participating households, by the end of April 2022, Habidom had signed up 80 households to participate. A typical apartment usually houses families comprising up to three generations, where only one or two people work and have to cover all of the costs for their home. Because of poor quality windows, façades, and roofs, the interior walls often have mould which can lead to health problems and water fittings in the kitchens and bathrooms are very old. These apartments are frequently overcrowded, *e.g.*, in one case eight people sleep in an area of just 20m², to keep energy costs down.

4.5.2 Behaviour change recommendations in North Macedonia

At the time of writing, North Macedonia is still at an early stage in recruiting and engaging the energy poor households. Consequently, experience to date with providing recommendations for energy-related behaviour change is not extensive. In the engagements thus far, the focus has been primarily on energy conservation behaviours⁸. Recommendations align with those presented in Section 0, the most common advice to date includes *e.g.*, turning off radiators in rooms when not in use; using washing machines and dishwashers with full loads; avoiding prewash programmes on washing machines; closing fridge doors promptly; boiling only the amount for water needed for tea and coffee; leaving the oven open after use to allow heat to circulate; similarly, after showering leaving bathroom door open to allow hot air to circulate⁹.

4.5.3 Measuring behavioural change

The impact of the behaviour change advice will of course be visible in the energy consumption data. Supplementing these data, a survey of householders will be used to capture the adoption (and maintenance) of energy-related behaviour change recommendations. This will follow the approach in other countries, with the objectives of measuring adoption or maintenance of specific recommendations, identify those which worked well and those that did not, and understanding the challenges and barriers to the successful implementation of individuals recommendations.

⁸ Some energy efficiency recommendations have also been made (in most cases aligning to the provision of small measures) *e.g.*, changing light bulbs to more efficient ones

⁹ This also increases humidity, which can be uncomfortably low in winter as warm air holds more moisture than cold air.

4.6 Poland

4.6.1 Polish engagement context

The Association of Municipalities Polish Network "Energie Cités" (PNEC) is leading the realisation of the EnergyMeasures project in Poland. The focus of their engagement activities is Bielsko-Biała, a city in southern Poland, with a population of approximately 168k, where PNEC is collaborating with city authorities in reaching the citizenry. The target groups are private owners occupying single-family buildings and private owners of flats in multi-family buildings – from these two groups, PNEC aims to recruit 400 households with a focus in both cases on the elderly and the families living on social benefits. As of the end of April 2022, PNEC has recruited a total of 255 households from Bielsko-Biała to participate in the project. The age structure of the participants coincides with the age structure of the inhabitants of Bielsko-Biała, with the 30-39 and 40-49 year-ranges being the most numerous.

Bielsko-Biała is a city with over 170,000 inhabitants. The housing base is 422 apartments per 1000 inhabitants. An average household is 70 square meters, which accounts to circa 30 square meters per person. About 37% of households have central heating and about 36.5% are connected to the gas system. The city area is divided into 30 housing estates, which constitute auxiliary units of the commune. Settlements vary greatly in terms of area size and population density. The post-war estates have a normative standard imposed on the construction industry in the years of real socialism. Buildings from 5 to 11 stories in large-panel technology dominate. Single-family housing is varied, usually of a low urban and architectural standard (Urząd Miejski w Bielsku-Białej 2010).

The city spends about 2.5% of its budget on housing and the housing stock in the commune is characterised by an unfavourable age and technological structure - buildings built before 1945 dominate and account for over 73% of the total number of buildings. Such a state of the stock is associated with significant renovation and modernisation needs, and thus requires significant financial outlays for their maintenance. In addition, it should be noted that the most common source of heating in such buildings are individual coal-fired stoves, which significantly contribute to air pollution with dust and benzo(a)pyrene. Apart from old buildings in the central parts of the city, single-family houses, especially the older ones, are also very energy-intensive, and here too, individual, coal-fired heating systems are used to a large extent (*Ibid.*).

4.6.2 Behaviour change recommendations in Poland

Of the participating household over 200 have already met with energy advisors. Their stories include a lot of issues, which can be considered important. The typology of houses, their age and location make a difference. Sometimes the historical aspects of older buildings cause additional difficulties. Some of citizens hasn't have appropriate incomes to make big changes. A lot of people try to do their best, but it is not easy, when taking in consideration all circumstances.

The advisors visited households to conduct a survey on the condition of the building, heat source(s) used and, above all, to develop an understanding of householders' energy-related behaviours. For each

household a personalised energy-saving report containing tailored energy-saving advice was developed. Implementing the proposed behavioural changes and other low-cost measures shall help to save energy and, as a result, money. The follow-up monitoring will show to what extent.

