A Citizen's guide to decarbonisation: An end-users guide to influence behavioural change

Organisation: Cork County Council
Deliverable: D.2.6.1
Version: Version 2
Date: 18/12/2025

Table of Contents

1 Introduction

1.1 Deliverable Overview

HYBrid Energy Solutions for buildings and infrastructure (HYBES) is a European project co-funded under the INTERREG Northern Periphery and Arctic programme, and includes partners from five countries:

- **Norway:** Nordland Research Institute (NRI) (Lead Partner); Bodø Kummune (BK)
- **Ireland:** Cork County Council (CCC); NCE Insulation (NCE); University College Cork (UCC)
- **Sweden:** City of Umeå (Umeå); Umeå University (UmU)
- **Iceland:** National Energy Authority (OS)
- **Faroe Islands:** Environment Agency (US)

HYBES focuses on the area of decarbonisation and will utilise the quadruple helix approach to create jointly developed knowledge-based tools and activities for promoting improved energy efficient solutions to achieve substantial reduction of greenhouse gas emissions within the NPA region. This will be achieved by implementing the 'Living Labs' model in rural and peripheral areas in the NPA region. The project will build citizen capacity and aim to facilitate and evoke behavioural change to assist in achieving climate action objectives and targets in the HYBES partner regions.

Deliverable 2.6.1, entitled **A Citizen's guide to decarbonisation: An end-users guide to influence behavioural change**, uses the learnings from WP2 and WP3 to provide a citizen's guide which includes guidance and evidence-based support to demonstrate to end-users the value, both environmental and financial, of implementing decarbonisation measures at both an individual and organisational level. This guide will offer advice for end-users, including building managers, businesses, and housing tenants, and a key objective of this guide is to empower end-users to adapt and change behaviour by providing pro-active guidance and advice to enhance awareness and knowledge of decarbonisation.

This deliverable outlines the process of developing a template/structure for a citizen's guide and includes consideration of existing research underpinning citizen decarbonisation and behavioural change (**Section 2**), as well as best practices in the project partner regions that are currently being implemented to inform citizens about decarbonising measures (**Section 3**). This deliverable also considers factors and context supporting the development of a guide, including funding sources (**Section 4**). Finally, this deliverable outlines a proposed structure for a citizen's guide to ensure maximum impact, based on the results and findings of the aforementioned research (**Section 5**).

The citizen's guide aims to inform citizens about emission reduction options through curation of decarbonisation relevant information. In concept, this guide builds on HYBES outcomes but is focussed on an individual's requirements rather than built environment professionals and public bodies. The individual is key to small business, community groups, and household works and HYBES guidance is relevant to these smaller scale projects. In practice, it proposes clear information presentation structures based on research and best practice. This concentrates on individual needs and aims to reduce small/mid-scale project and action complexity.

It is imperative to note that this citizen's guide will evolve as requirements and technology change. At present, it focuses on building related improvements, given this sector's complexity and potential cost. However, all consumption and lifestyle choices lead to carbon emissions and the guide supplies an overview on these sources for future development. **Deliverable 2.6.1** is an important output for the HYBES project.

2 Research Review

2.1 Review Introduction

To support the development of a citizen's guide, an extensive literature/research review was undertaken to identify areas of focus. Governments and public bodies are clearly motivated to act on decarbonisation given societal benefits. This is also the case for businesses and private sector entities, who experience efficiencies in their practices and reduced costs. However, individual citizens may have different motivations which can both positively and indirectly affect decarbonisation. As such, it is imperative that these motivations are considered to effectively develop a citizen's guide which will appropriately address the needs and requirements of the end user to achieve maximum impact. This research review aims to:

- Establish citizen motivations relevant to decarbonisation, and
- Identify options to leverage these motivations in a decarbonisation context.

2.2 Literature/Research Review

Relevant research papers and their key findings have bee outlined below, and the findings of these papers have been included for consideration due to their recency, focus on consumer and individual behaviour, and links to key HYBES deliverables, particularly building improvement and energy conservation.

The role of environmental and financial motivations in the adoption of energy-saving technologies: Evidence from European Union data (Canepa, Chersoni and Fontana, 2023)[1]

This paper concluded several important findings related to individual behaviour:

- Energy efficiency financial benefits and other advantages must be clear.
- Available financial supports need to be appealing.
- A "One stop shop" can simplify procedure and contractor choice.
- Neighbours and community experiences influence uptake.
- Environmentally focussed citizens tend to adopt lower cost measures.
- Financially focussed citizens tend to adopt higher cost measures, and

[1] Canepa, A., Chersoni, G., and Fontana, M. (2023) "The role of environmental and financial motivations in the adoption of energy-saving technologies: Evidence from European Union data", *The Quarterly Review of Economics and Finance*, 91, p. 1-14. Available at: https://www.sciencedirect.com/science/article/pii/S1062976923000753

- Urban, higher educated and larger households are more likely to adopt energy-efficient technologies than rural households with lower education levels.

Factors influencing energy efficiency investments in existing Swedish residential building (Nair, Gustavsson and Mahapatra, 2010)[2]

This paper concludes that for the majority of Swedish homeowners, it is important to reduce their household energy use, and most households undertook no-cost measures as compared to investment measures. Personal attributes such as income, education, age and contextual factors, including age of the house, thermal discomfort, past investment, and perceived energy cost, influence homeowners' preference for a particular type of energy efficiency measure.

How to Encourage Energy Savings Behaviours? The Most Effective Incentives from the Perspective of European Consumers (Słupik, Kos-Łabędowicz and Trzęsiok, 2021)[3]

This paper concludes that when seeking behavioural change, consumer motivations should inform incentive design.

Analysing the house-owners perceptions on benefits and barriers of energy renovation in Swedish single-family houses (Azizi, Nair, and Olofsson, 2019)[4]

This paper presents the findings of a questionnaire survey mailed to 1550 owners of single-family houses in northern Sweden. The research found that perceptions of homeowners on benefits and barriers of energy renovation (ER) are significantly different between the groups that are motivated and unmotivated to implement ER. Despite the perceived importance of some of the benefits such as energy cost reduction, they may not be determinative for the homeowners' decision to undertake ER. The homeowners are more likely to implement ER for reasons other than energy use reduction such as for improving the indoor environment. The barriers such as the difficulty of finding a low-interest loan and reliable information sources are found to impede the intention to implement ER among different groups.

[2] Nair, G., Gustavsson, L., and Mahapatra, K. (2010) "Factors influencing energy efficiency investments in existing Swedish residential building", *Energy Policy,* 38, p. 2956-2963.
[3] Słupik, S., Kos-Łabędowicz, J., and Trzęsiok, J. (2021) "How to Encourage Energy Savings Behaviours? The Most Effective Incentives from the Perspective of European Consumers", *Energies*, 14(23), 8009. Available at: https://www.mdpi.com/1996-1073/14/23/8009
[4] Azizi, S, Nair, G., and Olofsson, T. (2019) "Analysing the house-owners perceptions on benefits and barriers of energy renovation in Swedish single-family houses", *Energy and Buildings,* 198, p. 187-196.

Comparative evaluation of city dwellers perspectives on household energy use based on housing tenure: survey results from Northern Sweden (Nair et al., 2018)[5]

This paper presents the results of a survey, based on a random sampling method, which was carried out in 2016 with residents in Northern Sweden. The results of the survey indicated that the majority of respondents believed that their annual household energy use is less than actual rates. Residents in single-family houses, as compared to the other two types of tenure of the housing, were more likely to believe their heat energy use as high and likely to take actions to reduce the energy use in their household. More apartment owners (39%) and tenants (34%) as compared to owners of single-family households (22%) were satisfied with their current energy use and see no reason to reduce it. Financial incentives such as subsidy or lower interest rate were preferred by most of single-family homeowners (45%) to motivate them to take actions to reduce energy use. Personalized information to reduce energy use and lower interest rate and reduced rent are preferred by more residents in the other two categories.

Consumption-Based Energy Footprints in Iceland: High and Equally Distributed (Einarsdóttir et al., 2024)[6]

This study explores the urgent need to reduce energy demand and promote energy sufficiency, using Iceland, a country rich in renewable energy, as a case study. Through a bottom-up analysis, it examines how socio-economic factors such as income, urbanization, and lifestyle shape household energy footprints, especially in housing and mobility. The findings highlight a paradox: the abundance of renewable energy can create a false sense of limitless, low-impact consumption, leading to significant environmental consequences. By analysing detailed household consumption data, the research emphasizes the need for energy policies that not only support technological innovation but also actively encourage reductions in energy use.

Indicators for sustainable energy development: An Icelandic case study (Gunnarsdóttir et al., 2022)[7]

This study focuses on developing a context, specific set of sustainability indicators to support sustainable energy development in Iceland. Using an iterative stakeholder approach, it emphasizes the importance of stakeholder engagement in selecting indicators that reflect national priorities and local energy challenges. The process results in a comprehensive

[5] Nair, G., Olofsson, T., Nordlund, A., and Hudson, C. (2018) "Comparative evaluation of city dwellers perspectives on household energy use based on housing tenure: survey results from Northern Sweden", Cold *Climate HVAC*, p. 791-801.

[6] Einarsdóttir, A.K., Pesch, G., Dillman, K.J., Karlsdóttir, M.R., Heinonen, J. (2024) "Consumption-Based Energy Footprints in Iceland: High and Equally Distributed", *Energies*, 17(10), p. 2375. Available at: https://www.mdpi.com/1996-1073/17/10/2375

[7] Gunnarsdóttir, I., Davidsdottir, B., Worrell, E., and Sigurgeirsdottir, S. (2022) "Indicators for sustainable energy development: An Icelandic case study", *Energy Policy,* 164. Available at: https://www.sciencedirect.com/science/article/abs/pii/S0301421522001513

framework that includes indicators, stakeholder analysis, a localized definition of sustainable energy development, a roadmap, and identified linkages between indicators. These outcomes offer a strong foundation for creating energy policies and action plans that are both effective and broadly supported.

Accelerating the energy efficiency renovation of residential buildings — a behavioural approach (European Environment Agency, 2023)[8]

This report by the European Environment Agency concluded that renovation considerations include improved living conditions, perceived effort/disruption, and investment outcome uncertainty. However, homeowners, landlords and rental tenants may weight these outcomes differently.

CO2 intensity of GDP, energy productivity and environmental degradation in Iceland: evidence from novel Fourier based estimators (Abbasi, Oyemisi and Kirkikkaleli, 2023)[9]

This study examines the factors influencing Iceland's consumption-based emissions from 1995 to 2019, in the context of its goals to cut emissions by 40% by 2030 and achieve carbon neutrality by 2040. Using the Fourier Autoregressive Distributed Lag Model, the research finds that carbon intensity and economic growth significantly worsen environmental quality, while increased energy productivity helps reduce emissions. Globalization is also shown to raise emissions, highlighting a complex relationship between global integration and sustainability. These findings are critical for shaping effective climate policies aligned with Iceland's Climate Action Plan and long-term environmental goals.

