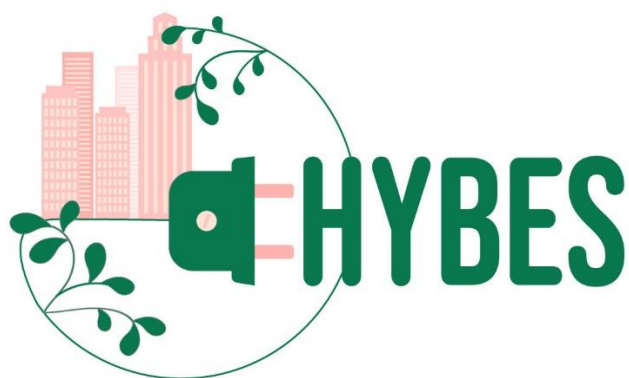


Capitalisation Plan for the HYBES project



Interreg



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Contents

1. Executive Summary.....	6
2. Introduction.....	11
3. HYBES Joint Action Plan and Capitalisation Plan.....	13
4. Changes in Regions Legislation and Policy and Implications / Potential for the HYBES Project Outputs.....	14
5. The Development and Sustaining of the Regions Living Labs.....	15
6 Evolution of Best Practices in the HYBES Project (including Lessons Learned and Education and Behavioural Change in the Regions).....	24
6.1 Best practice models for energy efficiency management and monitoring.....	24
6.2 Co-creation environment (co-creation cafes).....	31
6.3 Education.....	33
6.3.1 Curriculum change.....	34
6.3.2 Third level education - meeting needs of industry.....	34
6.4 CPD for existing professionals – meeting needs of industry.....	42
6.5 Training of trainers within different settings (how to engage with communities).....	43
6.6 Renewable energy (solar) generation.....	44
6.7 Renewable energy (geothermal) generation.....	47
6.8 Energy efficient transport systems.....	49
7. Funding the HYBES Project Per Region to 2026 and Beyond.....	51
8. Recommendations from the HYBES Project Outputs.....	71
8.1 Living lab process as an engagement tool for communities.....	71
8.2 Curriculum change (second and third level) and meeting industry needs.....	72
8.3 Citizen's Guide to Decarbonisation.....	72
8.4 Recommendations from the Technical Work Packages.....	73
8.5 Transnational Learning.....	78
9. Conclusion.....	81
10. Appendices.....	83



Abbreviations

BER – Building Energy Rating

BIPV – Building-Integrated Photovoltaics

CPD – Continuous Professional Development

CCAP – Community Climate Action Programme

CCC – Cork County Council

CAF – Climate Action Fund

CAP – Climate Action Plan

CHP – Combined Heat and Power

DH – District Heating

DZ - Decarbonisation Zone

EMRA – Eastern and Midland Regional Assembly

ECP – Embodied Carbon Principle

EI – Enterprise Ireland

ECB – European Central Bank

EGDIP – European Green Deal Investment Plan

EIB – European Investment Bank

EIF – European Investment Fund

ERDF – European Regional Development Fund



EU – European Union

GNI – Gross National Income

GHG – Greenhouse Gas

HLLM – HYBES Living Lab Model

ICNF – Infrastructure, Climate and Nature Fund

IF – Innovation Fund

JTF – Just Transition Fund

LCA – Life Cycle Assessment

LEAP – Low Emission Analysis Platform

MMC – Modern Methods of Construction

MFF – Multiannual Financial Framework

NDP – National Development Plan

NDPR – National Development Plan Review

NCE – NCE Insulation

NPA – Northern Periphery and Arctic

NWRA – Northern and Western Regional Assembly

SIF – Shared Island Fund

SRA – Southern Regional Assembly

SEAI – Sustainable Energy Authority of Ireland



SEIP – Sustainable Europe Investment Plan

SPF – Seasonal Efficiency Factors

THRIVE – Town Centre First Heritage Revival Scheme

UCC – University College Cork

UMEA – Umeå University

VAT – Value Added Tax



1. Executive Summary

Introduction

The purpose of the HYBES Capitalisation Plan is to review the activities of the project and to determine if there are opportunities for their development or replication when it ends (31st January 2026).

The development or replication of the HYBES project activities will contribute to the decarbonisation of the EU by 2050 (Regulation (EU) 2021/1119 of the European Parliament).

Joint Action Plan

The Capitalisation Plan is a deliverable in the Joint Action Plan and assesses what activities can be continued or replicated through legislation, policy, other and / or sponsored projects, funds, etc.

Living Labs

The living lab model builds knowledge, understanding and capacity to adopt co-design best practices and behaviours for the achievement of decarbonisation ambitions in the regions.

The living lab model and guide has evolved and is demonstrated through the following deliverables:

- Deliverable 1.3.1 - Living Lab model Report
- Deliverable 1.4.1 - Five Quadruple Helix (QH) regional stakeholder workshops
- Deliverable 1.4.2 - Report on Stakeholder workshops and key recommendations for policy
- Deliverable 1.6.1 - Reports on Cultural Events and Festivals as platforms for developing decarbonisation awareness
- Deliverable 1.7.1 - Technical guide on the Living Labs as a tool for delivering behavioural change for decarbonisation
- Deliverable 1.7.2 - Stakeholder report on the effectiveness of the Living Labs model



Best Practices

HYBES develops best practices through action, collaboration and consideration / reflection. Changing our society's behaviour to energy use and management will help combat climate change.

The development of HYBES best practices is demonstrated in the sub-sections below.

Models for energy efficiency and monitoring

These analyse and assess techniques for energy efficiencies in buildings, transport and the built environment.

Energy efficiency and monitoring models are demonstrated in the following deliverables:

- Deliverable 2.2.1 - Report on best practice models for energy efficiency, management and monitoring
- Deliverable 2.1.1 - Technical report on macro energy analysis for delivery of Decarbonisation Zones (DZs) in Umea and Bodø
- Deliverable 2.3.1 - Technical report on energy Monitoring and Management tool for social housing
- Deliverable 2.4.1 - Collaborative report on energy monitoring and behavioural change for educational facilities
- Deliverable 2.6.1 - Citizen's guide to decarbonisation: An end-users guide to influence behavioural change

Co-creation Cafes

Co-creation engagement with citizens helps build knowledge and understanding of decarbonisation and its benefits.

Co-creation engagement is demonstrated in the following deliverable:

- Deliverable 1.5.1 - Report on implementation of three Co-Creation Cafes

Education

European education institutions need to include modules on climate change, GHG's, sustainability, renewable energy, energy conservation, etc. Third level



graduates when entering employment need to have an awareness and understanding of climate change and decarbonising society to reduce its impacts.

Climate action education is demonstrated in the following deliverables:

- Deliverable 2.5.1 - Report on the potential for educational curriculum change for the delivery of decarbonisation goals
- Deliverable 2.4.2 - 12-week educational module

Continuous Professional Development (CPD) for professionals

Professionals in industry require CPD in decarbonisation to ensure climate action principles influence their work practices / choices and way of life.

Training of trainers

The evolving nature of climate change and the broad nature of the topic means knowledge share and education of all professionals is essential in combating the issue at all levels of society.

Renewable energy (solar) generation

Renewable energy from the sun through solar panels plays a significant part in decarbonising the EU and continent by 2050.

Renewable energy generation is demonstrated in the following deliverables:

- Deliverable 3.1.1 - Report on solar energy solutions for decarbonisation
- Deliverable 3.2.1- Technical report on the benefits of energy retrofit to facilitate fossil fuel replacement

Renewable energy (geothermal) generation

Renewable energy through geothermal steam / hot water heating systems plays a significant part in decarbonising the EU and continent by 2050.

Renewable energy (geothermal) generation is demonstrated in the following deliverable

- Deliverable 3.3.1 - Technical report on geothermal energy solutions for decarbonisation



Energy efficient transport systems

The existing transport system in Europe needs to be decarbonised, through electric vehicles, active travel (walking, cycling, running, etc.), public transport linked with land use development (at higher densities), etc.

Energy efficient transport systems are demonstrated in the following deliverable:

- Deliverable 3.4.1 - Report: Create an energy system for storage and energy sharing in city districts for EV

Funding

It is important that the HYBES activities have access to available and sufficient funding for development and / or replication when the project ends. The most realistic route to access funding is through other similar projects and / or programmes. Examples of these EU programmes that are currently in place to 2027 are:

- Interreg
- Horizon
- Urbact IV
- European Urban Initiative
- Life
- Etc.

Climate action funding at an EU level is held predominantly in the EU Budget, the European Central Bank (ECB) and the European Investment Bank (EIB).

The EU and its financial partners distribute funding for climate change through funds. Examples of these funds are:

- InvestEU 2021-2027
- Just Transition Fund 2021-2027
- Innovation Fund 2020-2030
- The European Green Deal Investment Plan 2020-2030
- European Regional Development Fund 2021-2027
- Etc.



These funds have allocated budgets and are time limited but will likely be extended (or under different titles) to 2050 for greenhouse gas (GHG) emissions neutrality in the continent.

EU climate action funding is also disseminated to the member states and others who distribute these funds at a national, regional and local level in their countries.

Conclusion

The discoveries, results and findings of the HYBES project activities can be continued and / or replicated, after the project, as part of the decarbonisation of the EU continent by 2050.

The HYBES partners will monitor relevant emerging legislation and policy in their countries to check if there are any opportunities to include the HYBES activities results in these statutory documents.

HYBES has been a breathing ground for positive transnational learning and cooperation / engagement, i.e. through the projects living labs. The living labs brought knowledge and experience from the project partners and their activities to their fellow citizens.

The knowledge and information in HYBES derive from the project pilots and deliverable best practices in areas such as energy monitoring and efficiency, renewable energy generation / conservation, etc. The projects citizen's guide to decarbonisation template is another method that can be used to inform citizens on the importance of decarbonisation and the need to change behaviours and habits to achieve it, in day to day living.

The decarbonisation of the EU to 2050 will be supported by the relevant EU funding and projects / programmes that are funded in the next Multiannual Financial Framework (MFF) 2028-2034 (currently worth more than €1 trillion).



2. Introduction

The HYBES Capitalisation Plan will reflect on the objectives in the Joint Action Plan Work Package 1 (see section 3 for further details) and will identify opportunities to capitalise, continue and replicate the project activities when the project ends (31st January 2026).

Capitalising on and developing the project actions from 31st January 2026 will contribute to the decarbonisation of the European Union (EU) by 2050 (Regulation (EU) 2021/1119 of the European Parliament) that accords with the relevant legislation and statutory plans and policies in the partner regions.

The term capitalisation has a few meanings in English grammar and in the financial sector, etc. Nonetheless, for EU project and programme reporting, it is defined by Interact and Interreg as follows:

- (i) *“As a building process, capitalisation is aimed at consolidating the capital built by Interreg projects and programmes, with the objectives of:*
- *Making the knowledge and results generated by projects more accessible, thus improving transfer of knowledge;*
 - *Obtaining additional results through benchmarking and detailed content analysis, building on existing knowledge and experience;*
 - *Promoting the re-use and / or transfer of this knowledge and these results, in order to boost performance and delivery;*
 - *Raising awareness and improving communication of results in specific fields of regional policy”.*

(Source: Capitalisation Plan 2016 – Interact)

- (ii) *“In the context of the Interreg Europe programme, capitalisation is defined as a process of collecting, analysing, disseminating and transferring good practices and policy experience in a particular field of regional policy with the objective of exploiting and deploying in policy the results achieved by the regions in that field....”*

(Source: Programme Manual - Interreg Europe programme - 2017)



The HYBES Capitalisation Plan is listed as activity 1.8 / deliverable 1.8.1 of work package 1 in the joint action plan. It is required for delivery in period 6 of the project.