The developed tailored energy reports have been printed and are being delivered to households by energy advisors along with the energy boxes containing small energy-saving equipment. During the visit advisors not only hand over the boxes and reports, but also present the equipment, go over the tips and assess householders' willingness to take up proposed behavioural changes. The second visits, during which energy advisors bring the energy boxes and recommendations have just started, so the reactions of householders to the proposed behavioural changes are yet to be observed.

From initial feedback, it is clear that some behaviours are highly unpopular, those are mainly turning the heating lower when leaving the house for a few hours (going to work/school) and carefully reading energy invoices. Therefore, the most frequently given advice is to turn the heating lower when you leave the house for several hours and to start reading and analysing energy invoices. Due to the age of commonly used household appliances, it is also generally advised to pay attention to energy labels when purchasing new ones. The participants have been also asked about knowledge and use of various subsidy programmes and it turned out that many of them are not even known to the public. 47% of all answers about subsidies were "never heard about it" and only 6% of answers accounted for taking advantage of them. Knowing this, PNEC have presented programmes to the householders who have not heard of them and whom from their other answers suggested that they may be eligible. As there was no one who was aware of all the support programmes there is at least one support programme included in recommendations for households.

A very visible problem in Polish households is the age of house appliances and therefore their energy class. It is particularly important in case of refrigerators, which work continuously and almost two-thirds of those used in surveyed households are older than 10 years. In recommendations it was shown that energy labels should be considered when buying new household appliances. With invoice reading being one of the main changes that householders should implement, it is possible to assess the change by comparing data format. In many households, the inhabitants could only provide the cost of the energy they consumed but did not know the amount of it. If they know the amount of energy they are consuming when entering data at the end of the project, it will mean that they have started paying attention to their invoices.

It is assumed that the change of householders' behaviours will come through small steps and regular building of new habits. During their work, the energy advisors teach also how to use and monitor energy bills. It will be possible to check the participant's knowledge during the collection of the future data – where it is probable to see the difference in the way the data are presented by the people. It is also hoped that the presentation of the significant amount of founding opportunities – both on the municipal and country level – will encourage some households to use the opportunity for improving the energy situation of their buildings. In coming months, information about new participants of city and national support programmes and donations will be observed. The last, but not least, lesson learnt

will be comparing the energy data from before and after the programme. This will show the real effect of small actions proposed to and being implemented by the households.

4.6.3 Measuring behavioural change

At a rudimentary level, the basis for measuring the success of energy-related behavioural changes will be an evaluation of energy consumption in the household. In this way, it will be possible to indirectly learn whether households have increased their energy literacy and learned to save energy through changing their energy related behaviours.

Energy advisors will liaise with householders during the duration of the project. In doing this, they will receive feedback from participants and gain insights into how well the recommendations for behaviour change are being adopted and the impacts they are having. From the contacts to date, it can be observed that people are beginning to see the necessity of change and the advantages of the new energy-related behaviours. They ask questions and want to know more about the aspects they can improve in the future. Even though the project is ongoing and the longevity of the effects of these discussions remains to be seen – it is promising, and the initial feedback is informing the ongoing evolution of the engagement and support for behaviour change.

In addition to this informal feedback, in the latter stages of the project, telephone interviews will be conducted with a selection of participants to explore the behaviour change in more details. This will provide information on the introduced measures and energy consumption structure for their time within the project. This will help to obtain insights as to the specific behavioural changes that the residents consider to be the most impactful for their energy use and the barriers that are hindering adoption of individual energy-related behaviour changes. To encourage as many people as possible to participate in the telephone interviews, those who take part will be eligible for a competition for household appliances for those with the highest energy savings.

In summary, although the study is at the early stages, and the final analysis and confirmation of the effects will come later on, it is expected though that these small behaviour changes will bring visible impacts to the participating households.