Unveiling the mindset: measuring consumer perception towards the dimensions of sustainability (Vaikma, 2025)[10]

Sustainability tackles challenges such as environmental balance, social equity, economic stability, and health. This paper introduces a multidimensional framework for understanding how consumers perceive sustainability. The Sustainability Dimensions Perception Scale (SDPS) revealed five consumer clusters: Sustainably Conscious (28 %), Sustainability Sceptics (7 %),

[8] European Environment Agency (2023) *Accelerating the energy efficiency renovation of residential buildings — a behavioural approach.* European Environment Agency. Available at: https://www.eea.europa.eu/publications/accelerating-the-energy-efficiency

[9] Abbasi, K.R., Oyebanji, M.O., and Kirikkaleli, D. (2023) "CO2 intensity of GDP, energy productivity and environmental degradation in Iceland: evidence from novel Fourier based estimators", *Energy Sources, Part B: Economics, Planning, and Policy*, 18(1). Available at: https://www.tandfonline.com/doi/full/10.1080/15567249.2023.2214906

[10] Vaikma, H. (2025) "Unveiling the mindset: measuring consumer perception towards the dimensions of sustainability", *Sustainable Futures*, 9. Available at: https://www.sciencedirect.com/science/article/pii/S2666188825001868

Green Health Advocates (27 %), Moderate Supporters (22 %), Health Neutralists (16 %). These clusters varied demographically: older individuals aligned more with health statements, plant-based food consumers resonated more with social and environmental statements, women agreed more with social statements, and Italians rated all dimensions higher. These findings emphasise the need to educate specific consumer groups about less prioritised dimensions or improve related policies.

Analysis of Hybrid Renewable Energy Systems for European islands: Market Dynamics, Opportunities and Challenges (Papadaki et al., 2025)[11]

European islands face energy challenges because of their geographical isolation and dependence on imported fuels. Despite the significant potential of renewable energy (RE), the extensive deployment of HRES faces economic, technical and regulatory restrictions. This paper focuses on challenges to implementing Hybrid Renewable Energy Systems (HRES) in European Islands and includes the results of a survey with 50 industry experts, to examine the barriers and drivers impacting HRES deployment. The results showed that islands with strong regulatory framework and stakeholder engagement had higher HRES adoption. The weakly networked islands benefit the most from energy storage systems, whereas specific policy actions can improve energy security and reduce carbon emissions by up to 40 %. Simplified licensing procedures emerged as the most critical determinant of HRES adoption, with a rating of 4.6/5. In conclusion, this study provides a policy proposal for promoting HRES adoption on EU islands, recommending fit-for-purpose regulatory frameworks, finance approaches, and technology advancements.

General guidelines for the optimal economic aggregation of prosumers in energy communities (Volpato et al., 2022)[12]

Energy communities are regulatory tools promoting aggregations of users to foster the shift towards a renewable distributed generation. This paper explores three main aspects affecting the convenience of these aggregations: the complementarity between generation and demand of different prosumers, the criterion allocating the operating costs of energy communities, and the application of demand-response programs.

[11] Papadaki, A., Savvakis, N., Sifakis, N., and Arampatzis, G. (2025) " Analysis of Hybrid Renewable Energy Systems for European islands: Market Dynamics, Opportunities and Challenges", *Sustainable Futures*, 9. Available at: https://www.sciencedirect.com/science/article/pii/S2666188825001716

[12] Volpato et al. (2022) "General guidelines for the optimal economic aggregation of prosumers in energy communities", *Energy*, 258(1). Available at: https://www.sciencedirect.com/science/article/abs/pii/S0360544222017030

2.3 Conclusion

This deliverable has reviewed a significant amount of relevant research and literature in order to support the development of a tailored citizen's guide for decarbonisation. The reports/papers outlined in the previous section are some of the key documents and studies analysed; however, this list is not all encompassing and other research papers have also been considered. Three key trends which influence individual decarbonisation choices have emerged from the literature review which are imperative to recognise and acknowledge:

- **Life Stage:** A citizen may be a homeowner, rental property owner, renter or living in an urban/suburban/rural location. Age also affects cost/benefit analysis.

- **Financial rather than carbon savings:** Energy efficiency measures can be costly, and citizens balance these costs against long-term saving potential. However, citizens may only have access to more expensive financing options and little direct experience of expenditure/benefits. Balancing these is critical. However, low-cost measures can also lead to significant potential savings.

- **Implementation barriers:** A homeowner may over or underestimate technological and implementation issues. They may also not have the resources to employ project expertise at initial stages. Addressing this knowledge gap can support decarbonisation efforts.

These key factors/components will inform the design process of the citizen's guide template.

3 Best Practices

3.1 Transnational Learning

To support the conceptualisation and development of a citizen's guide to decarbonisation, this deliverable has also considered several significant tools/guides/online resources that are currently being implemented in each of the HYBES project partner regions to inform citizens of possible actions to undertake to decarbonise. These best practices specifically relate to similar "guides", or online resources that are being used in the partner regions to offer guidance to citizens and support them in their journey to a decrabonised future. As such, these are separate to other best practices outlined in the project which exemplify the advancement of the HYBES objectives, such as the provision of 50% grant aid in Iceland by Orkustofnun (National Energy Authority of Iceland) to deliver energy-reducing equipment, such as heat pumps, in private homes[13]. Other strong examples include the provision of free energy advisory services to residents in Bodø, led by the municipality, where residents could register for a home visit from a professional energy advisor and receive tailored recommendations for improvements.

3.2 Regional Best Practice Examples

There is a myriad of measures being implemented across the NPA partner regions to support citizens to change behaviour and implement actions to decarbonise. Within the project partner regions (Norway, Sweden, Iceland, Ireland and the Faroe Islands), HYBES project partners have identified several innovative and beneficial tools currently being implemented which are outlined below.

Codema – 100 Ways to Save Energy at Home[14]

Codema, also referred to as Dublin's Energy Agency, is a not-for-profit company limited by guarantee, dedicated to working on behalf of local authority members to promote public good in the areas of energy and climate mitigation. Currently, Codema engages with Dublin City Council, Dún Laoghaire-Rathdown County Council, Fingal County Council and South Dublin County Council. Codema's key focus is to drive local-level climate action, through innovative project delivery and collaboration with a wide range of stakeholders, while ensuring that solutions have not only the greatest environmental impact but benefit society and are guided by the best-available research. In collaboration with Think Energy, Codema produced an informative citizen's guide entitled "100 Ways to Save Energy at Home" to support citizens in their pathway to decarbonization. The guide importantly outlines costs associated with an individual measure, from no cost to high cost, and indicates whether funding exists in Ireland

[13] Orkustofnun (2025) *Energy Transition – Subsiudies.* Available at: https://orkustofnun.is/en/energy_transition/subsidies/energy_equipment

[14] Codema (2024) 100 Ways to Save Energy at Home. Available at: https://www.codema.ie/resources-and-publications/

to support the implementation of the measure. This guide is available online and is a strong example of effective provision of information to citizens.

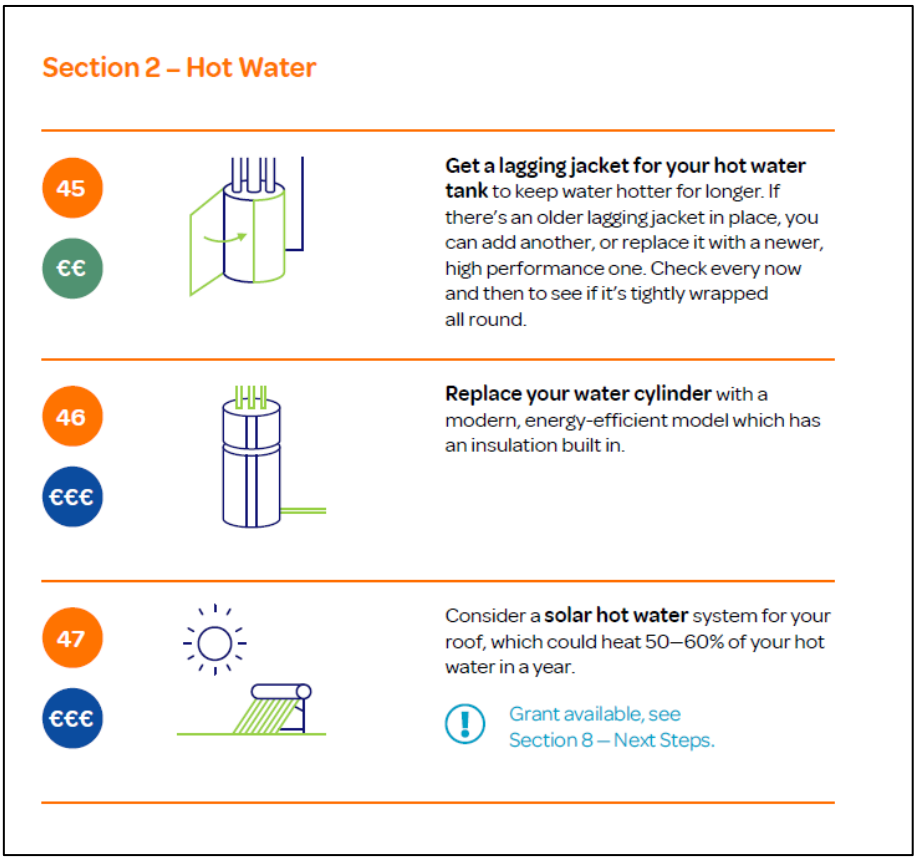

Figure 1: Advice for Hot Water in Codema's "100 Ways to Save Energy at Home".

National Olympic and Sports Association of Iceland (ÍSÍ) - Bike to Work (Hjólað í vinnuna)[15]

Bike to Work (Hjólað í vinnuna) is an annual health and motivation campaign organised by the National Olympic and Sports Association of Iceland (ÍSÍ) since 2003. The initiative encourages people to use active transportation methods, such as cycling, walking, or running to commute to work. This promotes public health, reduces greenhouse gas emissions, and raises awareness of sustainable mobility. The challenge runs for a few weeks in May. People join in as teams from their workplaces, track their trips, and can win prizes just for taking part. The initiative encourage friendly competition and peer support to build healthier habits, and is an innovative campaign undertaken by the association in Iceland to support citizens to shift behaviour. This example also demonstrates how collaboration between institutions,

[15] National Olympic and Sports Association of Iceland (ÍSÍ) (2025) *Hjólað í vinnuna.* Available at: https://www.hjoladivinnuna.is/

businesses, and individuals can drive positive change toward healthier and more sustainable communities.