3. HYBES Joint Action Plan and Capitalisation Plan

The HYBES Capitalisation Plan is interlinked with the HYBES Joint Action Plan (Deliverable 1.1.1) and will act as an audit check on the successfulness of the HYBES project activities, their links to new and emerging relevant legislation and policy in the regions and how these activities, where required, can be developed, replicated and / or carried on after the HYBES project ends (31st January 2026).

The HYBES Capitalisation Plan will identify and assess, where possible, obstacles that were experienced during the HYBES Joint Action Plan activities and how these challenges were / can be overcome. In addition to the replication of activities in other projects, as a reliable solution to the required progression of the project's deliverables post 2026, legislation and policy influence in the regions and EU and national climate action funding mechanisms are key for the continuation of the HYBES project activities after 31st January 2026 and to 2030 and 2050.

The HYBES Joint Action Plan is available in the Interreg Northern Periphery and Arctic HYBES website, in the Outputs and Results section.



4. Changes in Regions Legislation and Policy and Implications / Potential for the HYBES Project Outputs

Updates, where relevant, have been added to the regions legislation and policies in the HYBES Joint Action Plan and are included in Appendix 1.

The updates, in Appendix 1, include commentary from some of the partner regions on implications / potential for the HYBES project actions and deliverables to 2026 and in subsequent years.

See Appendix 1 for the region updates.



5. The Development and Sustaining of the Regions Living Labs

Living labs are an innovative instrument used in the project's five regions and beyond. They build knowledge, understanding and capacity for decarbonisation through co-design and participatory practices that engage European citizens as active agents of change in realising decarbonisation goals.

The living lab model has evolved and is demonstrated in the HYBES project in the deliverables below.

Deliverable 1.3.1 - Living Lab model Report

The HYBES Living Lab model report provides a contextualised, evidence-informed conceptual framework and approach for the HYBES living lab approach to be evolved over the course of the project. It builds on European best practice for living labs and citizen centred participatory design approach and created a high-level roadmap to evolve and refine the model over the duration of the project.

The report provides the theoretical and methodological underpinning for the approach taken in HYBES. This includes working with a place-based approach and across multi-level engagement for socio-technical transitions. The emphasis is placed on tailoring solutions to specific local contexts, including community-driven measures of change and making decarbonisation a collective effort.

The living lab model report was informed by early activities undertaken by project partners on policy mapping, local context mapping and framing and initial stakeholder mapping to ensure an approach that could be practically applied, relevant and flexible in local contexts, whilst supporting a cohesive approach.

The report also creates the framework for a knowledge based eco-system in HYBES operating and local and transnational level and anchors mutual learning theory as a pedagogical model to be embedded in the project to support this eco-system.

The report established initial core principles and worked with partner regions to identify early engagement activities needed with strategic partners to advance the local approach.



See Deliverable 1.3.1 - Living Lab model Report in the HYBES Capitalisation Plan Website

Deliverable 1.4.1 - Five Quadruple Helix (QH) regional stakeholder workshops

Partners in each region - Akureyri, Bodø, Cork, Tórshavn, and Umeå - worked to extensively map out stakeholders and lay the groundwork with early strategic stakeholders for local buy in and support.

Each region chose specific geographic focal points to align their decarbonisation efforts with local strategic opportunities, ensuring that initiatives were relevant and impactful within each area's unique context and optimising opportunities for longer-term goals beyond the project duration. In practice this required local meetings and a discovery phase to ensure the initiatives mitigated risks of duplication of effort, adding complexity to existing end-user engagement activities and infrastructure or worsening relational issues such as stakeholder fatigue and trust.

The emphasis was placed on identifying value add co-creation work and activity within the existing eco-system for organically developing and building capacity for living lab approaches practices rather than trying to impose an additional infrastructure. Sustained living labs are evolved over a longer period of time, building on the development of trusted relational working across sector and silo boundaries and working adaptively and flexibly with the local eco-system context.

Each partner then held local workshops with quadruple helix stakeholders to develop more comprehensive overview of current decarbonisation efforts and regional arrangements, as well as to hear diverse stakeholder perspectives on the issues and needs related to their focus area.

This enabled partners to test and advance meaningful and responsive work and activities in their local contexts, strengthening the overall value proposition of the HYBES activities.

Partners were provided with consultation support, guidance and templates to support the delivery of local workshops, facilitating partners to orient their efforts effectively within their local contexts.



See Deliverable 1.4.1 - Five Quadruple Helix (QH) regional stakeholder workshops in the HYBES Capitalisation Plan Website

Deliverable 1.4.2 - Report on Stakeholder workshops and key recommendations for policy

The workshops and initial engagement activities set the stage for understanding existing engagement practices and finding ways to enhance community involvement.

A report for each region created a baseline benchmark on the current state and evolve the approach to multi-level engagement and orchestration for long term change. This created a foundation for evolving learning and practice on the approach to the living lab model results framework.

Initial successful local practices were collected towards developing a Practice Guide catalogue.

Results from this phase also informed the co-design of the Co-Creation Cafes as a model for transnational mutual learning to support the evolution of joint solutions building on existing good practice knowledge and know-how.

Local reports provide a detailed overview of activities and outputs from each region.

The practice experience and workshop insights evolved the living lab principles and a practitioner-focussed approach to gathering reflective practice learnings informed emerging policy recommendations. Key policy recommendations from this work are:

1. Strategic Funding Allocation:

- Governments and international bodies should allocate dedicated funding to support the establishment and operation of Living Labs. This funding should cover both initial setup costs and ongoing operational expenses.
- Funding mechanisms should be designed to encourage long-term sustainability and scalability of Living Labs, ensuring they can continue to operate and expand their impact over time.



2. Integration into Policy Frameworks:

- Living Labs should be integrated into broader environmental and economic policy frameworks. This integration ensures that the objectives of Living Labs align with national and international decarbonisation goals.
- Policies should be developed to support the coordination between Living Labs and existing local, regional, and national initiatives, fostering synergy and avoiding duplication of efforts.

3. Support for Quadruple Helix Partnerships:

- Policies should encourage the formation of partnerships between academia, industry, government, and civil society. These partnerships are crucial for leveraging the strengths and resources of different sectors to drive innovation and implementation of decarbonisation strategies.
- Incentives should be provided to promote collaboration among these stakeholders, facilitating knowledge, resources, and best practices sharing.

4. Capacity Building and Training:

- Policies should support capacity-building initiatives that equip communities with the skills and knowledge necessary to participate in and sustain Living Lab activities. This includes training programs on energy efficiency, renewable energy technologies, and community engagement practices.
- Educational institutions and vocational training centres should be involved in delivering these capacity-building programs to ensure broad accessibility and impact.

5. Fostering Mutual Learning and Knowledge Sharing:

- Policies should promote the establishment of frameworks for mutual learning and knowledge sharing between different regions and Living Labs. This can be achieved through regular inter-regional workshops, conferences, and collaborative projects.
- Digital platforms and networks should be developed to facilitate the exchange of information and best practices, making it easier for Living



Labs to learn from each other and adapt successful strategies to their local contexts.

6. Monitoring and Evaluation:

- Policies should include provisions for continuously monitoring and evaluating Living Lab activities to assess their impact on decarbonisation efforts. This involves setting clear metrics and indicators to measure progress and outcomes.
- Regular reporting and feedback mechanisms should be established to ensure transparency and accountability, allowing for the iterative improvement of Living Lab models and strategies.

7. Community Empowerment and Engagement:

- Policies should prioritise community empowerment and engagement, ensuring that local populations are actively involved in the decision-making processes related to decarbonisation initiatives.
- Support should be provided for grassroots movements and local organisations that advocate for and implement sustainable practices within their communities.

See Deliverable 1.4.2 - Report on Stakeholder workshops and key recommendations for policy in the HYBES Capitalisation Plan Website

Deliverable 1.6.1 - Reports on Cultural Events and Festivals as platforms for developing decarbonisation awareness

The deliverable D161 outlines a comprehensive overview that demonstrates how arts, cultural events, and festivals can build awareness for decarbonisation through replicability and sustained data collection. This activity engages with three cultural events in Bodø, Cork and Umeå – two of which align with significant cultural events; Bodø as Capital of Culture in 2024 with events rolling into 2025, and Cork as a significant context which celebrates 20 years of the promotion of Irish Arts worldwide by Culture Ireland (Cultúr Éireann). This deliverable focuses on the implementation, documentation and dissemination of these cultural events and festivals as platforms for developing decarbonisation awareness with a central focus on the potential of arts and artistic thinking to accelerate this. The dissemination of this activity emphasises



the value of learning communities and cities through modes of co-learning, co-creation and co-design where knowledge is co-created through a bottom-up approach rather than a top-down prescription of knowledge by experts.

The deliverable explores three pilot cultural events and festivals in Bodø, Cork and Umeå, two of which have taken place earlier this year (Bodø in January and February 2025, and Umeå in May 2025) with a third event in Cork in November 2025. In Bodø, the European Capital of Culture 2024 status was leveraged to foreground pedagogy and indigenous knowledge, creating engagement between cultural institutions and schools around Sami arts and culture. In Umeå, emphasis was placed on the necessity of circular economy principles, creating intergenerational engagements and local placemaking across the QH in which mutual learning dynamics are focused on the re-use of building materials. The Cork event focused on engagement between the QH and local artists illustrating arts and artists as intermediaries to cultural activities and events.

Arts, cultural events and festivals are uniquely positioned within the Living Lab Model due to its holistic qualities that draw stakeholders into interaction with one another. This is enacted through embodied and spatial ways intensifying affective, social, and imaginative dimensions of climate innovation which might not be similarly experienced in virtual or typically more formalised living lab environments. In preparing for the Cork event opportunities to collaborate with experts external to the HYBES project were built and relationships between the HYBES Living Lab and practitioners within the arts were formed. The deliverable includes a valuable contribution from Dr Brice Catherin, a post-doc researcher in UCC which will be embedded within the HYBES Guide to Living Labs for Decarbonisation due at the end of delivery period 6. Offering valuable insights into the value and expansive nature of artistic thinking in addressing abstract issues, Brice also contributed to the planning and execution of the Cork event which mobilised artists as mediators for decarbonisation.

The deliverable includes a working paper research and early iteration of a framework being developed through PhD research of Jedda Desmond of Her 'Pause-Encounter-Reimagine- repeat' (PERr) framework examining how arts, cultural events and festivals can theoretically, methodologically and practically contribute positively to transformative change, raising awareness around decarbonisation. Within the deliverable, these Bodø, Cork and Umeå pilots are translated into typologies for replication beyond the scope of the HYBES project. Within the proposed PERr framework, arts, cultural events and festivals are



conceptualised as effective place-based decarbonisation ecosystems out of which several thematic lines emerge. These follow an illustrative methodology for data collection, and reflect on how arts, cultural events and festivals contribute to long-term transition pathways through their social, spatial, and creative infrastructures.