4.7 United Kingdom (Scotland)

4.7.1 Scottish engagement context

In the United Kingdom, prospective participants are being recruited across the Western Isles (Outer Hebrides), an island chain off the west coast of Scotland. Tighean Innse Gall (TIG), a local community benefit society, which acts as a housing and energy agency for the Island is delivering the EnergyMeasures project on the Western Isles. The focus for engagement is the privately-owned households located in remote communities on the islands who suffer from energy poverty, many of which are by led by single women. The engagement is quite challenging and spread out across a chain of islands involving communities speaking two languages – English and Gàidhlig (Scots Gaelic). Extensive marketing of the project has been conducted throughout the Western Isles to reach fuel poor households. This has included adverts in printed newsletters to households, newspaper adverts, and social media including Facebook and Twitter posts. The TIG team have also spoken at a few public events, (albeit this was somewhat curtailed due to Covid restrictions). A target of 500 households was established for the Scottish engagement, and as end of April 2022, a total of 443 households had been recruited.

Amongst the target communities, cold damp homes or cold draughty homes are the two main concerns for people, coupled with the affordability of heating their homes which of course is inextricably linked. The islands have similar issues to remote and rural communities elsewhere in Scotland and indeed the United Kingdom as a whole, *i.e.*, low incomes, high energy costs, and poor efficiency of housing coupled in our specific case of the Western Isles Atlantic coastal weather patterns. Erratic weather patterns can mean in effect four seasons appearing in one day in the form of wind, sun, rain, and snow, often within sight of each other scanning a horizon. Western Isles' residents suffer from the trinity of energy poverty:

- **Poor building quality:** Strikingly, 85% of homes in the Outer Hebrides are poor in efficiency, at EPC D or below. The traditional houses were designed to have a fire on constantly, creating a thermal mass of heat in stone walls, which can be 2-3 feet thick. Common problems include draughts through poorly sealed windows and doors (exacerbated by the salt air from the sea weakening seals), open fires not blocked despite not being in use, and quite simply an old housing stock with poor maintenance.
- **High energy costs:** Energy costs are higher than other communities because of the isolation of the Islands. Additional charges apply to electricity (1 pence per unit higher than mainland central belt Scotland), heating oil and coal (with both of these having associated shipping costs).
- **Low incomes:** Islanders often suffer from low wages, with many working in two to three jobs to make ends meet. Public sector jobs remain the highest in terms of employed people, with tourism and small businesses making up many more. Public sector squeezes in finance have led to less people working for the municipality, with subsequent lower incomes. Many women who are over 60 have modest work-based pensions from a period of employment as a teacher or nurse, or from

a deceased husband, which means they are unable to claim wider social benefits and in fact this acts as a hinderance to affordability. There is also a fierce proudness by many, particularly older people, who do not 'make a fuss' or sit quietly without complaint, so may not even claim benefits in the first place.

In short, this means many suffer cold homes and cannot afford to always heat their homes to a correct level. Consequently, we have sought to conduct behaviour change options and measures that increase comfort, reduce bills, and seek to warm homes.

One example of the many Western Isles households participating in the project are a brother and sister living in their family home, a traditional detached 1930's concrete build croft house. The woman is a retiree living on a fixed pension, while her brother is a weaver working from home. In their preliminary survey that indicated spending GBP£1,600 a year on electricity but had no costs for their main heating source – domestic heating oil. On querying it was discovered that they were so worried about costs that they do not use the oil heating, rather relying on plug-in electric heaters. Incomplete and poorly installed roof insulation has caused worrying damp and mould issues. The house has very old timber doors and inefficient old, double-glazed windows.

Referrals: The main concern with this household was their inability to afford to heat their home. We referred them to the Financial Inclusion Team of the municipality, as they are likely to be eligible for additional state benefits, which would put them in a better position to be able to heat their home. We also referred then to Home Energy Scotland and their Community Liaison Officer is to visit the property and discuss Scottish Government grant options for insulation and new windows and doors. Finally, it was noted during the home visit that the smoke alarms were extremely old and faulty, this information was passed on to TIG's Home Safety team who will arrange to install interlinked fire alarms.

Low-cost energy measures: The opportunities for low-cost measures with this dwelling was perhaps less than others. The household was provided with LED lamps to replace the old incandescent bulbs and reflective panels were installed behind three radiators which were on external walls. This modest package of low-cost measures could lead to potential annual savings of GBP£104.

Energy related behaviours: Whilst the small measures installed felt like a drop in the ocean for the household, it was a great opportunity to discuss concerns and energy behaviours. If implemented, the recommendations for energy-related behaviour change could lead to an annual saving of GBP£354!

These householders were delighted and relieved to have the experience of a home visit, it gave them the chance to really explain the difficulties they are facing at home with rising costs and harsh weather conditions across the islands.