Umea Kommun – Climate Podcasts (Poddar med Klimatekot)[16]

To support the dissemination of climate action related guidance and information to citizens, Umea Kommun in Sweden have produced a climate action podcast which provides knowledge and answers to questions about climate change, electric cars, food waste, solar PV, the circular economy etc. Each episode includes content from Umeå Municipality, interviews with Umeå residents who live climate-smart lives and other guests who work with climate issues in Umeå. The use of a bespoke podcast to disseminate climate related guidance to citizens in Sweden is an innovative best practice, and this mechanism has the potential for replication across the NPA partner regions. It is imperative that this communication tool be considered for inclusion in any proposed citizen's guide template.

Figure 2: Umea Kommun, Climate Podcasts.

Bodø Kommune – Communication network for professional stakeholders (Kompetanseforum)[17]

Bodø Municipality has established a well-functioning communication arena for professional stakeholders involved in sustainable urban development. This network brings together key actors from across the city's development landscape, including:

[16] Umea Kommun (2024) *Poddar med Klimatekot*. Available at: https://www.umea.se/byggaboochmiljo/energiochuppvarmning/energiochklimatradgivning/poddarmedklimatekot.4.1a04d085177d4c035db1bad.html

[17] Bodø Kommune (2024) Hva er Kompetanseforum. Available at: https://bodo.kommune.no/ny-bydel-hernes/kompetanseforum-bygg-og-eiendom/

- Property developers and construction companies
- Energy providers and infrastructure actors
- Consulting firms and technical advisors
- Public sector representatives
- Local industry stakeholders

The network is professionally managed by the municipality and serves as a strategic platform for dialogue, collaboration, and knowledge sharing. It has proven effective in aligning stakeholder interests with the municipality's sustainability goals, while also facilitating the dissemination of updates on ongoing and planned development projects.

By maintaining regular engagement and fostering mutual trust, the municipality has succeeded in creating a forum that supports both transparency and innovation in sustainable city development. The network has become a valuable tool for ensuring that professional stakeholders remain informed, involved, and aligned with the city's long-term vision.

This stakeholder network has been extremely successful in disseminating climate action guidance and information to key local stakeholders and is a best practice example that could be replicated across the NPA partner regions.

Figure 3: Strong attendance at a Kompetanseforum meeting in Bodø.

Bodø Kommune – Online Energy Calculator (Energiportalen)[18]

[18] Bodø Kommune (2024) Energiportalen. Available at: https://bodo.energiportalen.no/

Another innovative best practice model established by Bodø Municipality was a bespoke publicly accessible energy calculator. As part of a contract with a third party to provide an energy advisory services to residents, the provider developed a publicly accessible online energy calculator. This tool allows any resident to input basic information about their home and receive customized energy-saving suggestions.

The service was well-received by those who used it, and residents many reported gaining valuable insights and appreciated the quantified recommendations. As such, this system is a valuable best practice example that could be replicated in other partner regions due to its obvious benefits for public engagement and behavioral change. The model was also replicated by the regional authority in Norway.

However, the overall uptake of the resource was lower than anticipated in Bodø, and it is imperative to consider how this could be enhanced for future iterations of the system. Local feedback suggests that limited awareness and insufficient communication may have contributed to the underutilization of the service. As a result, the municipality decided to reallocate funding to other measures in the subsequent procurement round; although, the online energy calculator remains available to all residents .

Figure 4: Bodø Kommune – Online Energy Calculator (Energiportalen)

Umhvørvisstovan– Energy Evenings: Green Energy for Homes[19]

[19] Umhvørvisstovan (2025) Faroese Environment Agency. Available at: https://www.us.fo/

Similar to the communications network developed by Bodø Kommune, Umhvørvisstovan (The Faroese Environment Agency) ran a series of Energy Evenings with local citizens in 2025 to support their transition to greener energy. The target audience for the energy evenings was Faroese homeowners who still use oil for heating their home, with the overarching aim of providing participants with better skills and confidence to embark on a transition process towards a greener energy solution. Umhvørvisstovan were responsible for establishing the series of engagement events and also provided context during the sessions on the progress of the energy transition, while the energy evenings also included representatives from an energy supplier and a financial institution, who offered energy solutions and financing options, respectively.

In total, 7 sessions were held in the autumn of 2025 with over 275 attendees, which represented 1.5% of all building owners in the Faroe Islands. Feedback from the sessions was very positive, and Umhvørvisstovan are keen to scale up this methodology of engagement and communication with citizens in 2026. This engagement method critically included collaboration with other key stakeholders (energy providers and financial institutions), and this was important to provide a holistic narrative on energy transition and the steps that citizens can take to green their energy supply.

Direct engagement with citizens is essential to support energy transition and behavioural change, and this method deployed by Umhvørvisstovan can be considered a best practice example which has the potential for upscaling and replication in the NPA partner regions to support citizens to change behaviour and implement actions to decarbonise.

4 Guide Factors and Context

4.1 NPA Context

Countries in the NPA region each have their own unique characteristics and factors underpinning and supporting their pathway to decarbonisation. These factors are imperative to consider when developing a universal template for a citizen's guide to decarbonisation. This section outlines some of the key factors influencing decarbonisation in the HYBES partner regions.

4.2 Geographic/Climate Factors

Each regional climate influences building fabric/energy source recommendations. This is relevant to a citizen maximising investment return on a limited budget. In terms of solar resource, the following chart shows each HYBES location plus a Southern European comparison. This implies southernmost locations benefit most from PV technology excluding installation/maintenance costs.

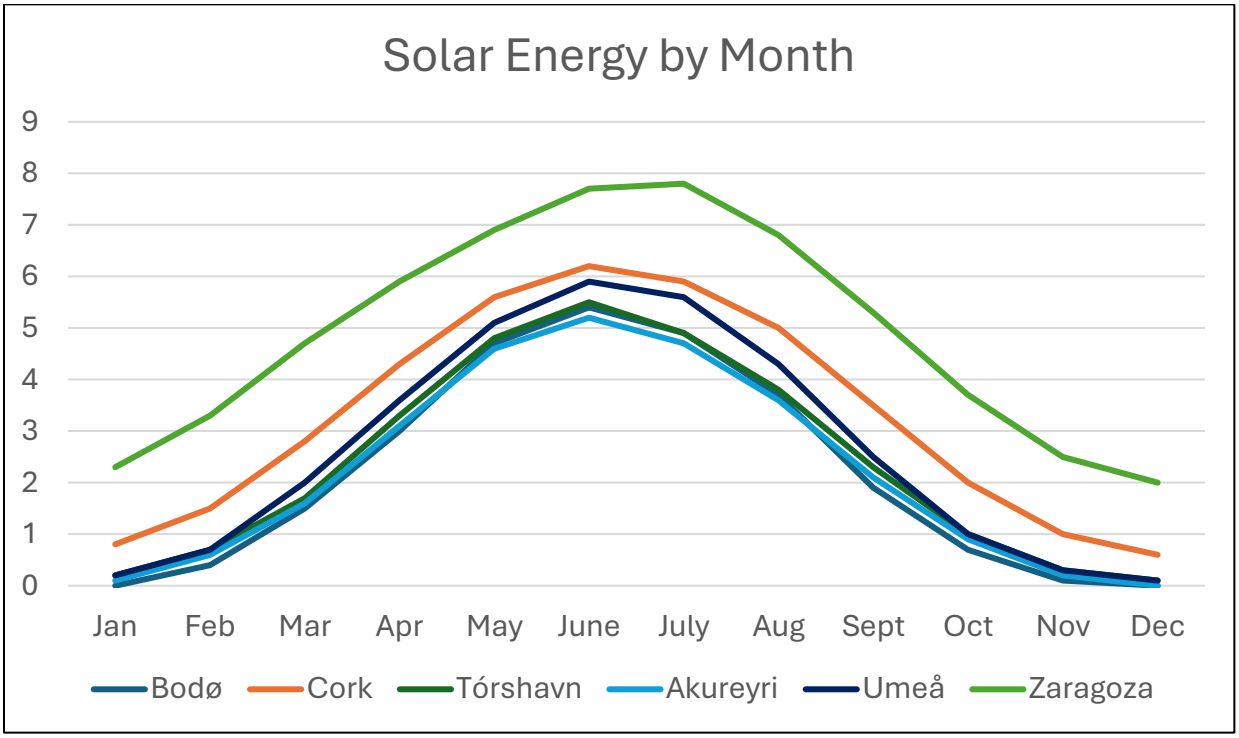

Figure 5: Solar Energy produced per month in the HYBES partner regions[20].

[20] Weather Spark (2025) *Climate and Average Weather Year Round*. Available at: https://weatherspark.com/

In terms of temperature, the following chart shows a clear difference based on latitude and prevailing climate. Insulation material will therefore benefit high latitude/Arctic locations more than lower latitude/Maritime locations.