During the work on this deliverable practice examples were also collected for the practice catalogue.

This deliverable identifies several key learnings including; the need and opportunity for knowledge resources and guidance for Living Labs and within the Living Lab Model on how to best integrate arts, cultural events and festivals for decarbonisation which will be explored as part of the HYBES Living Lab toolkit; how integrating arts can contribute to diverse knowledge and ways of knowing for Living Labs; provide a particularly strong format for working with citizens, schools and education; capitalise on the relationship between arts, culture, creative businesses and open innovation in the context of a regional research and innovation ecosystem; and acknowledges the value of creative industries and practices are especially relevant for circular economy, materials and built environment for systems change.

See Deliverable 1.6.1 - Reports on Cultural Events and Festivals as platforms for developing decarbonisation awareness in the HYBES Capitalisation Plan Website

Deliverable 1.7.1 - Technical guide on the Living Labs as a tool for delivering behavioural change for decarbonisation

The technical guide on living labs as a tool for delivering behavioural change for decarbonisation is presented as practitioner focussed practical guide and toolkit for other regions wishing to kick-start local living lab approaches.

It brings together the learnings and work of the living lab deliverables, as well as the experience from the project wide to create a step-by-step process guide to initiating a decarbonisation living lab approach based on the HYBES model.

It evolves iterative work and refines final elements such as guiding principles, multi-level engagement and working across six different dimensions as system lever for change. The technical guide includes a final practice catalogue, bringing



together in one place good practice tools and knowledge resources collected by all partners across the duration of HYBES.

It translates activities from each of the living lab deliverables into guidance documents and tools for wide dissemination, application and replication inviting actors in NPA regions to strengthen a community of practice approach to unlock the wider opportunity for living labs as an instrument for decarbonisation.

See Deliverable 1.7.1 - Technical guide on the Living Labs as a tool for delivering behavioural change for decarbonisation in the HYBES Capitalisation Website

Deliverable 1.7.2 - Stakeholder report on the effectiveness of the Living Labs model

HYBES set out with the ambition to define and refine a living lab model for hybrid energy solutions.

The stakeholder report on the effectiveness of the living lab model serves as a summative report of activities. It draws on the partners mutual learning, reflective practice evolved during the project, the project results reviewed against the initial baseline as well as stakeholder feedback gathered to provide a summative evaluation of the model and its effectiveness.

Complementing the Technical Guide as a user-friendly tool, the report records the process and practice insights of evolving and refining the model that is not captured in earlier deliverables and reports. It calls out key successes as well as examines what can be learnt from issues and challenges experienced along the way.

The report includes a region-by-region living lab model view of the hybrid activities delivered in each partner region through this and other work packages. It captures summative data on the multi-level stakeholder engagement, collaboration and co-creation activities delivered within HYBES and takes a temporal lens to consider the living lab approach and model advanced during the project. It identifies key issues and considerations for developing and sustaining living labs beyond the HYBES project.

In doing so, it presents a final and current horizon scan view of the wider opportunity space for living labs as a growing movement and community of



practice, based on knowledge resources informing the ongoing work and which are collated and curated in the practice catalogue of the final technical guide.

It concludes high level challenges, opportunities and makes final forward-looking recommendations for exploiting the learnings and results of the work.

See Deliverable 1.7.2 - Stakeholder report on the effectiveness of the Living Labs model in the HYBES Capitalisation Plan Website



6 Evolution of Best Practices in the HYBES Project (including Lessons Learned and Education and Behavioural Change in the Regions)

The HYBES project and its activities is an invaluable opportunity to develop best practices in the regions through action, collaboration and consideration / reflection. The HYBES partners and associated experts will use and test their project experimentations to educate citizens and bring them on the journey to decarbonisation in the continent.

Cumulatively, changing citizen behaviours and implementing new approaches to energy usage and management is key to address the rapid escalation of climate change through GHG emissions throughout our societies.

The evolution of best practices in the HYBES project is best demonstrated in the sub-sections and deliverables below.

6.1 Best practice models for energy efficiency management and monitoring

These will be used to analyse and assess techniques for energy efficiencies in buildings, transport and the built environment. These innovative pilots can be replicated throughout the Northern Periphery and Arctic (NPA) region and continent for GHG reduction and carbon neutrality in Europe.

This is best demonstrated in HYBES in the following deliverables.

Deliverable 2.2.1 - Report on best practice models for energy efficiency, management and monitoring

This report evaluates a range of energy programmes and tools within the HYBES consortium, focusing on their implementation for decision makers. *"The Best Practice Tool"* framework enables a comparative analysis of these solutions, which aim to reduce carbon emissions, enhance energy efficiency and support sustainability goals.



The tools discussed in this report represent a spectrum of solutions, from comprehensive digital platforms to specific applications for municipal infrastructure. For example, the Consumption Compass encourages sustainable behaviours by visualising the environmental impact of individual and organisational consumption patterns, providing tailored recommendations for reducing carbon footprints. Climate OS, which integrates data collection, emissions mapping, and strategic planning to help organisations meet international climate targets.

The integration of these tools with local knowledge ensures their effectiveness and scalability.

“The Best Practice Tool” work package emphasises the critical role of collaboration. By fostering knowledge exchange among municipalities, universities, and private stakeholders, one accelerates innovation and facilitates the dissemination of best practice. This collaborative approach ensures that even smaller municipalities can access cutting-edge solutions and expertise and minimise the risk of spending precious time to “re-invent the wheel”.

In conclusion, by leveraging tools like those evaluated, municipalities can make data-driven decisions, reduce emissions, and create a more sustainable future. The insights gained from “The Best Practice Tool” will guide municipalities in scaling these solutions and adapting them to local needs, setting the stage for broader climate action and guide decision makers.

See Deliverable 2.2.1 - Report on best practice models for energy efficiency, management and monitoring in the HYBES Capitalisation Plan Website

Deliverable 2.1.1 - Technical report on macro energy analysis for delivery of Decarbonisation Zones (DZs) in Umea and Bodø

This study analyses the energy resource and greenhouse gas emissions mitigation potential in two Nordic urban contexts: Bodø a city in Northern Norway and Ålidhem a neighbourhood district in Umeå. The study uses a two-step methodology: first, establishing baseline scenarios for energy



demand and emissions in buildings and transport sector; second, developing future scenarios to assess effect of mitigation strategies.

These scenarios incorporate measures such as building retrofits, electrification of vehicles. The analysis uses Life Cycle Assessment (LCA) through two perspectives—the fuel mix approach, which reflects average national energy conditions, and the marginal approach, which considers the impact of incremental energy demand on fossil fuel based marginal production within the interconnected European grid. The simulations tool - Low Emission Analysis Platform (LEAP) is used for the scenario analysis.

The case studies differ in their energy supply sources. For example, Bodø's reliance on hydropower and its limited district heating coverage contrast with Ålidhem's comprehensive District Heating (DH) network, which integrates Combined Heat and Power (CHP) technologies and waste-to-energy systems. In both Bodø and Ålidhem, this method reflects the relatively low-carbon nature of the Nordic energy systems, dominated by hydropower, biomass, wind power, and nuclear energy. Consequently, interventions such as rooftop PV installations or switching heating systems from electric to district heating show limited impact on emissions, as they merely substitute one low-carbon source for another. Conversely, the marginal approach demonstrates significantly higher emission reduction potential. For Bodø, replacing resistance heating with heat pumps and reducing electricity demand can displace fossil-based generation elsewhere in Europe, yielding reductions greater than local emissions. Similarly, in Ålidhem, combining building maintenance, intensive energy efficient retrofits, and PV deployment could offset nearly all emissions if coal-based power plants is considered as the marginal technology, though results are relatively less favourable when electricity production using natural gas is assumed.

The study shows that methodological choice critically influences the effectiveness of climate mitigation strategies. While the fuel mix approach offers a static, regionally bounded view, the marginal approach provides a dynamic, system-wide perspective that better captures the global implications of local energy decisions. For policymakers and planners, the latter approach underscores the need to prioritize interventions that reduce electricity demand and enhance efficiency, as these actions can deliver substantial climate benefits beyond local and national boundaries.



Accordingly, it could be beneficial to integrate marginal approach into urban climate planning to design strategies that not only meet local sustainability targets but also contribute meaningfully to broader decarbonization efforts across interconnected energy systems

See Deliverable 2.1.1 - Technical report on macro energy analysis for delivery of Decarbonisation Zones (DZs) in Umea and Bodø in the HYBES Capitalisation Plan Website

Deliverable 2.3.1 - Technical report on energy Monitoring and Management tool for social housing

Deliverable 2.3.1 requires a technical report on energy monitoring and management tool for social housing. Cork County Council are responsible for the publication of the report with support from the Icelandic Environment and Energy Agency and the Faroese Environment Agency.

Cork County Council will upgrade an existing energy monitoring tool that is used in their municipal buildings for piloting and use in theirs, Iceland's and Faroe Island's social and rural housing and buildings. The aim of this energy monitoring is to show the benefit of retrofitting housing and buildings to increase energy efficiency, reduce costs and remove greenhouse gas emissions.

The Cork County Council's energy monitoring system evolved from another EU project called E-Lighthouse (<http://www.elighthouse.eu/>). This project was under the Northern Periphery and Arctic (NPA) Programme 2014-2020. The tool was developed by Nimbus Research Centre, Munster Technological University, on behalf of the Cork County Council.

The energy monitoring system in Cork County Council will need to be adjusted to monitor energy in real-time. Examples of new features in the system are weather data and augmented reality. The upgrade, installation and running costs of the new system can be funded through, EU Innovation Fund 2020-2030 (€40 billion), Cork County Council Annual Budget (Environment, Climate and Communications grant and subsidy from Central Government (€2,118,522 (annual allocation (varied amount))).



The Icelandic Environment and Energy Agency have experience in installing heat pumps in buildings and monitoring their energy usage to show their benefits. Benefits include significant energy efficiencies leading to reduction in energy usage and costs.

The Faroese Environment Agency have also carried out similar exercises (moving from fossil fuel oil burners to heat pumps) and shared similar results.

The Cork County Council, the Icelandic Environment and Energy Agency and the Faroese Environment Agency conducted detailed discussions on their monitoring software which led to proposed upgrades of the system in Cork (regression analysis).

See Deliverable 2.3.1 - Technical report on energy Monitoring and Management tool for social housing in the HYBES Capitalisation Plan Website

Deliverable 2.4.1 - Collaborative report on energy monitoring and behavioural change for educational facilities

This deliverable presents and discusses the first part of NCE Insulation's involvement in Activity 2.4. The work outlined here is an approach to educating local students about and engaging them in processes contributing to a community's green transition. To achieve a sustainable behavioural change and awareness for green transition-related topics, NCE Insulation organised a competition between schools, motivating them to reduce their energy consumption.