4.7.2 Behaviour change recommendations in Scotland

The participating householders across the Western Isles have to date shown a good willingness to engage in energy-related behaviour change. In particular, and perhaps unsurprisingly once-off behaviours that require the installation of low-cost measures (especially as they were provided

through the project) have been warmly received. For instance, two-thirds of participating households agreed to replace incandescent bulbs with LED lights, while over four in ten signed up to insert chimney balloons in unused fireplaces. Other popular small measures related behaviour changes included draught-proofing doors & windows (34%), installing radiator panels (32%) and servicing boiler (28%).

On the other hand, curtailment measures which require repeated efforts from householders are understandably 'a more difficult sell', not least because people inherently are drawn to technical solutions even when presented with potentially more impactful behavioural measures. With the householders engaged thus far, the area perceived to have the most potential for behaviour change has been food preparation and storage – Almost two-thirds are planning to use a microwave oven whenever possible, with over half intending to use a slow cooker twice a week in place of an oven. Other noteworthy recommendation in this area including fridge/freezer temperature setting and appropriate filling of kettles.

Another area of energy use seen as having significant savings potential is washing and bathing – over half of households have agreed to wash only full loads of clothes and to do so at lower temperatures. While other recommendations in this category agreed by between one-fifth to one-third of the households include air-drying of clothes, showering instead of bathing, reducing the length of showers, setting timers for heaters. Other examples of recommendations involve areas such as heating (*e.g.*, turning down thermostats; draughtproofing by pulling curtain and blinds), lighting (*e.g.*, switching off lights when leaving rooms; using task lighting), and appliances (*e.g.*, turning off electrical appliances when not in use; disabling stand-by mode; maintaining, repairing and as require replacing appliances).

All recommendations and measures provided were appropriate to households and the majority reflect issues around improving heat efficiency, removing draughts and heat loss. The next areas of importance were cooking and lighting (long dark winters), followed by hot water use. We anticipate fluctuations in numbers but overall stay reasonably constant in terms of priority for savings.

4.7.3 Measuring behaviour change

A record is maintained of the energy-related behaviour change recommendations provided to each household. The energy advisors will liaise periodically with the participating households over the life of the project, to monitor any issues arising in implementing these recommendations and to provide advice and support as required. Towards the end of the project, participants will be asked to complete a final survey on energy-related practices and changes to their behaviour. This will enable an assessment of the extent to which the householders have adopted the individual behaviour change recommendations. It will also explore any barrier that arose and, in that way, consider potential means of supporting the householders overcoming such challenges.

5 Conclusion

This document aimed to describe the approaches being undertaken to promote changes in energy related practices and behaviours within the EnergyMeasures project. The report outlined the project's general strategy to behaviour change in the participating households, summarising the multi-step approach in undertaking an energy-related behaviour change intervention presented in Dunphy *et al.* (2020) – Deliverable 1.2 of this project. A wide range of indicative recommendations for energy behaviours was presented along with a description and in many cases potential savings. An overview of the realisation of behaviour change promotion within the project was presented for each participating country as of the end of April 2022 – with an understanding that arising from the Covid-19 pandemic, some countries were further along with implementing behaviour change than others.

The timing of the household recruitment means even in the countries most advanced in rolling out their behaviour change initiatives; it is far too early to assess how well the recommendations have been adopted and to evaluate the success or otherwise of the programme. In all countries the implementing organisations intend to maintain periodic contact with participating households, albeit the nature of this contact will differ from country to country considering the specificities involved. The continued contact with the householders enables informal feedback on the adoption of the recommendations and for advice and referrals to be provided through the project to assist the households in adopting the changes in practices and behaviours.

An overview is presented of the realisation of the envisaged behaviour change component of the project for each of the participating countries, Belgium, Bulgaria, Ireland, the Netherlands, North Macedonia, Poland, and United Kingdom. Within each country section, the context for energy-related behaviour change and particularly that planned within EnergyMeasures is presented, the approach taken / to be taken for behaviour change is described and explained, and the means by which the behaviour change will be assessed is outlined. As mentioned earlier, the participating countries are at different stages in household recruitment and engagement and in the roll-out of the behaviour change component of their programme. There are therefore differing levels of details provided for each of the countries reflecting their progress in this work.

Looking forward to the full implementation of the behaviour change component in the different countries, it is already apparent that there is a good opportunity for exchange of experiences, especially – but not exclusively – from those countries more advanced in the roll out of the programme to those less progressed. This will be a key component of the regular engagement meetings held in the project but will also feed into ongoing capacity building activities both within the project and in the context of the external training workshops envisaged within WP6.

6 References

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