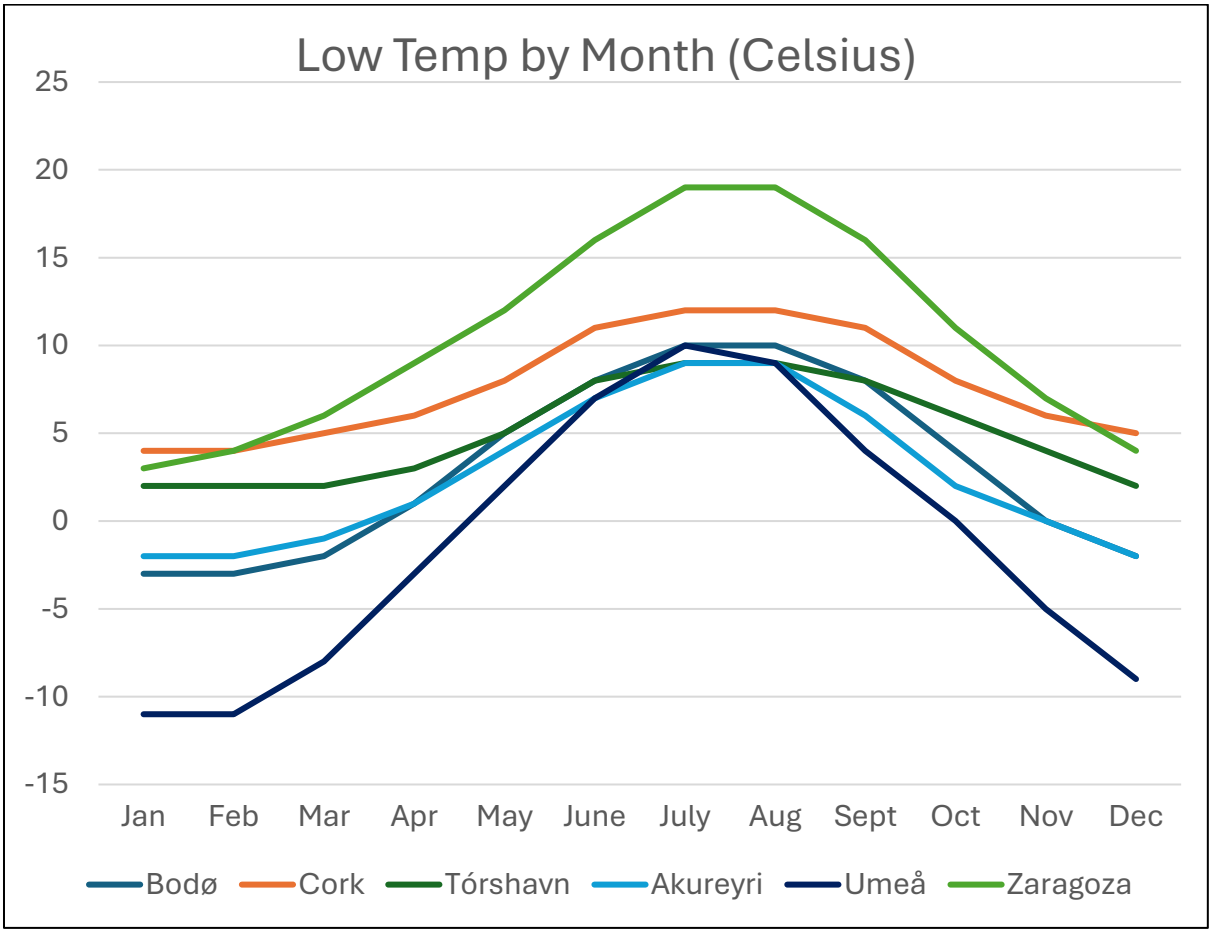

Figure 6: Low temperature per month in the HYBES partner regions[21].

In conclusion, a "one size fits all" energy efficiency recommendation is not feasible given the wide geographic area and absence of a comprehensive underlying model. Therefore, each HYBES partner region preparing a local decarbonisation guide must draw on local climate knowledge relative to energy efficiency improvement, and this is an important consideration in conceptualising a citizen's guide.

4.3 Funding Factors

Another important contextual factor relates to funding within each of the HYBES partner regions, and the public and private authorities supporting the provision of grant aid for decarbonisation activities. This is unique to each of the partner regions and is a key consideration when tailoring communication and guidance to citizens. In general, prominent

[21] Weather Spark (2025) *Climate and Average Weather Year Round*. Available at: https://weatherspark.com/

funding authorities/bodies in each of the HYBES partner regions which provide funding and subsidies to citizens, business, and community groups include:

- EU/National/Local Government bodies, and
- Established energy efficiency bodies/agencies.

The following chart outlines how this broad funding and governance structure applies to Ireland to support citizens in their pathway to decarbonisation:

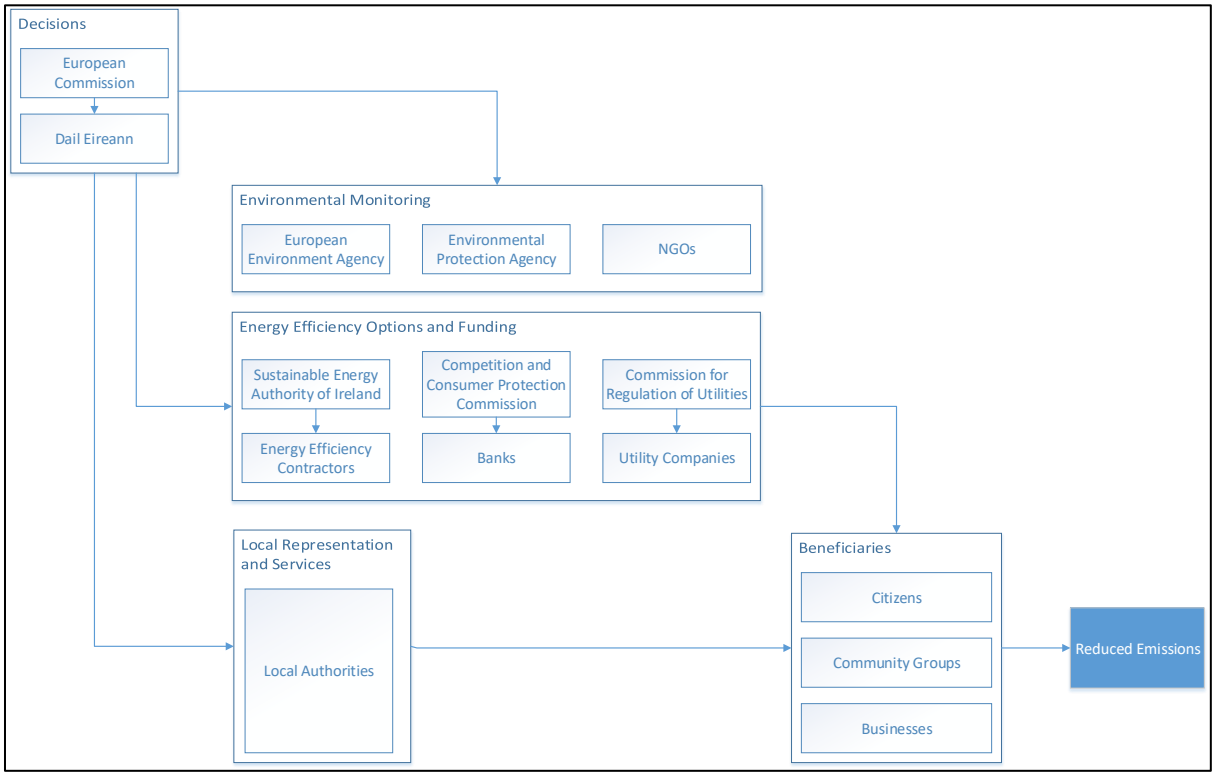

Figure 7: Pathways to decarbonisation in Ireland - governance structure and funding bodies.

Regarding energy efficiency funding, Ireland's approach includes:

- Domestic and business energy efficiency grants.
- Building dereliction reversal grants that may also cover energy efficiency.
- BER (Building Energy Rating) dependent reduced rate loans.
- Utility led power buy back schemes, and
- General community grants that may also cover energy efficiency.

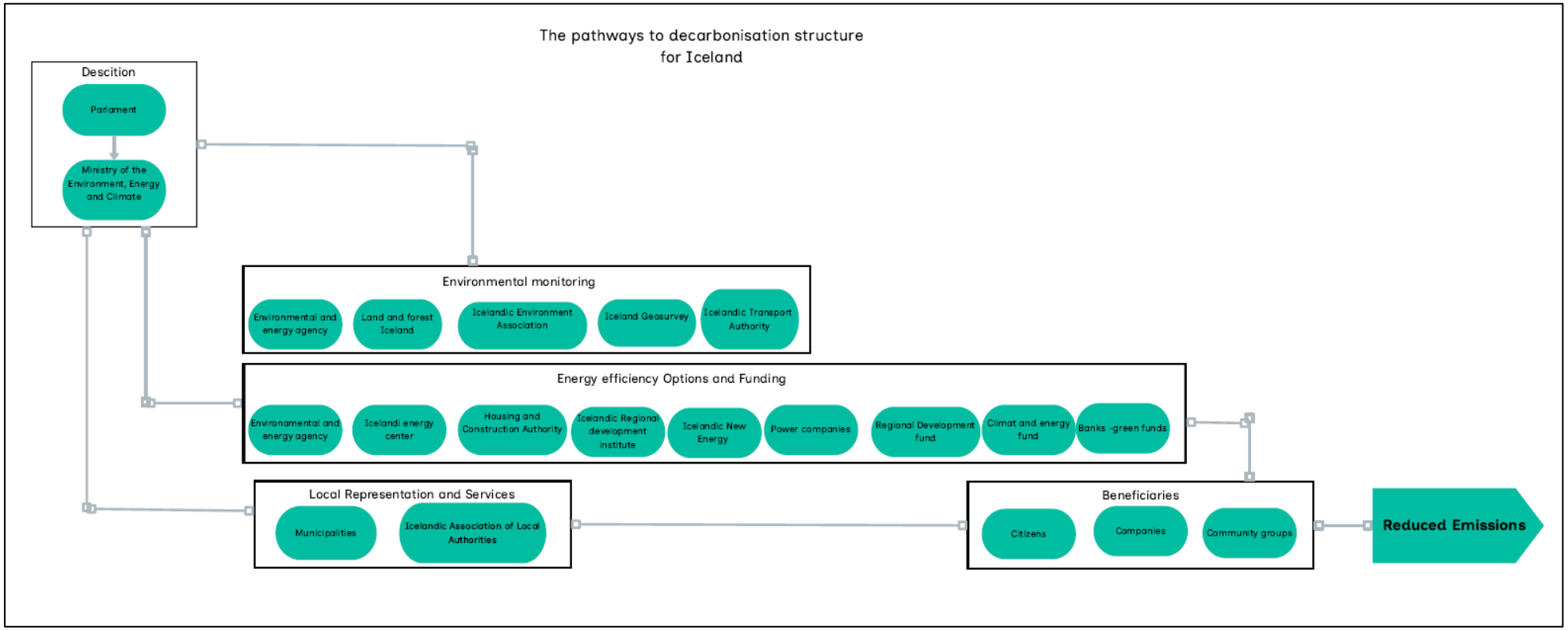

Figure 8: Pathways to decarbonisation in Iceland.

This is further emphasied in **Figure 6** above, which outlines the governance structure and funding bodies in Iceland. As such, whilst most countries use similar schemes, differing underlying detail will require a location-by-location approach.

4.4 Energy Source Factors

Energy source is also critical to decarbonisation. As per **Figure 7** below, each country has a differing domestic heating profile based on national energy strategy and available resources. Ireland is very fossil fuel dependent as a lower renewable energy level country in comparison to Norway, which has a strong focus on renewables. This unique energy source context is imperative for consideration, and therefore, an Irish energy efficiency installation's decarbonisation impact is likely higher than in a country with a lower base emission level.