The organiser of the Schools Competition was the newly founded non-profit initiative "The Carbon Club". By participating in the competition, schools had the opportunity to win a prize that would contribute to their green transition. The diverse array of schools each set up an Energy Team made up of one teacher and multiple students that would take over the responsibility for their school's involvement. Using newly installed monitoring systems, the Energy Teams tried to tackle challenges that would support their schools' efforts of reducing energy consumption.



All 10 participating schools completed the competition. Overall, the competition constituted a savings of 70,786 kWh of energy and 30.08 metric tonnes of carbon. The long-term educational impacts are not as easily quantifiable and require further visits and surveys to be undertaken at the schools.

The schools experienced a varying degree of success, highlighting the capabilities and circumstances of the participating schools. These were either structural issues or obstacles related to human relations. Should further competitions be organised in future, support and resources should be tailored to each school's context.

This format was aimed at initiating and encouraging behavioural change in local communities, therefore it was necessary to create the conditions for students to have to engage with the topic at hand. The real value of these efforts will become clearer over time, as students carry forward the knowledge and habits they have acquired. These learnings are fundamental to raising awareness and instigating a cultural shift towards establishing sustainable practices as integral parts of everyday life. While the students involved share their knowledge and experiences with their surroundings, the learnings spread through communities.

The true extent of the competition's impact is still to be seen. Therefore, there are plans to conduct follow-up visits and potential similar competitions in future.

This deliverable presented and discussed an attempt by NCE Insulation to initiate behavioural change regarding energy consumption by organising a competition between schools in Cork, Ireland. Students and teachers at participating schools were forced to engage with topics related to green transition and raising awareness for it. In doing so, the schools experienced a net savings of energy and carbon emissions, proving the effectiveness of small, targeted actions in the short term. Whether or not long-term educational value contributing to general behavioural change was achieved is yet to be determined.

See Deliverable 2.4.1 - Collaborative report on energy monitoring and behavioural change for educational facilities in the HYBES Capitalisation Plan website



Deliverable 2.6.1 - Citizen's guide to decarbonisation: An end-users guide to influence behavioural change

Deliverable 2.6.1 (A Citizen's guide to decarbonisation: An end-users guide to influence behavioural change) provides a citizen's guide (from an Irish Context) with guidance and evidence that demonstrates the value of implementing decarbonisation in our societies. The guide's main aim is to influence behaviour change for the end-users and to enhance their awareness and knowledge of decarbonisation.

The subject citizens guide has been developed through extensive research and literature reviews from each of the regions. The trends that influence individuals' behaviours to decarbonisation are their stage in life; costs associated with carbon reduction and barriers to implementation. These trends have informed the production of the citizen's guide.

There are several existing tools that have been implemented across the project partner regions to support citizens to change their behaviour and actions towards decarbonising our societies. Examples are; Codema – 100 Ways to Save Energy at Home Citizen's Guide – supporting citizen's on their pathway to decarbonisation (Ireland), National Olympic and Sports Association of Iceland (ÍSÍ) - Bike to Work (Hjólað í vinnuna) – an annual campaign (for the month on May) encouraging citizens to use active travel options (cycling, walking, running, etc.) to commute to work other than by fuel based motor vehicles (Iceland), and Umea Kommun – Climate Podcasts (Poddar med Klimatekot) – a climate action podcast providing knowledge on related topics, such as electric cars, food waste, solar PV, circular economy, etc. (Sweden).

Each of the regions have differing climatic conditions and energy requirements and this guide would have to be altered to suit each region and their unique settings and energy usage. For instance, the Nordic regions would require more dense insulation material to heat their homes compared to Ireland, southern regions would have more access to solar light in the colder months compared to the Nordic regions, Ireland would have a large dependence on fossil fuels, whereas Norway would use a vast amount of renewable energy and fuel, etc.



Access to funding for decarbonisation initiatives is also country / region specific and requires a tailored approach per region for their own citizen's guide. Generally, each country / region holds the following funding structure for climate action funds, including EU/National/Local Government bodies, and Established energy efficiency bodies/agencies.

The target audiences of this sample citizen's guide are individuals, small businesses and communities.

It is considered that the guide would be best served by the public through an online website. The reasons for this include; it could be easily accessible and updated, it could facilitate a future phone APP based approach, it could be linked to other sources (i.e. access to the Sustainable Energy Authority in Ireland (SEAI) and information on their grants and supports (home retrofitting, etc.)), it would provide user analysis and audio and visual functionalities, etc.

The subject citizens guide shows the end-users the value of implementing decarbonisation measures at an individual and organisational level. It has been informed through inputs from all partners and would require adaptation for region specificity.

See Deliverable 2.6.1 - Citizen's guide to decarbonisation: An end-users guide to influence behavioural change in the HYBES Capitalisation Plan Website

6.2 Co-creation environment (co-creation cafes)

Co-creation engagement, remotely or in-person, can be used to engage with citizens to build their knowledge and understanding of what is needed to decarbonise Europe.

This is best demonstrated in HYBES in the following deliverable.

Deliverable 1.5.1 - Report on implementation of three Co-Creation Cafes



Report on Implementation of Three Co-Creation Cafes presents the development, implementation, documentation, and dissemination of the HYBES Co-creation Café Framework.

Co-Creation Cafés create an interactive online co-creation space to support stakeholder dialogue, transnational and mutual learning, and the co-exploration of locally embedded energy challenges and opportunities.

Three Co-Creation Cafes were facilitated in May 2025 with practice presentations by contributors from each HYBES partner region and an external best practice energy living lab.

The Café's piloted a framework for mutual learning exercises anchored in a twinning approach. The themes of the Cafés were

1. District Energy Planning,
2. Solar Energy, and
3. Education and Circularity.

The themes were jointly developed by HYBES partners during an in-person partner co-creation session earlier in 2025.

Cafés are framed not only as discrete engagement events but as a core acceleration mechanism with expert contributions from two regions, employing a 'twinning' strategy for mutual learning to tackle the challenge that scaling or replication of good practice requires in-depth exchange as solutions are typically site and context specific.

The mutual learning approach enables practitioners to deep dive into practical delivery, technical specifications or operational considerations of solution and identify the relevant insights to adapt and adopt innovative practices from other regions or to find common areas where new joint solutions or collaborative efforts could be focussed.

The report provides the theoretical underpinning of the approach and documents for dissemination the methodological design and delivery of



these first experimental Co-Creation Cafes. It also presents a first iteration of the ambition to evolve the Co-Creation Cafes as a key component of the final model and technical guide.

A subsequent co-creation session with partners at the partner meeting in Bodo invited reflective practice, evaluative learnings and feedback from partners to evolve the co-design of the framework for inclusion in the final reports.

See Deliverable 1.5.1 - Report on implementation of three Co-Creation Cafes in the HYBES Capitalisation Plan Website

6.3 Education

The Practice Catalogue within the technical guide highlights how higher education research performing organisations are anchor partners in living labs and hub for co-creating knowledge, learning, research and innovation working with industry. It also highlights the need for collaborating with higher education for green skills and jobs for the transition, particularly including vocational training.

Apprenticeships and innovative curriculum delivered through CPD modules are examples of approaches responding to industry and public sector needs as well as current thinking on the future of green skills and jobs in Europe. This includes not just technical and built environment skills, but points to the GreenComp competency framework that includes several competencies aligned with living lab principles and approaches such as systems thinking, problem framing, futures literacy, adaptability, exploratory thinking and collective action.

It also includes practice examples and resources that highlight collaborations secondary level curriculum, and the possibility of collaborations between second and third level to support continuous learning journeys and strengthen the pipeline of students from second to third level studies.



6.3.1 Curriculum change

There is a need to educate society on the benefits of decarbonisation throughout their educational journey. All European education institutions and their teachings need to be modernised to include modules on climate change, GHG's, sustainability, renewable energy, energy conservation, etc.

6.3.2 Third level education - meeting needs of industry

Third level students when they enter industry need to have an awareness and understanding of the importance of energy reduction and renewable energy generation. Their behaviours and actions must align with the need to decarbonise industry and society through the green transition. The benefits of carbon reduction in society are wide ranging and include monetary savings for citizens and industry while simultaneously tackling climate change and helping the environment and nature.

These are best demonstrated in HYBES in the following deliverables.

Deliverable 2.5.1 - Report on the potential for educational curriculum change for the delivery of decarbonisation goals (NCE).

The HYBES Project (NPA0100025), funded by the Interreg NPA Programme, aims to strengthen capacity for climate change adaptation and decarbonisation in the NPA region by providing education on energy/resource efficiency and developing sustainable hybrid energy systems. HYBES recognises that providing educational resources for children/young adults will arm them with the knowledge and tools necessary to combat climate change and can initiate cultural shifts in the wider community towards decreasing carbon emissions and other sustainable practices.

UMU and Umeå Municipality co-lead WP2, which delivers technical assessments of decarbonisation and develops educational outreach. As part of this, NCE Insulation lead Activities 2.4 and 2.5 which focus on influencing curriculum and behavioural change through targeted educational interventions. Activity 2.4 advanced second-level curriculum change through the Carbon Club School Competition and a 12-week module on 'Sustainability and Decarbonisation' (please see NCE's D.2.4.1



and D.2.4.2). Activity 2.5 will now develop a roadmap to replicate these models in other educational settings, including third level and Continuing Professional Development (CPD), and support behavioural change across the NPA region and beyond. Building capacity and knowledge in decarbonisation by embedding energy efficiency and sustainability principles in education and professional development is a key HYBES objective. This report draws on lessons learned from WP2 to develop the roadmap.

This report — D.2.5.1 — is one of three WP2 educational deliverables developed by NCE Insulation (D.2.4.1 and D.2.4.2 were delivered in period 4 and 6 respectively). These will be combined into a single report upon their completion. NCE Insulation appointed Peter Luddy to develop D.2.5.1.

Reviewed existing HYBES educational content (including D.2.4.1 and D.2.4.2) and case studies of real change (SchoolFood4Change's 'Whole School Food Approach', Umeå Kommun's 'Energy in Kitchen', WWF Sweden's 'One Planet Plate', Vistorka's 'KortEr' and Bodø Museum's 'At Our Service').

This section provides tangible steps to enable the replication of previously developed resources/models. While not exhaustive, this guide can expedite future expansion. The roadmap provides the following recommendations:

Expanding to Irish post-primary schools outside the Cork DZ

1. National Replication Pack: Develop a National Replication Pack.
2. National Pilots: Identify 2-3 new pilots outside of Cork. Collect evaluation data to demonstrate replicability.
3. Consortium: Establish a dedicated team / consortium to manage and deliver the educational programme in partnership with School Environmental Officers.
4. Website & Repository: Develop and maintain a programme website and central resource repository.
5. Rewards: Fund and implement an appropriate reward system to motivate programme engagement.



6. Video Competition: Run a video competition demonstrating carbon reduction in pilot schools which can be used as a programme advertisement and educational tool.
7. Content Reviews: Review and update educational resources / support for easy adaption in varied contexts.
8. Cross-curricular Links: Incorporate cross-curricular links using alternative perspectives and activities around sustainability and decarbonisation.
9. Funding: Seek appropriate central funding for any future development and all lifetime costs.
10. Alignment for Accreditation: Align the language of the TY module with appropriate frameworks and strategies to prepare for future accreditation.

Expanding into third-level education

- 11 TY Workshop: Organise a workshop for TY students with CCAE students and graduates focused on decarbonisation in architecture, research and career pathways, and transferable knowledge and skills.
- 12 Teacher Workshop: Organise a workshop for post-primary teachers with CCAE teaching staff focused on decarbonisation in architecture, research and career pathways, and transferable knowledge and skills.
- 13 Third-level Module: Adapt the existing 12-week educational module on 'sustainability and decarbonisation' as a third-level module.

Expanding into CPD

- 14 Teacher-fronted CPDs: Develop a teacher-fronted CPD programme using a tiered approach and recognised delivery structures.
- 15 Community of Practice: Develop a community of practice through annual meetups, peer-sharing, and exchange.
- 16 Onsite Coaching: Prioritise onsite CPD coaching over online resources where possible.
- 17 Inter-generational exchange: Implement inter-generational knowledge exchange and collaboration as a prelude to formal educational resources.



Expanding across the NPA region and further afield

- 18 International Replication Pack: Develop an International Replication Pack, updated for easy translation by separating core and local layers, and introducing new case-studies for new contexts.
- 19 Language Accessibility: Provide a variety of language options across programme website, resources, and literature.
- 20 'Replication Schools' Network: Establish a global network of 'Replication Schools' to pair existing and new participants together for collaboration, support, and project amplification.

This section will provide tangible steps to realise the long-term goal of Activity 2.5, which is to influence behavioural change for the delivery of decarbonisation across the NPA region (and further afield).

Visibility and legibility of energy use

21. Integrate energy monitoring data into educational activities and daily institutional practice where possible.
22. Present energy and carbon information in accessible, age-appropriate formats.
23. Support students to interpret and communicate energy-related data within and beyond the school.

Embedding behavioural change within routine practice

- 24 Support student-led sustainability or energy groups with defined roles and responsibilities.
- 25 Embed energy-conscious behaviours into routine institutional practices.
- 26 Align behavioural initiatives with existing school policies and frameworks where relevant.

Peer learning and social reinforcement

27. Facilitate peer-to-peer exchange between participating schools or institutions.
28. Use student-generated outputs as tools for dissemination and reflection.



29. Recognise and communicate participation and progress within schools and communities.

Linking behaviour to tangible outcomes

- 30 Document and communicate the outcomes of behavioural change where feasible.
- 31 Reinvest financial savings from energy reductions into sustainability initiatives where possible.
- 32 Situate educational activities within local or regional decarbonisation objectives.

Reflection, evaluation, and reinforcement

33. Incorporate reflective evaluation at the end of programme cycles.
34. Develop simple indicators to track behavioural change alongside educational outcomes.
35. Use evaluation findings to inform the ongoing refinement of educational supports.

Supporting longer-term cultural change

- 36 Position educational initiatives within a longer-term transition context.
- 37 Encourage continuity between post-primary, third level and CPD engagement.
- 38 Support inter-generational learning pathways that extend impact beyond the classroom.

See Deliverable 2.5.1 - Report on the potential for educational curriculum change for the delivery of decarbonisation goals in the HYBES Capitalisation Plan Website

Deliverable 2.4.2 - 12-week educational module

The HYBES Project aims to strengthen capacity for climate change adaption and decarbonisation in the NPA region by providing education on energy/resource efficiency and developing sustainable hybrid energy



systems. HYBES recognises that providing educational resources for children/young adults will arm them with the knowledge and tools necessary to combat climate change and can initiate cultural shifts in the wider community towards decreasing carbon emissions and other sustainable practices.

UMU and Umeå Municipality co-lead WP2, which delivers technical assessments of decarbonisation and develops educational outreach. As part of this, NCE Insulation lead Activities 2.4 and 2.5 which focus on influencing curriculum and behavioural change through targeted educational interventions. Having already conducted a 12-week pilot project — The Carbon Club’s School Competition — in Cork DZ in 2022/23, NCE Insulation will now develop a new 12-week post-primary educational module on the theme of ‘Sustainability and Decarbonisation’. This report provides the basis/outline of a brief for how that module might be developed and delivered.

Constraints of project funding require that any module developed be easily replicable and feasible for school staff to deliver without external educators. NCE Insulation appointed Peter Luddy as *‘Education Module Developer’* in May 2025 to develop D.2.4.2 on their behalf.

Initial work in June 2025 included a review of existing HYBES educational content (D.2.4.1 and HYBES Co-Creation Café on ‘Education and Circularity’) and an appraisal of existing open-access educational resources/tools available in NPA regions.

In July 2025 co-creation questionnaires were issued to eight HYBES partners and ten post- primary schools in Cork ETB (participants in the Carbon Club pilot) — to leverage expertise and ensure development aligned with stakeholder needs. Their feedback was received in early September 2025 and incorporated into the design of the module brief.

A first draft was circulated to NCE Insulation and CCC for review on 31 July 2025. The finalised report was subsequently circulated to NCE Insulation on 22 September 2025.

The following descriptor outlines a vision a 12-week educational module — detailing key considerations and suggestions for its development.



Module Title

Classroom to Climate Action: Empowering Cork's Sustainable and Decarbonised Future

Overview

An educational module on 'Sustainability and Decarbonisation' for schools who participated in the Cork DZ pilot. It will connect global climate challenges with Cork's local context through case studies, student-led projects, and active learning.

Goal/Objective(s)

- Educate students on sustainable development, stewardship, and responsibility.
- Equip learners with knowledge and skills to contribute to a sustainable future.

Target Audience(s)

Designed for TY students (15–17), but adaptable for Junior Cycle (12–15) and senior primary (8–12) students. Also promotes thematic awareness across the wider community.

Module Content

Covers climate science, justice, and SDGs; the environment and biodiversity; circularity; sustainable travel; energy efficiency; food and fashion impacts; and individual/collective solutions.

Learning Outcomes

Students will:

- analyse the climate crises — locally and globally,
- reflect on climate justice,



- define/apply the concepts of sustainability, circularity, and decarbonisation,
- evaluate Ireland's climate targets and envision Cork's future,
- assess lifestyle choices and demonstrate waste and conservation strategies,
- recognise renewable energy technologies,
- collaborate on school sustainability projects, and
- connect learning to the UN SDGs.

Format/Duration

12-week curriculum (8 hours total) of instruction, based on 1 class/week for 12 weeks or 2 classes/week for 6 weeks. Calculated for schools which use a 40-minute class/period format. Schools following a 60-minute format can use the additional time for further work.

Teaching Methods and Delivery

Delivered by existing teaching staff with digital supports. Approaches may include direct instruction, Socratic dialogue, field trips, project-based work, and transnational collaboration via online workshops.

Resources and Materials

Comprehensive lesson plans, factsheets, media, activity packs and templates could be provided through the creation of a shared digital hub.

Assessment and Evaluation

No formal exams. Continuous evaluation via discussions, debates, quizzes, and a final group project/presentation.

Cross-Curricular Links

Science; Geography; CSPE; Business; Home Economics; Art & Design and English.



Evaluation & Sustainability

Teacher and student reflections, and resource reviews will support long-term integration.

The following list outlines a vision for how the educational module might be structured:

1. Introduction & Climate Basics
2. Climate Justice & Equity
3. UN Sustainable Development Goals (SDGs)
4. Local Action for Cork
5. Energy Efficiency & Decarbonisation
6. Circularity & Waste
7. Biodiversity & Ecosystems
8. Food Systems
9. Fast Fashion
10. Sustainable Travel
11. Project Development
12. Presentations & Reflection

Further research is required on this area for the development of any module.

See Deliverable 2.4.2 - 12-week educational module in the HYBES Capitalisation Plan Website

6.4 CPD for existing professionals – meeting needs of industry

Existing and new professionals in industry require decarbonisation focused CPD to ensure carbon reducing measures and approaches and sustainability will influence their current and future work practices / choices and way of life. However, industry needs, local contexts, educational offers, etc. remain fragmented and slow in response to the pace of complexity and scale of change.

Third level education as an anchor partner for place-based living labs for decarbonization is considered critical.



Region-level approaches to living labs could enhance quadruple helix dialogue between third level education, industry, municipalities, energy agencies and utilities and other stakeholders to deepen eco-system thinking and solutions, devise sustained long term joint strategies and collaborations and accelerate co-created innovative responses that support skills needs for territorial transformation and decarbonization ambitions. These should address not only provision of relevant and targeted CPD offerings but also seek to unlock system issues and barriers through policy innovation, and innovations in planning and development opportunities.

Several policy spaces support this approach including Partnerships for Regional Innovation Playbook, Missions-oriented policy and engaged research and the focus on living labs within new European University Alliances.

Systematically cohering partners around place-based decarbonization mission should focus on innovation for CPD at all levels from local energy communities to regional economic development. Living labs should support transdisciplinary practice training for existing professionals working in decarbonization cutting across existing silos not only of built environment related disciplines engineering, architecture, construction, etc. but also municipalities, energy agencies, social services, housing bodies and other stakeholders.

6.5 Training of trainers within different settings (how to engage with communities)

The evolving nature of climate change, new discoveries, technological advancements, etc. on how to tackle the issue, etc. and the broad nature of the topic, means knowledge share and education of all professionals in this area is a vital component to being informed in combating the problem.

In short, society increasingly needs to tackle the challenge through collaborative, co-creation practices that adopt a transdisciplinary lens, as demonstrated by the NEB Compass Working Principles. This means including citizens and publics as well as multi-disciplinary expertise to work together on innovating new solutions and which requires a systems



shift from a culture of information-giving or consulting with publics and communities to more meaningfully empowering communities and citizens as active participants and agents of change.

Living lab environments that have third level education as anchor partners are particularly well positioned to support transdisciplinary practices within the system and can mobilize train-the-trainer formulations to support this system shift for transdisciplinary practice within municipalities, higher education, industry and public sector agencies for more effective citizen engagement.

Yet there remains a need for accelerating capacity building for evolving and sustaining living labs as instruments for transdisciplinary practice. It is noted that the European Living Lab Hub and ENoLL are two key fora that are supporting a growing field and community of practice in this space. It is also noted that across the NPA there is extensive experience on community engagement, collaborative working as well as existing living labs or NEB transdisciplinary-practice oriented communities. It is believed that there are untapped potential and a latent, disaggregated community of practice across the NPA and an enhanced focus on this could have significant impact.

6.6 Renewable energy (solar) generation

Generating and using energy from renewable sources, such as through solar panel generated power from the sun, plays a significant part in decarbonising the EU and the continent by 2050. Solar panel energy from the sun provides electricity and heat, can be stored in batteries and can be transferred back into national power grids.

This is best demonstrated in HYBES in the following deliverables.

Deliverable 3.1.1 - Report on solar energy solutions for decarbonisation (NRI).

In this study of solar energy in Arctic areas the team have learned and gained experience from pilots representing a variety of different building types. From sizeable public buildings in Bodø, and social and private rental houses in Cork to off-grid buildings in Western Iceland.