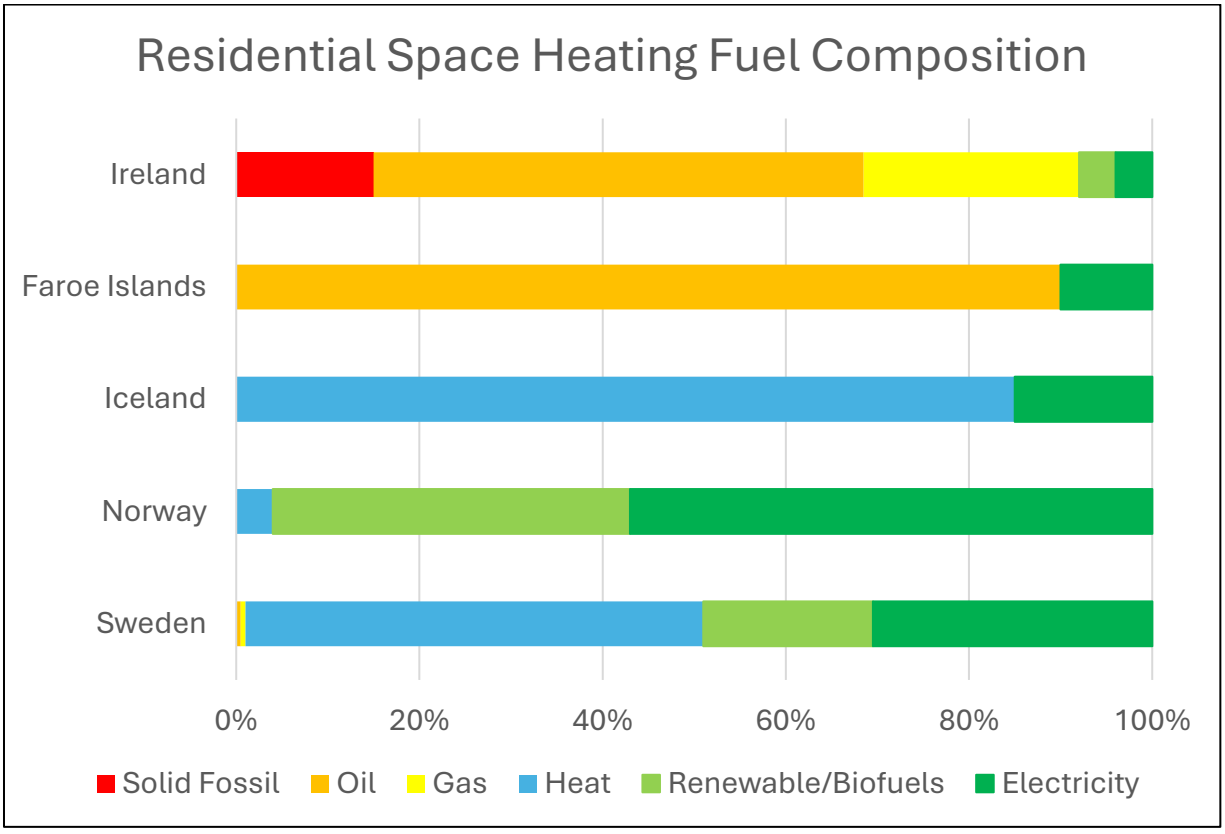

Figure 9: Residential space heating composition in the NPA region[22].

[22] Eurostat (2025) *Energy consumption in households*. Available at: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Energy_consumption_in_households#Energy_consumption_in_households_by_type_of_end-use

4.5 Individual Factors

There are also significant individual factors that influence decarbonisation, and the following section relates to citizen rather than structural constraints. As has been outlined in the literature/research review supporting this deliverable, the below are important individual considerations for citizen's:

- Financial savings are key for consumers - however, reduced energy usage still benefits decarbonisation.
- Individuals need support to navigate energy efficiency and implementation choices.
- Individual socio-economic profile drives energy efficiency priorities.

This section outlines key considerations in relation to financial savings, implementation support and installer support that impact citizen's ability to decarbonise.

Financial savings

Underlying energy costs affect energy efficiency measure viability. As is outlined in **Figure 8**, Ireland has high electricity costs compared to other HYBES regions. This will positively affect Irish decarbonisation investment relative to other sample locations and is a key driver in the transition to more renewable solutions.

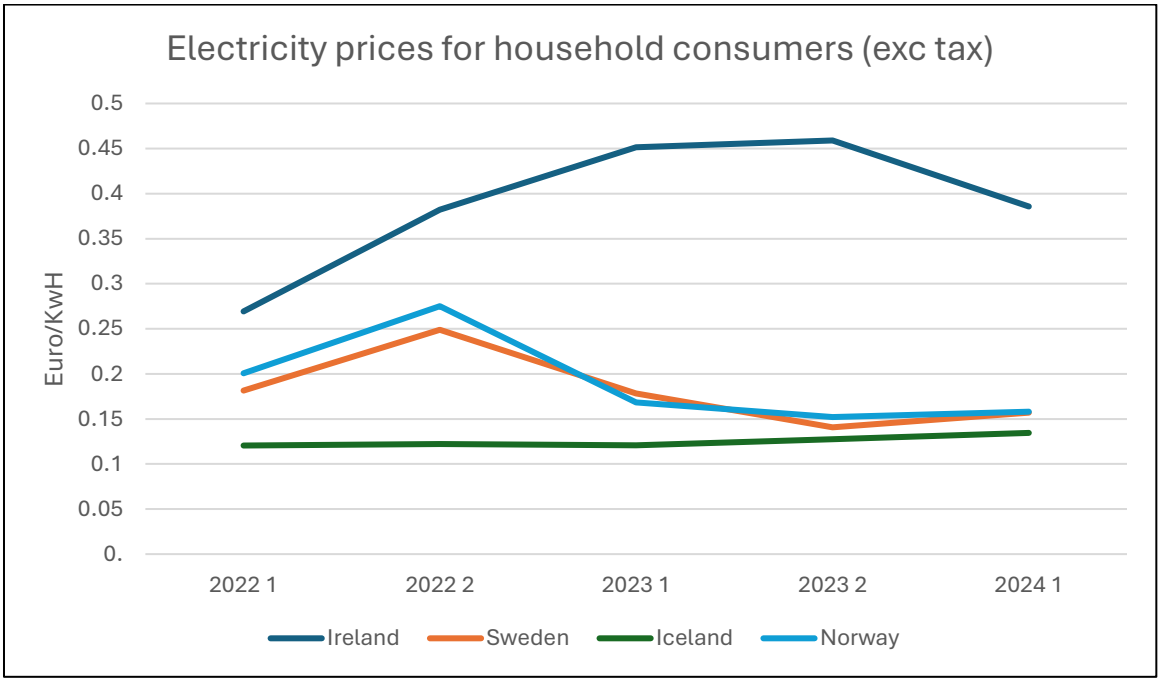

Figure 10: Electricty prices for hosuehold consumers[23].

[23] Eurostat (2025) *Energy consumption in households*. Available at: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Energy_consumption_in_households#Energy_consumption_in_households_by_type_of_end-use

Cyclical and supply vulnerable energy costs compound this, and this is particularly prevalent in Ireland, as is outlined in **Figure 9** and **Figure 10** below.

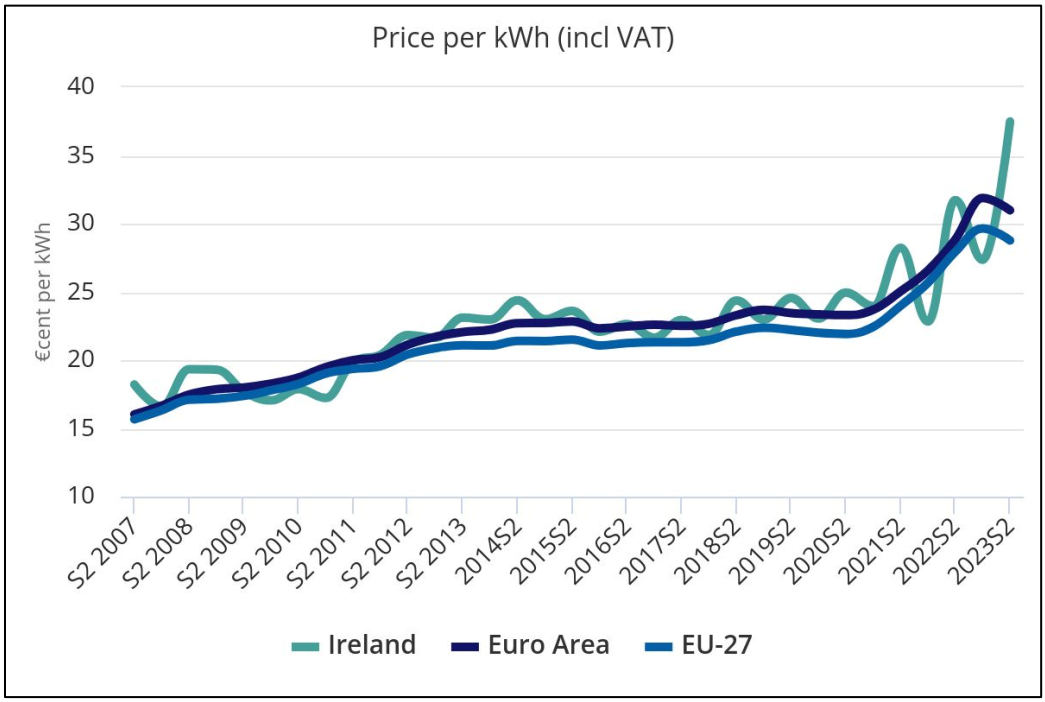

Figure 11: Electricity prices in Ireland[24].

[24] Sustainable Energy Authority of Ireland (SEAI) (2025) Energy price trends. Available at: https://www.seai.ie/data-and-insights/seai-statistics/prices

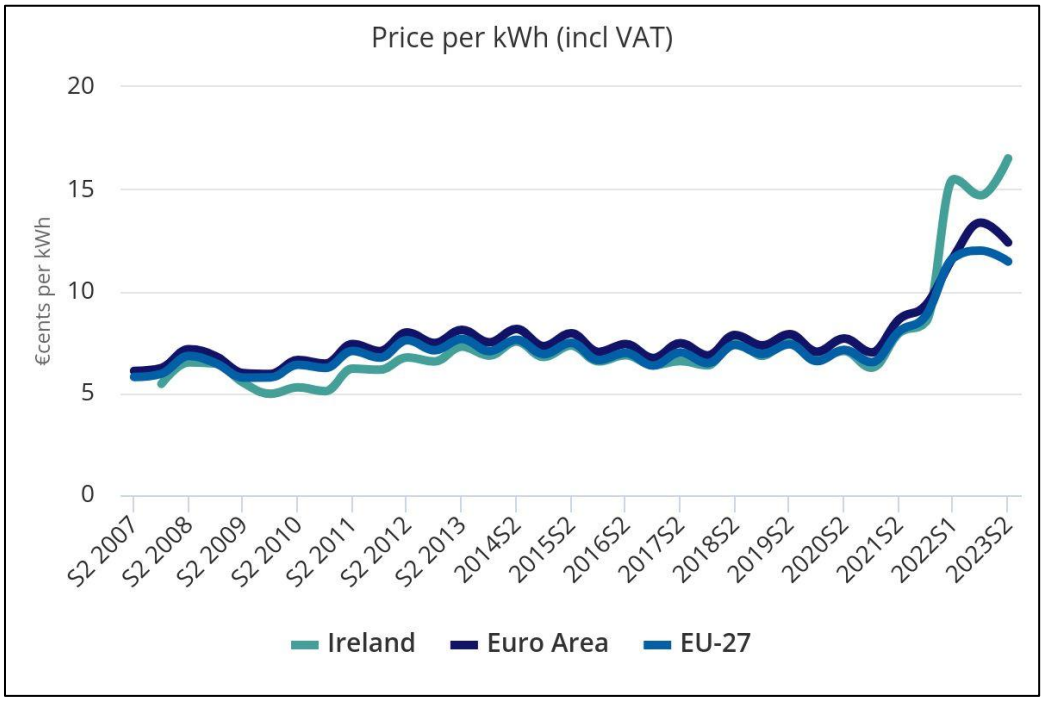

Figure 12: Gas prices in Ireland[25].