Furthermore, the Icelandic case promotes the implementation of a solar energy as a strategy into the Icelandic energy system. Task to standardized instructions for PV installations into the grid, strengthen vocational education to support capacity building and competence on solar installation, a grant and incentive program to scale up solar as energy carrier, has promoted a process and a road map for solar energy towards the year 2030

All HYBES pilots has documented that Solar energy and PV installations are an efficient energy carrier in Arctic regions as Bodø in Northern Norway, Cork in Southwest Ireland and the Northwest regions of Iceland. This is documented though monitoring energy data. To document the effects of implemented Solar energy installations it's important to get valid baseline data and to calculate a pre and post situation. HYBES pilots in Bodø have been monitored for three years, Cork Pilot for one year and for the Icelandic pilots we have used estimated calculations because the installations of solar installations were done late in HYBES project.

Compared between HYBES pilots' Solar energy are even more efficient and profitable in Cork than in Bodø and Grimsey. This is because solar access in Cork makes it possible to produce 50 % more solar energy than in the two other arctic district and because energy costs is more than twice in Cork than it is in Norway and Iceland.

All our pilots shows that solar energy is most efficient if storage is integrated. To achieve most efficient and flexible use of solar energy it's important to integrate storage systems either with batteries or solar installations combined with thermos energy wells. Mørkvedbukta school don't have this possibility, and one insight is that a thermos geothermal system would have allowed storage. For private household it's important that a battery storage system is easy to manage. Cork pilots have experienced that this can be a bottleneck.

Therefore, monitoring energy data is important not only to document effects. In general, we also see that continuous monitoring of energy data is important to achieve high degree of energy efficiency and to guide both private and public owners of solar installations to obtain good performance of installed Renewable Energy Systems.



The comparison between the two technologies analysed we have studied, the top roof PV installations versus building integrated PV installations, shows that top roof installations have highest energy production, but that Building-Integrated Photovoltaics (BIPV) systems fits better to energy consumptions patterns of buildings in an arctic region as Bodø. This is because horizontal solar rays make the BIPV system most efficient in the spring and autumn period. A combination of these two technologies therefore is recommended.

All our pilots show that solar energy is an important energy carrier to increase energy safety and to reduce investment in grid capacity in cities and rural areas. Solar will reduce problems in peak period with maximum energy consumptions and avoid heavy investment in grid infrastructure. To scale up flexible Solar energy installations is important to ease grid capacity and not overexert grid infrastructure.

Furthermore, the Icelandic case also shows the importance of solar energy in remote and off-grid districts to support electrification, business development and decarbonisation.

Finally, our solar pilots have demonstrated that solar contributes substantially to reducing CO2 emissions and contributes substantial to regional and national climate goals.

See Deliverable 3.1.1 - Report on solar energy solutions for decarbonisation in the HYBES Capitalisation Website

Deliverable 3.2.1- Technical report on the benefits of energy retrofit to facilitate fossil fuel replacement (NCE).

The Pilot case study demonstrates the benefits of deep retrofit, heat pumps, solar, and storage installation at Kilworth House in Cork, showcasing energy efficiency and fossil fuel replacement improvements.

Kilworth House, built in 1952 with an extension in 2019, initially had a high BER of C3, indicating poor energy efficiency typical of Irish bungalows, which often feature cavity wall insulation and attic spaces. The full retrofit, which was carried out over three phases, raised an initial BER of C3 to an A2, incorporating airtightness, additional solar panels, batteries,



and monitoring systems, achieving near-zero energy performance and decreasing emissions by around 40%, to NZEB standard.

The retrofit at Kilworth involved a fabric-first approach with external wall and cavity insulation, airtightness, heat pumps, and renewable energy systems, aligning with national strategies for deep renovation. The comprehensive upgrade was funded partially by SEAI grants. DCSix Technologies provided the Wattics energy monitoring system, capable of real-time, high-resolution monitoring of electricity consumption and generation, supporting feasibility studies, audits, and operational optimisation. Monitoring revealed Kilworth's PV system could be carbon negative in summer, with excess generation stored in batteries, and suggested switching to night tariffs to optimise energy use and savings.

Initial data showed very low grid consumption and high photovoltaic self-consumption, with annual solar generation close to predicted levels, demonstrating effective renewable integration and potential for further savings with battery storage. The Kilworth House pilot demonstrates that such comprehensive measures can bring existing homes to NZEB standards, provided substantial grant support and accessible financing are available.

See Deliverable 3.2.1- Technical report on the benefits of energy retrofit to facilitate fossil fuel replacement in the HYBES Capitalisation Plan Website

6.7 Renewable energy (geothermal) generation

Generating and using energy from renewable sources, such as through geothermal solutions plays a significant part in decarbonising the Arctic and remote regions by 2050. Geothermal steam / hot-water power generation can be used for heating in buildings. It can also be stored in batteries for transfer into national power grids.

This is best demonstrated in HYBES in the following deliverable.



Deliverable 3.3.1 - Technical report on geothermal energy solutions for decarbonisation.

This report demonstrates that geothermal energy and heat pump solutions can play a decisive role in decarbonising heating systems in cold-climate regions, although the pathways and outcomes vary between countries.

The pilot project in Grundarfjörður illustrates how geothermal heat pumps can successfully replace oil-based heating in public buildings. The transition has eliminated the use of approximately 130,000 litres of oil annually and reduced CO₂ emissions by around 300 tonnes per year. Beyond the environmental benefits, the project has resolved long-standing operational challenges, particularly for the swimming pool, and has built valuable local expertise for future energy transitions in other municipalities.

The Mørkvedbukta school and kindergarten pilot in Bodø emphasises the importance of integrated energy planning in new buildings. Geothermal energy wells, heat pumps, and a large rooftop solar installation are combined with high-performance building envelopes that meet passive house standards. The results indicate that geothermal systems can cover most heating needs with low delivered energy per square metre. Advanced energy monitoring and control systems further enable continuous optimisation of energy performance over time.

In the Faroe Islands, the development of geothermal heat pump systems has followed a gradual, evidence-based approach supported by long-term monitoring. Studies show stable thermal performance and Seasonal Efficiency Factors (SPF) typically between 3 and 4. With thousands of systems now installed, geothermal solutions have become a mature technology. The Leirvík heating system highlights how geothermal boreholes, heat pumps, electric boilers, and thermal storage can be combined into a flexible and resilient energy system, delivering substantial cost and emission reductions compared to oil-based heating, despite some efficiency challenges.

Taken together, the cases show that there is no single solution suitable for all contexts. Successful decarbonisation of heating depends on tailoring



geothermal and heat pump technologies to local geological conditions, building characteristics, and energy system structures. Nevertheless, across all three countries, geothermal-based solutions have proven to be a robust and effective cornerstone for reducing fossil fuel dependence, lowering emissions, and improving the long-term sustainability of heating systems in northern regions.

See Deliverable 3.3.1 - Technical report on geothermal energy solutions for decarbonisation in the HYBES Capitalisation Plan Website

6.8 Energy efficient transport systems

One of the main GHG emitters in the EU is the transport sector. The existing sector needs to be decarbonised through the replacement of fossil fuel vehicles with electric vehicles, increase in active travel (walking, cycling, running, etc.), increase use of public transport, integrating land use development (at higher densities) and transport systems, with a focus on active travel infrastructure (cycleways, walkways, etc.) and public transport systems and routes, etc., linking active travel infrastructure and public transport systems and routes, etc.

This is best demonstrated in HYBES in the following deliverable.

Deliverable 3.4.1 - Report: Create an energy system for storage and energy sharing in city districts for EV (NRI)

This report presents experiences and learning points from energy district planning in the HYBES project, with a particular focus on the transition from hybrid renewable energy systems at building level to integrated solutions at district and city scale, including transportation infrastructure. The purpose is to support municipalities in planning and implementing flexible, low-carbon energy systems that enable electrification while managing grid constraints and system-level impacts.

The report is based on case studies from Bodø (Norway) and Umeå (Sweden), two northern cities with different energy system characteristics but shared ambitions for climate neutrality. In Bodø, the analysis focuses on energy planning in two major urban transformation projects: the development of Bodø Harbour as an energy hub for maritime



electrification, and the planning of a new city district linked to the relocation of the airport. These cases illustrate how grid capacity constraints, peak power challenges and sector coupling require a shift from isolated solutions towards coordinated, district-level energy planning. Particular emphasis is placed on the role of thermal energy, district heating, energy flexibility, business models and the use of zoning plans as municipal tools to influence energy outcomes.

In Umeå, the report draws on strategic energy and climate planning processes, supported by modelling using LEAP and CEA, and on concrete district-level analyses in Ålidhem. The Umeå case highlights how scenario-based energy system analysis can inform long-term climate strategies, evaluate trade-offs between district heating, heat pumps and electrification, and identify system-wide effects of efficiency measures, local energy production and transport electrification.

Across both cases, the report demonstrates that successful energy district planning depends not only on technical solutions, but on understanding local energy system conditions, regulatory frameworks, timing of investments and collaboration between actors. HYBES has contributed by linking pilot-level insights with system-level planning, providing municipalities with practical knowledge on how hybrid and flexible energy solutions can support the transition towards low-emission, resilient urban districts in northern climates.

See Deliverable 3.4.1 - Report: Create an energy system for storage and energy sharing in city districts for EV in the HYBES Capitalisation Plan Website



7. Funding the HYBES Project Per Region to 2026 and Beyond

The continuation, replication and development of the HYBES project activities after the 31st of January 2026 is primarily hinged on funding through other EU projects and programmes or through bids for climate action funding per region.

The EU climate action funding processes and channels will be explained in this chapter along with other relevant and available EU projects and programmes and funding schemes in the partners countries.

Central to climate action funding in the EU is through its annual budget.

The EU Budget

The EU budget funds the following commodities:

1. EU Priorities
2. Major Infrastructure Projects
3. Research Projects

It compliments its members national budgets and avoids duplication of funds. It is drawn up annually between the member states and must accord with the agreed long-term budget MFF – 2021-2027 – €2 trillion).

The EU generates revenue from four main sources:

1. Custom duties on imports from outside the EU and levies collected on behalf of the EU.
2. Value added tax (VAT) from member states.
3. Gross National Income (GNI) from member states.
4. Taxes, bank interest, fines, etc.

The Commission also borrows funds on international capital markets to support the green transition in the continent.



The EU is committing 30% of its long-term budget (MFF 2021-2027) to fighting climate change in the continent and beyond.

Alongside the EU budget, there are other bodies, funds, initiatives, etc. that hold and provide financing for climate action in Europe.

European Central Bank

The ECB supports a carbon neutral economy in the EU. It also supports climate action policies in the EU, such as carbon pricing, green finance, green innovation, etc.

The ECB provides climate action finance in conjunction with the European Investment Bank.

European Investment Bank

The EIB provides loans for small climate and environmental projects. It also assists banks on the distribution of climate and environmental action funds.

In addition to financing, the EIB provides technical assistance to help climate projects succeed.

The EIB is investing up to €250 billion in the InvestEU and the Just Transition funds.

InvestEU 2021-2027

InvestEU is a €27.2 billion fund (30% allocated to climate objectives) that supports private and public investment in four main areas:

- I. Sustainable Infrastructure
- II. Research, Innovation and Digitisation
- III. Small and Medium Sized Businesses
- IV. Social Investment and Skills

Eligible recipients of InvestEU funding are:

- Companies
- Public Sector Entities
- Public Private Partnerships
- Not-for-Profit Organisations



InvestEU is provided through implementing partners or banks. An example of the implementing partner is the European Investment Fund (EIF) (funds projects in the areas of energy, transport, environment and digital connectivity).

Just Transition Fund 2021-2027

The Just Transition Fund (JTF) (worth €19.7 billion (100% allocated for climate objectives) is for parts of the EU that are significantly affected by the proposed switch to zero carbon (such as the midland bog (peat) areas in Ireland and the Swedish peatlands, etc.).

The JTF supports enterprise adaptation, research and innovation, energy transition, environmental enhancement, etc.

Eligible recipients of the JTF can also apply for InvestEU and EIB funding.

Innovation Fund (IF) 2020-2030

This fund (worth circa €40 billion) is on offer for the decarbonisation of energy and industry, that are intrinsically linked. The fund is open to all EU members, including Norway, Liechtenstein and Iceland (who are not members of the EU).

The European Green Deal Investment Plan 2020-2030

The European Green Deal Investment Plan (EGDIP) or the Sustainable Europe Investment Plan (SEIP) initiative will invest circa €1 trillion to tackle the negative impacts of climate change in Europe.

It will allocate funding through the EU budget, InvestEU, etc.

European Regional Development Fund (ERDF) 2021-2027

The ERDF is a €226.05 billion fund (30% allocated to climate objectives) that provides shared funding to public and private bodies in the EU and Europe through national or regional programmes. The fund has a few objectives, i.e. making Europe and its regions greener, low-carbon and resilient.

Climate action funding is also available in EU programmes, such as Interreg, Horizon Europe and Life.



Interreg 2021-2027

Interreg is a collaborative programme between countries in Europe to collectively fight climate change and join the digital transformation, etc.

The Interreg programme is worth €10 billion.

Horizon Europe 2021-2027

Horizon Europe is a collaborative programme between countries in Europe to fight climate change through research and innovation and knowledge sharing.

The Horizon Europe programme is worth €95.5 billion.

Urbact IV 2021-2027

Urbact IV builds on the legacy of past programmes and provides opportunities for cities in Europe to make positive changes, in areas such as the EU digital and green initiatives.

The Urbact IV programme is worth €80 million.

The European Urban Initiative 2021-2027

The European Urban Initiative creates opportunities for solution, technique and model building and information sharing to develop sustainable urban development in European cities.

The European Urban Initiative is worth €450 million

Life 2021-2027

Life is the only EU funding programme that is dedicated solely to environment, climate and energy. The programme is divided into the following sub-programmes:

- (i) Nature and Biodiversity
- (ii) Circular Economy and Quality of Life
- (iii) Climate Change Mitigation and Adaptation
- (iv) Clean Energy Transition

The Life programme is worth €5.43 billion (61% allocated to climate objectives).



Climate Action Funding for EU and European Regions

Funding from the EU's core sources, the Budget, ECB, EIB, etc., and funds and initiatives are used by the EU member states and others to fund climate action schemes in their countries. Schemes and funding are predominantly allocated at a national, regional and local level in the EU member states and countries.

Climate Action schemes and funding for the HYBES partner countries are summarised below. Please note, there are a wealth of funding schemes in each of the Partner regions. The high level and noteworthy schemes are included in this Plan.

Climate Action Funding Schemes – Ireland

There are several climate action funding schemes in Ireland to finance and support the decarbonisation of the Irish society by 2050.

National Funding

Irish Government National Budget 2026

Carbon tax on petrol and diesel will increase to €71 per tonne from 8th October 2025. This will apply to other fuels (i.e. home heating fuels) from 1st May 2026. €558 million of tax revenue will be allocated to fund residential and community energy schemes.

Irish Government National Budget 2025

The Irish Government have allocated €1.4 billion to the development of a low carbon digitally connected country. Carbon emitted by petrol and diesel from 9th of October 2024 will be taxed at €63.50 per tonne. This will apply to all other fuels from May 2025.

Irish Government National Budget 2024

The Future Ireland Fund (€4.3 billion for 2024) will be used to meet the costs to the country from climate change. The Infrastructure, Climate and Nature Fund (€3 billion for 2026-2030) will support climate and nature related projects. Carbon tax on the sale and use of mineral oils, natural gas and solid fuels is



€56.00 (which was increased to €63.50 from the 9th of October 2024 in the National Budget 2025).

Climate Action Fund

The Climate Action Fund (CAF) was set up to help the Irish public meet the climate and energy targets in the Climate Action Plan (CAP) (which is updated annually). The CAF is a €500 million fund that was set up in 2020 to 2027. The fund is distributed through calls to applicants for the development of low carbon and energy efficient projects, in areas such as electricity, transport, heat and agriculture, etc. An Example of a CAF call is the Community Climate Action Programme (CCAP).

Community Climate Action Programme

The Community Climate Action Programme (CCAP) 2021 is a €61.5 million fund that is funded by the CAF and the Shared Island Fund (SIF). The fund will support community climate action initiatives and energy transition and conservation on the island of Ireland and Northern Ireland. The fund will be administered by the local authorities in the state and Northern Ireland and will be given to applicants who demonstrate viable sustainable development projects.

National Development Plan Review 2025

The National Development Plan Review (NDPR) 2025 covers the period between 2026-2035 and is made up of a total public investment of €275.4 billion. The NDPR 2025 is investing €24.33 billion to support key transport programmes. €2 billion of this funding is for the commencement of the new Dublin Metrolink project. ICNF funding will also be used during construction.

€2 billion a year is being invested into the Infrastructure, Climate and Nature Fund (ICNF) between 2024 and 2030 to build an overall fund of €14 billion to assist climate change objectives and address nature and biodiversity issues. Between 2026 and 2030, 22.5% of the ICNF can be used to support designated environmental projects per year to a maximum of €3.15 billion. €500 million of the ICNF has already been allocated to the Department of Climate, Energy and Environment to support climate mitigation and renewable energy projects.



The Government are assigning €5.64 billion to the Department of Climate, Energy and Environment between 2026 and 2030.

National Development Plan 2021-2030

The National Development Plan (NDP) is a €165 billion fund that will support climate change projects. The NDP proposes to allocate €8.6 billion towards the decarbonisation of the Irish public transport system. €9.5 billion in carbon tax receipts are predicted to be collected by the Irish Government over the lifetime of the NDP. Half of these carbon tax receipts will be allocated to members of the public to improve the energy efficiency of their homes.

The Government are committing €28 billion towards the upgrade of 500,000 existing and new homes to Building Energy Rating (BER) B2 and the installation of 600,000 heat pumps. More than 20% of NDP funding to 2030 will be spent on tackling climate change.

Regional Funding

The majority of climate change funding in Ireland is collected and distributed at national and local level. There are a few climate change funding schemes that are held and distributed at a regional level, i.e. Town Centre First Heritage Revival Scheme (THRIVE).

Town Centre First Heritage Revival Scheme (THRIVE)

THRIVE is a €120 million ERDF. The fund is managed by two regional authorities in Ireland (the Southern Regional Assembly (SRA) and the Northern and Western Regional Assembly (NWRA)). The fund will also have input from the Eastern and Midland Regional Assembly (EMRA).

The scheme offers up to €7 million to local authorities in the SRA and NWRA to renovate buildings and spaces in cities and towns. The scheme is a competitive call to the public and provides schemes with 100% funding. The renovation and renewal of buildings and spaces will use modern methods of construction (MMC) and will follow the embodied carbon principle (ECP). The MMC, ECP and sustainable development approaches will reduce CO₂ emissions during construction and throughout the life of the developments.



Local Funding

Most of the funding for the Irish public to develop sustainable development projects to combat climate change is available at a local level.

Sustainable Energy Authority of Ireland (SEAI)

The SEAI are an Irish Government body that were set up to promote and support sustainable energy development in the country. The SEAI offer several grants to conserve energy in Ireland. Further information on the type of grants the SEAI offer is on their website (<https://www.seai.ie>).

One of the most popular and well-known sustainable development schemes offered by the SEAI to the Irish public is the Home Energy Upgrade Loan Scheme.

The SEAI Home Energy Upgrade Loan Scheme

The SEAI and financial institutions in Ireland offer this loan at a range of between €5,000 and €75,000, depending on the proposed home upgrades, and at a low interest rate (3%-4%). The home upgrade must achieve a minimum BER B2.

The financial institutions in Ireland that work alongside the SEAI on the provision of the Home Energy Upgrade Loan Scheme are:

1. Strategic Banking Corporation of Ireland
2. Bank of Ireland
3. Allied Irish Banks
4. Permanent TSB
5. The Irish League of Credit Unions
6. An Post (the Post Office)
7. Avant Money

The Home Upgrade Loan Scheme also offers aggregate loans of up to €225,000 on a maximum of 3 residential properties. The loans can be from 1 year to 10 years and the scheme will expire on 31st of December 2026.



Enterprise Ireland

Enterprise Ireland (EI) are an Irish government agency who support Irish owned companies to develop in their respective sectors. Further information on the type of grants EI offers Irish companies to decarbonise is on their website (<https://www.enterprise-ireland.com>). An example of an EI decarbonisation scheme is the Capital Investment for Decarbonisation Processes.

Capital Investment for Decarbonisation Processes

This scheme is focused on the decarbonisation of company's equipment and technologies. The scheme offers a maximum grant of €1,000,000.00 per project.

Climate Action Funding Schemes – Norway

Norway has committed to reducing greenhouse gas emissions by at least 55% by 2030 and achieving climate neutrality by 2050. To support this transition, a range of national, regional, and local funding schemes are in place, targeting decarbonisation across energy, transport, buildings, and industry. Bodø Municipality has set its own ambitious targets, aiming for a 50% reduction in emissions by 2030 and climate neutrality by 2045. Funding is essential to achieving these goals, and Bodø actively uses national and local instruments—such as Enova grants and its own “Climate Million” scheme—to implement concrete climate measures.

National Funding

Norwegian International Climate and Forest Initiative (NICFI)

Launched in 2008, NICFI allocates up to NOK 3 billion annually to combat deforestation in tropical countries, thereby contributing to global emission reductions and biodiversity conservation.

Enova SF

A state enterprise under the Ministry of Climate and Environment, Enova provides funding for innovative energy and climate projects, including substantial investments in offshore wind energy, such as the Hywind Tampen project.



Carbon Taxation and Emissions Trading

Norway has implemented a carbon tax since 1991 and participates in the EU Emissions Trading System, covering approximately 80% of its greenhouse gas emissions. The carbon tax is set to increase to NOK 2,000 per tonne by 2030.

Climate Investment Fund

Established in 2022 and managed by Norfund, this fund receives NOK 2 billion annually (2022–2026) to invest in renewable energy projects in developing countries, particularly those reliant on coal, aiming to reduce global greenhouse gas emissions.

Research Council of Norway

Research Council of Norway supports research within the green transition and the national goal towards zero emissions. One programme to support research applications is the Green Platform. This initiative provides support for research- and innovation-driven green transition in the business sector. Collaborative consortia are sought to deliver the best projects, from research and technology development to finished solutions. The purpose is to develop a sustainable business sector that takes care of the climate and the environment and creates economic value.