Within the Irish context, by late 2024 the average Irish household spent €1,752 solely on electricity costs. Ireland's house heating costs are less clear given the differing energy mix (gas/kerosene/solid fuel), building size and fabric. However, it is comparable to electricity expenditure costs. Subsequently, in Ireland it is evident that energy efficiency improvements can lead to considerable savings, and this is an important message to convey to citizens. However, improvement cost vs benefits vary significantly when comparing basic attic insulation to external wall wrapping, for example. Energy efficiency spending also competes with other spending/investment options. Therefore, a citizen must have access to cost/benefit analysis data and calculators ideally supplied through a reputable organisation. Incorporating this within any proposed citizen's guide is key in an Irish context and is likely transferable across all NPA partner regions.

[25] Sustainable Energy Authority of Ireland (SEAI) (2025) *Energy price trends*. Available at: https://www.seai.ie/data-and-insights/seai-statistics/prices

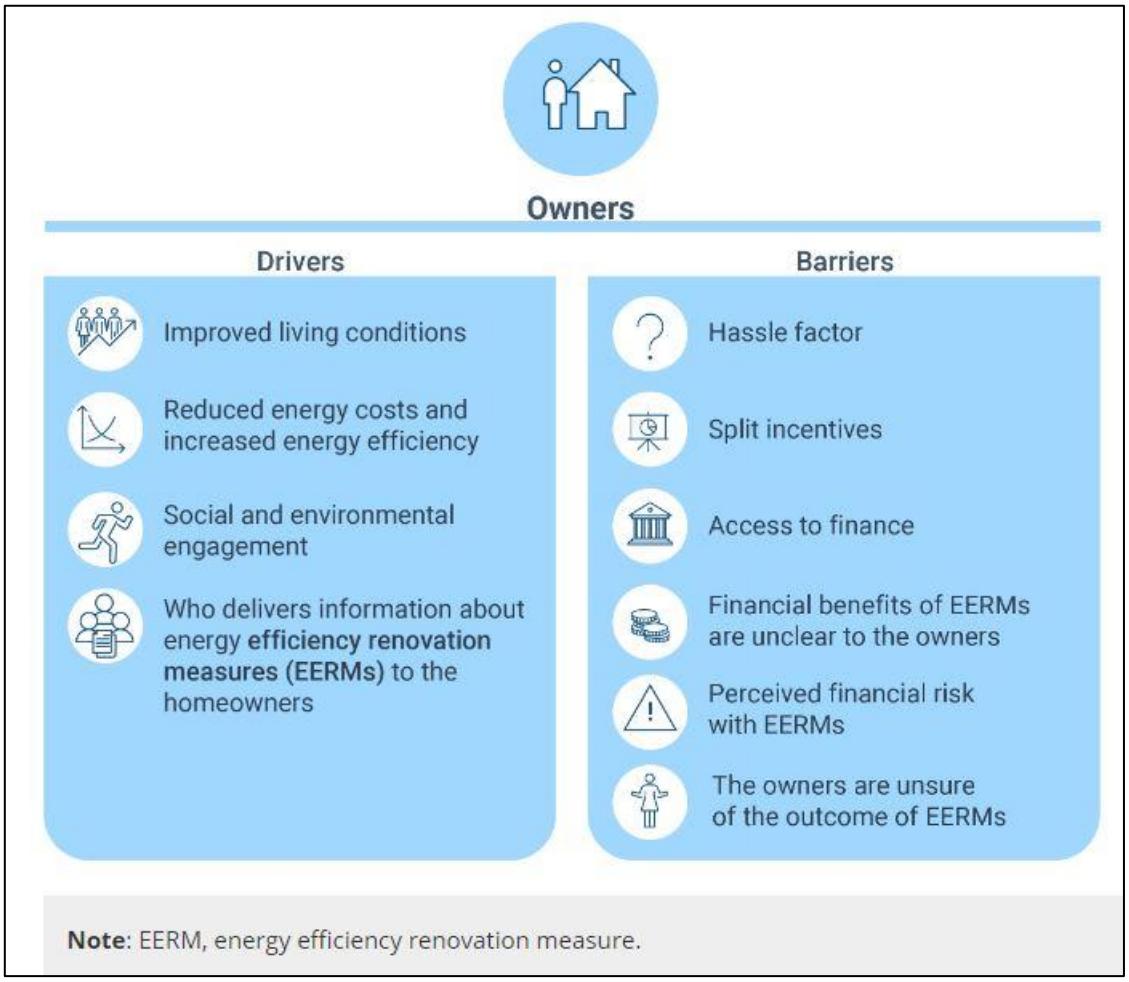

Figure 13: Prominent drivers and barriers influencing owners to implement energy efficiency renovation measures[26].

Full decarbonisation requires considerable technology and building fabric investment. However, low-cost lifestyle and product choices also yield significant benefits. These options are more likely to appeal to:

- Lower income households.
- Short term leaseholders, and
- Risk/Investment averse households.

As has been outlined in Section 3, Codema, an energy agency in Ireland, have produced a document entitled 100 Ways to Save Energy at Home[27], which outlines costs associated with an individual measure, from no cost to high cost, and indicates whether funding exists in

[26] European Environment Agency (2025) *Accelerating the energy efficiency renovation of residential buildings — a behavioural approach*. Available at: https://www.eea.europa.eu/publications/accelerating-the-energy-efficiency

[27] Codema (2024) 100 Ways to Save Energy at Home. Available at: https://www.codema.ie/resources-and-publications/

Ireland to support the implementation of the measure. This guide is available online and is a strong example of effective provision of information to citizens. Crucially, this guide also outlines low and mid cost changes relevant to households. It is imperative that decarbonisation guidance for citizens includes reference to these low/no cost measures.

Implementation Support

Another important consideration is that energy efficiency investment may also lead to hidden costs. These include:

- Time spent organising works.
- Ongoing maintenance.
- Household disruption, and
- Home resale value impact.

As such, it is essential that implementation support is provided to citizens to enable them to deliver retrofitting works and renovations in their own homes. One such method that is being implemented by agencies across the NPA region is the provision of a "One Stop Shop" by funding bodies to effectively manage projects for the citizen. This works by empowering a reputable body (such as the Sustainable Energy Authority of Ireland (SEAI)) to manage retrofitting projects and the provision of grant aid from ideation to completion on behalf of the citizen, including contracting relevant suppliers.

Figure 12 below outlines possible measures to address identified barriers to and drivers of energy efficiency renovations, including improving decision-making processes and improving access to financial support. These factors align with the provision of a "One Stop Shop", and this is an important conclusion for inclusion in a proposed citizen's guide template.

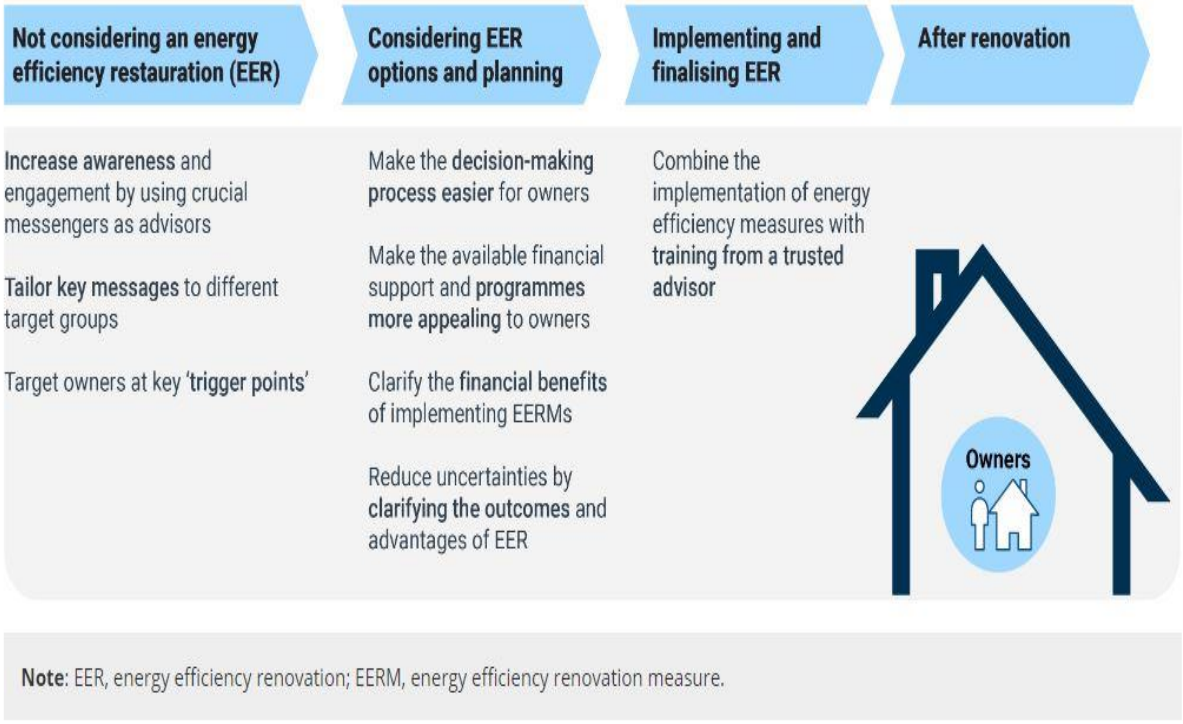

Figure 14: Possible measures to address identified barriers to and drivers of energy efficiency renovations[28].

Installer Support

While strong emphasis on citizen actions to decarbonise is a core focus of a proposed citizen's guide, it is also imperative to consider other facets of the process that require enhancement or guidance. Installer support is one such areas, and contractor competency and knowledge can reduce implementation issues for home retrofit and other energy projects. In Ireland, contractors can receive energy efficiency measure installation training at vocational or skill enhancement levels. Additionally, the Sustainable Energy Authority of Ireland (SEAI) operates a registered contractor database and provides installation standards guidance.

Iceland has adopted a similar approach, and the National Energy Authority of Iceland (Orkustofnun) engage directly with suppliers to introduce grant programs and installation guidance regarding integrating solar power into the national grid. Organisations/Contractors that availed of this expert guidance included:

- Electricity providers.
- Infrastructure installation contractors.
- Energy Regulators, and

[28] European Environment Agency (2025) *Accelerating the energy efficiency renovation of residential buildings — a behavioural approach*. Available at: https://www.eea.europa.eu/publications/accelerating-the-energy-efficiency

- Vocational Education providers.

Orkustofnun provide this expert guidance to clarify previously unclear PV installation processes, and this aims to address PV adoption bottlenecks, creating structured educational pathways and clarifying regulatory processes. This is an important transnational learning and emphasises the need for any citizen's guide template to include tailored messaging and supports for providers, as well as clients.

5 Decarbonisation Guide Structure

5.1 Decarbonisation Guide Overview

The key output of this deliverable is the proposal of a template for **a Citizen's guide to decarbonisation: An end-users guide to influence behavioural change**. This template has been conceptualised and developed in collaboration with partners from across the NPA programme area and demonstrates the value of transnational learning to co-design and co-create transferable solutions that support citizens to decarbonise.

To inform the development of a citizen's decarbonisation guide, this deliverable has reviewed and analysed existing research and literature underpinning citizen decarbonisation and behavioural change, while it has also considered best practices in the project partner regions that are currently being implemented to inform citizens about decarbonising measures. Factors and context supporting the development of a guide, including funding sources, have also been considered. The proposed structure for this guide, developed by the HYBES project, is outlined in the next section.

5.2 Proposed Structure

This Decarbonisation Guide proposal primarily focuses on:

- Individuals.
- Small business, and
- Communities.

However, it is important to recognise that individuals can have different requirements, and this has been outlined in this deliverable's research/literature review. For example, a person focused on cost savings may be interested in technical efficiency and funding, whereas a citizen focused on climate change may be interested in day-to-day choices and local event participation. In either case, all information needs to be up to date, reliable and straightforward.

Information source is also crucial. The environmental guidance sphere is well established, and, in Ireland, specific public bodies oversee monitoring, funding provision, and advice. Leveraging this credibility is critical whilst avoiding duplication. Any proposal must also factor in local Government and NGO climate change roles.

Based on the research undertaken to develop this guide, the proposed guide template is based on a website platform for the following reasons:

- Visually appealing.
- Easily updated.
- Supplies credibility.
- Allows for direct customer service.
- Possible to link to other resources.
- Can underpin forums and visual presentations.
- Facilitates a future App based approach.
- Allows software driven translation, and
- Allows traffic analysis.

While each region in the NPA has a different context and requirements, there are common trends/thematic areas that should be included in any universal citizen guide. These themes have consistently emerged in the research and partner best practice examples. As such, the online citizen's guide should include the following content streams:

1. Impacts, Strategy and Plans

This section supplies International, National and Local carbon reduction information and adds legitimacy to individual decarbonisation efforts. For ease of use, this information is best summarised rather than presented in original form. Document links can still be added, however.

2. Toolkits

This section supplies individual/household emission information relevant to understanding carbon and financial baselines. It can also supply technical guidance for decarbonisation measures.

3. Idea Bank

This section aims to inspire or inform individuals. This may involve podcast or online lecture curation and grassroot level forum moderation.

4. Actions

This section supports individual, community, and business level initiatives/schemes and supplies information on operating or applying for such schemes.

5. Funding

In an Irish context many emission reduction measures require high investment levels. Several public and corporate organisations offer individual grants and financial support, and this section could supply this information as no website currently draws together all these options.

Figure 13 below outlines a proposed website structure for the decarbonising guide, in an Irish context.

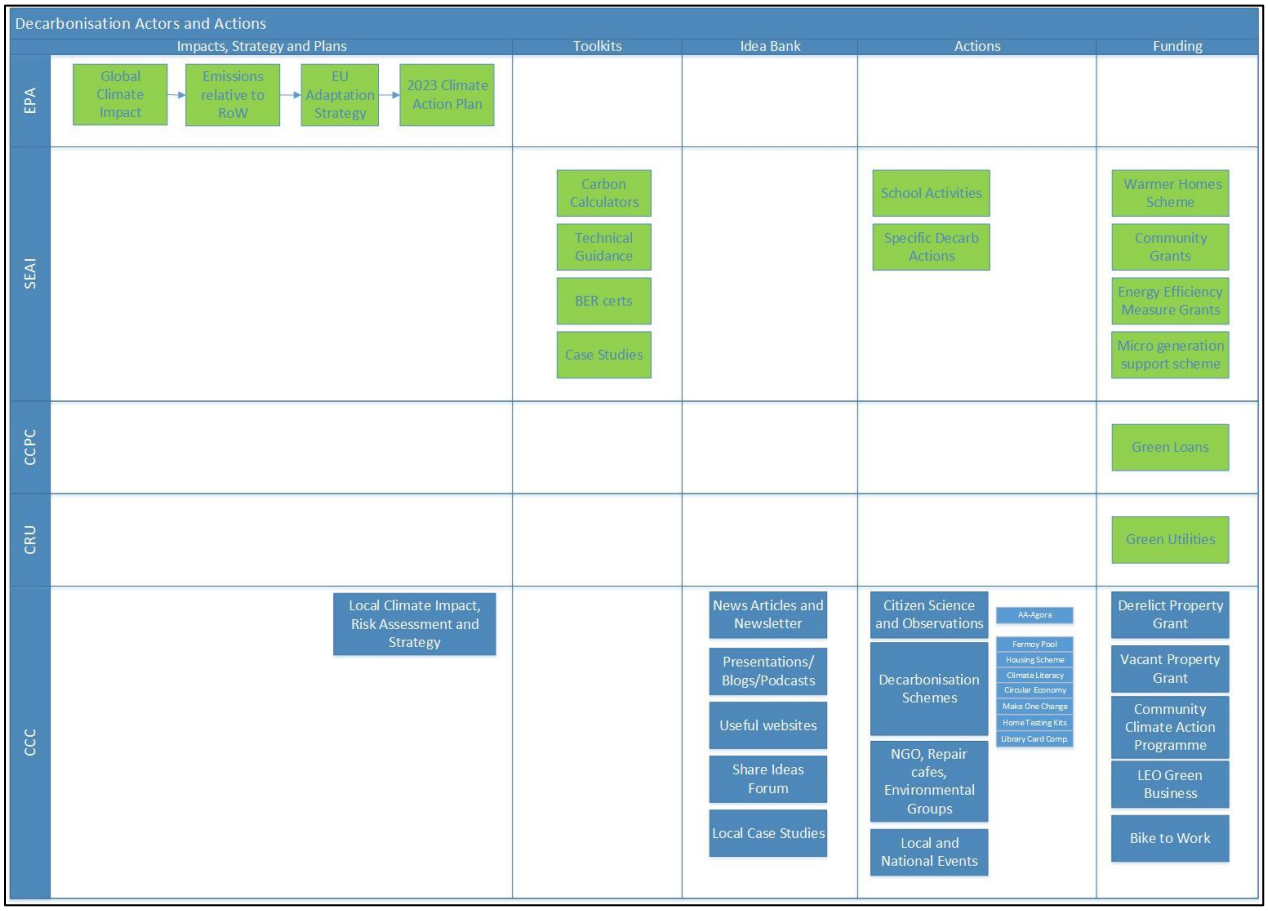

Figure 15: Decarbonising Guide Website structure, for an Irish context.

The proposed template outlined above, for an Irish context, includes content provided by the Irish public bodies, as these organisations have a record of accomplishment and information provision. These include:

- Environmental Protection Agency (EPA).
- Sustainable Energy Authority of Ireland (SEAI).
- Competition and Consumer Protection Commission (CCPC).
- Commission for Regulation of Utilities (CRU), and
- Cork County Council (CCC).

However, these bodies are unique to Ireland and other countries may not have analogous organisations. Nevertheless, the relevant region can still use available local expertise and best practice albeit with curation, when developing a localised citizen guide.

Content to be included within each of these key thematic areas is further expanded in **Figure 14** below. The example below is specifically tailored to a local Irish context, but the overarching thematic areas and topics to be included are universal across the HYBES project partner regions.

Stream	Owner	Item	Detail
Impacts, Strategy and Plans	EPA	Global Climate Impact	Illustrate EU/National level climate change impacts in a brief yet engaging manner. Focus areas include Average Temperature Rise, Likely Sea level rise, % loss in area, Flooding risk increase.
	EPA	Emissions compared to the Rest of World.	Shows how each nation and/or person's emissions relate to others. It aims to contextualise decarbonisation needs.
	EPA	EU Adaptation Strategy	Overview of EU climate adaptation goals ideally in a bullet point format.
	EPA	2023 Climate Action Plan	Overview of Irish climate adaptation goals in a bullet point format.
	CCC	Local Climate Impact Risk Assessment and Strategy	Place climate change in a local context referencing areas affected by floods, coastal erosion and works aimed at improving same.
Toolkits	SEAI	Carbon Calculators	This allows citizens set up a cost/emissions baseline and identify potential financial savings. A reputable body should develop and update these calculators.
	SEAI	Technical Guidance	This should clearly explain complex technical energy efficiency measures including air-heat pump mechanisms and insulation options.
	SEAI	BER Certs	BER Certs ensure a common energy assessment approach and underpin improvement choices and funding applications.
	SEAI	Case Studies	Individuals value peer experience when considering energy efficiency measures. This can be either video or written testimony but should be clear and attributable to an individual.
Idea Bank	CCC	News Articles and Newsletter	These sections can supply valuable information but need curation to provide accurate and up to date details.

Stream	Owner	Item	Detail
	CCC	Presentations/ Blogs/ Podcasts	
	CCC	Useful Websites	
	CCC	Share Ideas Forum	
	CCC	Local Case Studies	
Actions	SEAI	School Activities	Schools are both a primary decarbonisation focus and mechanism to spread good decarbonisation practices.
	SEAI	Specific Decarbonisation Actions	Guidance across a range of discrete actions of varying cost and complexity.
	CCC	Citizen Science	3rd level education or local government projects that citizens can either contribute to or conduct individually.
	CCC	Decarbonisation Schemes	Projects carried out to reduce emissions amongst local authority activities.
	CCC	NGO, Repair Cafes, Environmental Groups	Reputable national and local bodies that citizens can become involved with.
	CCC	Local and National Events	Sponsored events that citizens can take part in.
Funding	SEAI	Warmer Homes Scheme	These grants supply financial and implementation support to specific cohorts (older persons, community groups and individuals).
	SEAI	Community Grants	
	SEAI	Energy Efficiency Measure Grants	
	SEAI	Micro Generation Support Scheme	
	CCPC	Green Loans	Financial Institutions supply discounted rate loans for property purchase or improvement which meet high BER standards.
	CRU	Green Utilities	Utility companies supply off peak usage plans at discounted rates.
	CCC	Derelict Property Grant	These grants target unused property renovation but can include energy efficiency measures.

Stream	Owner	Item	Detail
	CCC	Vacant Property Grant	
	CCC	Community Climate Action Programme	These grants support community-based initiatives with a climate change impact (building improvements in particular).
	CCC	LEO Green Business	These grants support businesses carrying out energy efficiency works
	CCC	Bike to Work	These grants support low carbon emission transportation choices.

Figure 16: Proposed content for an Irish citizen's decarbonisation guide, with thematic areas universal for all HYBES partner regions.

5.3 Non Building Related Decarbonisation

Carbon emissions arise from all aspects of modern living such as.

- Travel
- Appliances
- Diet
- Recreation

As such, these areas also create further opportunities for decarbonisation in the daily lives of citizens. The HYBES project primarily focuses on building related measures (home retrofits etc.), and the proposed decarbonisation guide structure has been conceptualised and developed in line with the project objectives, it is important to be cognisant of the opportunities that exist in relation to these other sources of carbon. Subsequently, there is potential to cover non-building source emissions by further developing the decarbonisation guide. **Figure 15** below outlines the potential for the inclusion of non-building related decarbonisation measures in an enhanced citizen's guide.

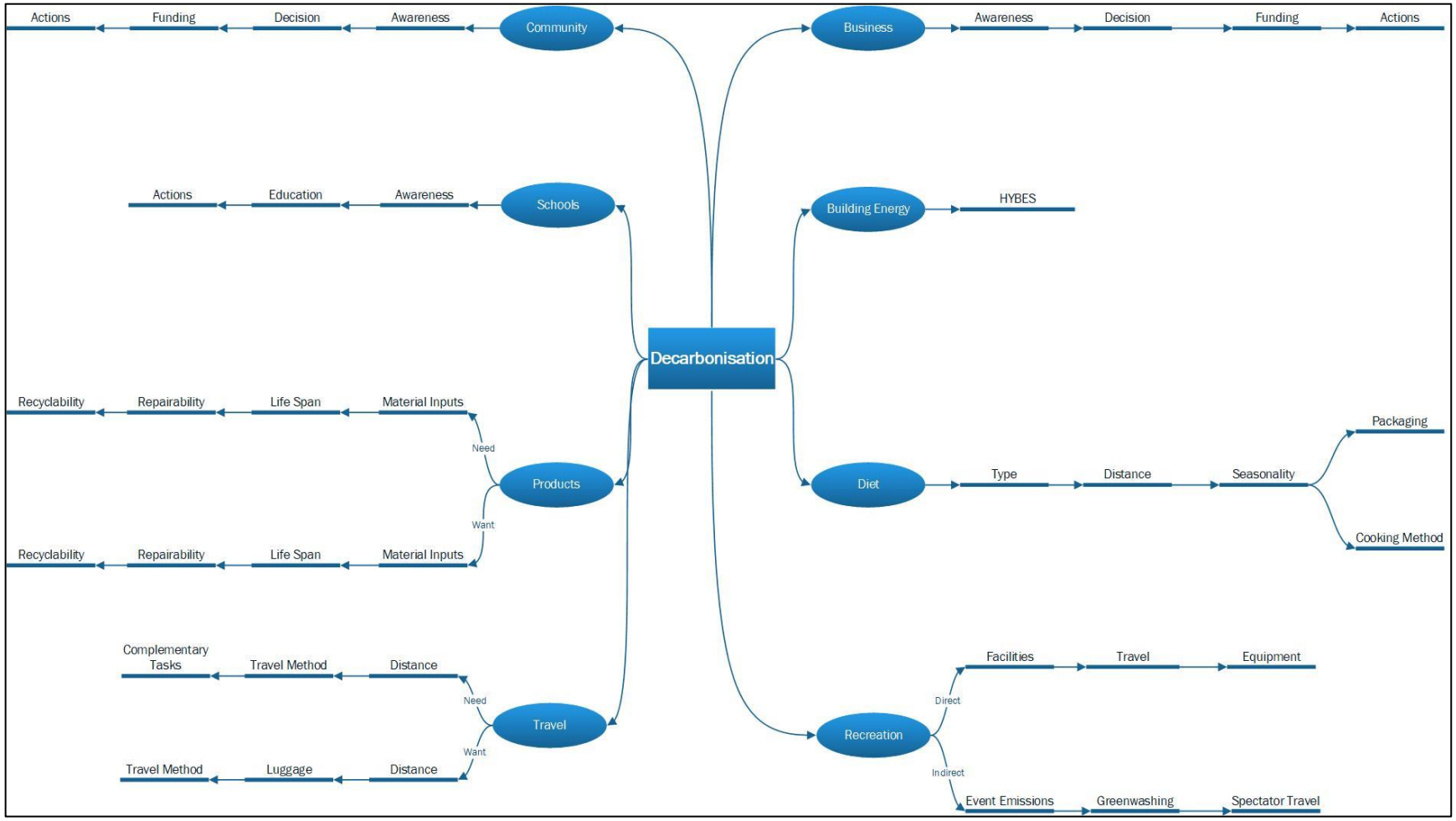

Figure 17: Enhanced citizen's guide with the inclusion of non-building related decarbonisation measures.

6 Conclusion

6.1 A Citizen's guide to decarbonisation

HYBrid Energy Solutions for buildings and infrastructure (HYBES) is a European project co-funded under the INTERREG Northern Periphery and Arctic programme, and includes partners from five countries (Norway, Ireland, Sweden, Iceland and the Faroe Islands). HYBES focuses on the area of decarbonisation and aims to facilitate and evoke behavioural change to assist in achieving climate action objectives and targets in the HYBES partner regions.

Deliverable 2.6.1, entitled **A Citizen's guide to decarbonisation: An end-users guide to influence behavioural change**, supports the development of a universal citizen's guide which includes guidance and evidence-based support to demonstrate to end-users the value, both environmental and financial, of implementing decarbonisation measures at both an individual and organisational level. Target audiences (end-users) include building managers, businesses, and housing tenants. This deliverable outlines the process of developing a template/structure for a citizen's guide and includes consideration of existing research underpinning citizen decarbonisation and behavioural change, as well as best practices in the project partner regions that are currently being implemented to inform citizens about decarbonising measures. This deliverable also considers factors and context supporting the development of a guide, including funding sources.

Section 2 presents the results of a comprehensive research/literature review that was undertaken by the HYBES project partners to identify key common trends relating to citizen decarbonisation and decision making. Three key trends which influence individual decarbonisation choices emerged (life stage, financial savings and implementation barriers) which are imperative to recognise and acknowledge, and these key factors/components have informed the design process of the citizen's guide template.

Section 3 considers several significant tools/guides/online resources that are currently being implemented in each of the HYBES project partner regions to inform citizens of possible actions to undertake to decarbonise. These best practices specifically relate to similar "guides", or online resources that are being used in the partner regions to offer guidance to citizens and support them in their journey to a decarbonised future. Best practices outlined in this deliverable which have been used to inform the citizen's guide template include the Codema 100 Ways to Save Energy at Home briefing guide (Ireland), the National Olympic and Sports Association of Iceland (ÍSÍ) Bike to Work (Hjólað í vinnuna) campaign/competition (Iceland), Umea Kommun's Climate Podcasts (Poddar med Klimatekot) (Sweden), Bodø Kommune's Communication network for professional stakeholders (Kompetanseforum) and Online Energy

Calculator (Energiportalen) (Norway), and Umhvørvisstovan's Energy Evenings (Faroe Islands). These best practices emphasise innovative measures being implemented in the NPA region to support decarbonisation and have supported the conceptualisation of content themes for the HYBES guide template.

Guide context and factors are considered in **Section 4**. Each partner region in the NPA has its own unique characteristics, context and factors underpinning and supporting their pathway to decarbonisation. These factors are imperative to consider when developing a universal template for a citizen's guide to decarbonisation, and this section outlines some of the key factors influencing decarbonisation in the HYBES partner regions such as geographic/climate factors, different key energy sources, variances in funding bodies, and other individual factors.

The final section of this deliverable (**Section 5**) presents the key output of the deliverable and an important output for the HYBES project; an evidence-based template for a universal citizen's guide to decarbonisation. This template has been conceptualised and developed in collaboration with partners from across the NPA programme area and demonstrates the value of transnational learning to co-design and co-create transferable solutions that support citizens to decarbonise. Based on the research undertaken to develop this guide, the proposed guide template is based on a website platform and should contain content relating to five key thematic areas; Impacts, Strategy and Plans; Toolkits; Idea Bank; Actions, and; Funding. Proposed specific content, which will vary depending on the localised content (funding bodies, agencies) is also identified. Further opportunities also exist for the expansion of the citizen's guide to include content related to non-building decarbonisation, including lifestyle factors and travel methods.

It is imperative to note that this citizen's guide will evolve as requirements and technology change, and this deliverable has affirmed that local context and requirements are essential considerations when communicating decarbonisation guidance to citizens. While this deliverable has proposed a universal design template for a citizen's guide to decarbonisation which has been developed through evidence-based research and transnational learning, any localised decarbonisation guide will require bespoke information and content to ensure that the guide provides benefit for the citizen. This is evident across the NPA programme region and is an important takeaway from this deliverable.

Appendix 1 Deliverable Description

Deliverable title: A Citizen's guide to decarbonisation: An end-users guide to influence behavioural change.

Deliverable description: Led by CCC. Using the learnings from WP2 and WP3, this activity will develop a citizen's guide to influence behavioural change and deliver decarbonisation activities. This guide will include guidance and evidence-based support to demonstrate to end-users the value, both environmental and financial, of implementing decarbonisation measures at both an individual and organisational level. This guide will offer advice for end-users, including building managers, businesses, and housing tenants, and will identify the benefits of decarbonisation techniques. Activity 2.6 will allow municipalities to demonstrate the transition from fossil-fuel to green energy through flexible renewable energy sources. A key objective of this guide is to empower end-users to adapt and change behaviour by providing pro-active guidance and advice to enhance awareness and knowledge of decarbonisation. The guide will also provide decision-makers with a step-by-step framework to engage with future end-users.

Deliverable: D.2.6.1

Description: This will provide an end-users guide to influence behavioural change. This guide will include guidance and evidence-based support to demonstrate to end-users the value, both environmental and financial, of implementing decarbonisation measures at both an individual and organisational level.

Delivery period: Period 6, month 31 - 36, 01/08/2025 - 31/01/2026