Another main program area is within Climate and Environment. The portfolio covers basic and cross-sectoral efforts vis-à-vis climate, environment, nature and circular economy, and has overall responsibility for research of the polar areas. This includes ecosystem effects of human pressures, the effects of climate and nature changes, greenhouse gas reductions, land use and encroachment on nature, and society's adaptation and transition to climate change.

A third area supported by Research Council is within Energy and Transportation. The portfolio covers efforts to promote environment-friendly energy, low emissions, petroleum, maritime activities and transport. The efforts are largely aimed at society's and businesses' need for the transition to a zero-emission society, green competitiveness and sustainable utilisation of the country's resources.



Regional Funding

EEA and Norway Grants

Through these grants, Norway supports climate change mitigation and adaptation projects across various European regions, focusing on renewable energy, energy efficiency, and sustainable mobility.

Enova SF and the Climate and Energy Fund

Enova SF is a state-owned enterprise under the Ministry of Climate and Environment, responsible for managing the Climate and Energy Fund. This fund is primarily financed through government budget allocations (84% in 2023), supplemented by a surcharge on electricity bills and returns on fund investments. Enova provides investment aid for energy efficiency measures, conversion to renewable energy sources, and energy recovery in various sectors, including industry and transport. It also supports full-scale demonstration projects involving new energy and climate technology under live operating conditions.

Norwegian Government's Climate Investment Fund

The Norwegian government has established a Climate Investment Fund, managed by Norfund, to invest in renewable energy projects in developing countries. While its primary focus is international, the fund reflects Norway's commitment to climate finance and may influence regional initiatives through knowledge sharing and policy development.

Local Funding

Climate Million

Bodø Municipality has established the "Climate Million", a local grant scheme aimed at supporting climate and environmental initiatives. The program allocates NOK 1 million annually to fund projects that align with the municipality's Climate and Energy Plan. Eligible activities include energy efficiency upgrades, zero-emission transport solutions, circular economy practices, and sustainable urban development.



Local Enova Grants

Enova also provides grants to municipalities for local climate initiatives, including energy-efficient building renovations and the adoption of low-emission technologies.

Other Funding

Norwegian Agency for Development Cooperation (Norad)

Norad administers climate-related aid focusing on low-emission development, climate-resilient food production, and nature-based solutions in developing countries.

Sovereign Wealth Fund (Government Pension Fund Global)

Norway's sovereign wealth fund is increasingly directed towards sustainable investments, including renewable energy projects, aligning financial returns with climate objectives.

Climate Action Funding Schemes – Sweden

There are several finance schemes in Sweden to finance and support the decarbonisation of the Swedish society by 2050.

National Funding

National Energy Agency

The Swedish Energy Agency's mission is to combine ecological sustainability, competitiveness and security of supply in energy systems that are sustainable and cost-effective with a low impact on health, the environment and the climate. Research on future energy systems and technologies can be supported by the agency.

Vinnova

Vinnova is Sweden's innovation agency, tasked with strengthening Sweden's innovation capacity and contributing to sustainable growth. They work to ensure that Sweden is an innovative force in a sustainable world. Vinnova's support gives companies and organisations the opportunity to experiment and



test new ideas. Every year, Vinnova invests around Swedish Krona (SEK) 3.5 billion in research and innovation.

Formas

Formas is a government research council for sustainable development. Formas funds research and innovation; develops strategies; conducts analyses and evaluations, and its' areas of activity are the environment, agricultural industries and spatial planning. Formas conducts research summaries that aim to help Sweden achieve their environmental goals.

Impact Innovation

Impact Innovation is a strategic and long-term collaboration between the Swedish Energy Agency, Formas and Vinnova, where they work together to solve global societal challenges and accelerate the transition to a sustainable society by building on previous collaboration on strategic innovation programmes.

The Swedish Agency for Economic and Regional Growth

The Swedish Agency for Economic and Regional Growth work to strengthen competitiveness, innovation, adaptability and sustainable development throughout the country. They implement parts of the European cohesion policy. The Agency works in three policy areas - regional development, rural areas and business, and its funding strengthens businesses, municipalities and regions.

Council for Sustainable Cities

The Council for Sustainable Cities is a partnership between authorities that aims to strengthen the conditions for municipalities to develop vibrant and sustainable cities and communities. Among other things, the Council will create conditions for cooperation between authorities that contribute to the achievement of goal 11 Sustainable Cities and Communities in Agenda 2030; develop and manage the Hållbarstad.se website as a platform for up-to-date, comprehensive information on knowledge support and funding opportunities for the development of sustainable cities and communities, and to support the municipalities affected by major industrial establishments and industrial expansions in Norrbotten and Västerbotten counties with regard to sustainable urban planning and the designed living environment.



Regional Funding

Swedish Regional Fund

The Swedish Regional Fund funds projects in areas such as green transition, digitalisation, entrepreneurship, skills, research and broadband access. The aim is sustainable regional development and employment throughout the country.

Interreg Programmes

Interreg programmes develop co-operation between countries. They encourage cities, regions and organisations in different countries to cooperate and learn from each other through joint programmes, projects and networks. Sweden participates in 12 programmes to address the unique challenges in different parts of Europe.

Agricultural Fund for Rural Development

Supports actions that favour rural development, competitive farms and the preservation of biodiversity.

Just Transition Fund

The Just Transition Fund funds projects that help communities adapt to a greener economy, with a focus on job creation and training.

The Swedish Environmental Protection Agency

The climate step, Klimatklivet, is a support for physical investments that reduce greenhouse gas emissions. Through Klimatklivet, you can apply for support to switch to renewable energy and invest in fossil-free solutions.

Local Funding

Development Grants

The basic principle for projects funded by the Development Grant is that they should lay the foundations for long-term social, economic and ecological sustainability, high attractiveness and growth with the aim of reaching 200,000 citizens by 2050.



Umeå Municipality's Rural Support

Between 2023 and 2027, Umeå municipality is offering special rural support to associations in Umeå's rural areas. The support aims to increase the opportunities for non-profit organisations to work with initiatives and projects that benefit the community and contribute to local development. You can apply for a maximum of SEK 35,000 per project, and the support is applied for continuously.

Other Funding

Viable Cities Platform

A gathering of calls from the Viable Cities Platform and other relevant factors contributing to the transition to climate-neutral, sustainable and liveable cities for all within the planetary boundaries.

Climate Action Funding Schemes – Iceland

There are several finance schemes in Iceland to finance and support the decarbonisation of the Icelandic society by 2050.

National Funding

Climate and Energy Fund (Loftslags- og orkusjóður)

The role of the Energy Fund is to promote the efficient use of the country's energy resources through grants, in particular the actions are aimed at reducing the use of fossil fuels and increasing the use of domestic renewable energy sources.

Electric car subsidies

Municipalities, companies and individuals can apply for subsidies for the purchase of passenger cars and vans under 3.5 tons: Electric car subsidies | Ísland.is

Subsidies for trucks and vans

Subsidies for the purchase of clean energy or emission-free vans and vans for individuals, companies and municipalities | Ísland.is



Rannís (Rannís)

Its mission is to strengthen the pillars of Icelandic culture and business life by promoting targeted scientific work, technological development and innovation.

Icelandic Environment and Energy Agency

Homeowners who currently receive subsidized electricity heating and wish to adopt environmentally friendly energy production and/or implement measures that lead to improved energy efficiency in heating can apply for a subsidy. This concerns a one-time subsidy for measures that result in better energy efficiency in heating.

Electric heating is considerably more expensive than heating from geothermal sources. In order to equalize living conditions, the government subsidizes the distribution and transmission costs of electricity for heating households.

Orkusetur- Energy Center (Icelandic Environment and Energy Agency)

Special grants to launch new projects for a limited time, determined each time and depending on the funds available at any given time.

Regional Funding

There are a few regional climate action funding schemes in Iceland outlined below:

- (i) Development fund for municipalities of East Iceland (Austurbrú)
- (ii) Development fund for municipalities of Northeast Iceland
(Uppbyggingarsjóður Norðausturlands)
- (iii) Development fund for municipalities of Northwest Iceland
(Uppbyggingarsjóður Norðvesturlands)
- (iv) Development fund for municipalities in the Westfjords region of Iceland
(Vestfjarðastofa)
- (v) Development fund for municipalities in the West Iceland Region
(Uppbyggingarsjóður Vesturlands)
- (vi) Development fund municipalities in the South region of Iceland
(Uppbyggingarsjóður Suðurlands)



- (vii) Development fund - Regional Development Agency for the Reykjanes peninsula (Samband sveitarfélaga á Suðurnesjum)
- (viii) Implementation fund of tourist attractions
- (ix) Municipal loan fund - green loans
- (x) Grants for the restoration of wetlands by Land and Forest Agency
- (xi) Grants for protection against land encroachment by Land and Forest Agency

Land Improvement Fund

Municipalities can apply to the Land Improvement Fund to finance projects related to the protection and restoration of dryland ecosystems (e.g. to prevent sand and silt drift, increase soil flood attenuation, prevent soil erosion, etc.) and can also have all construction costs reimbursed by Land and Forest if such restoration projects are carried out in collaboration with Land and Forest.

Recycling Fund

The Recycling Fund pays municipalities for special collection of waste if the municipalities submit to the fund adequate data on collection by the municipality.

Municipal Sewerage Projects cf. Regulation

Municipalities can apply for a contribution from the treasury to support municipal sewerage projects cf. regulation thereon. The grant amount normally amounts to 20% of the confirmed total cost. The condition for granting a grant is that the sewerage project is a phase in a complete solution to the municipality's sewerage issues in accordance with a plan that has been approved by the Ministry of the Environment, Energy and Climate.

Fisheries Fund

Municipalities can also apply to the Fisheries Fund, which includes, among other things, looking at projects related to climate goals and environmental protection, stronger social structures and infrastructure development.

Local Funding

Examples of local climate action funding in Iceland are listed below:



- (i) Community Grant Norðurorku (Utility Company)
- (ii) Community Grant KEA

Other Funding Streams

Iceland.is

Iceland.is is creating a grant platform where all the grants available in Iceland will be listed. It will be possible to search for grants by project, business sector, and region of the country, to name a few.

All Icelanders have access to www.island.is, with their own electronic ID and their area recorded. All the administration of the country as well as various services is streamlined through this portal. www.Island.is is connected to all the citizens emails, and it is also used to send out notifications to the Icelandic public, if needed.

Grants Used for HYBES Project Activities

Examples of grants used for HYBES project activities in Iceland are:

- Orkusjóður - Energy Fund- Grundarfjörður - geothermal project við heatpumps for the school and swimmingpool
- Orkusetur - Energy Center - Sólarsellustyrkir - Solar panel grants.
- Orkusetur- Energy Center - Verkmenntaskólinn á Akureyri, a vocational college, to explore funding opportunities for solar installation education. The collaboration aimed to create hands-on learning environments for future PV installers, which is needed to support Iceland's solar energy ambitions.

Climate Action Funding Schemes – Faroe Islands

The Faroe Islands, like many other countries, are on their way to decarbonizing all of their activities. The utility company SEV, which is owned by all Municipalities in the Faroe Islands and has a monopoly on distributing and selling all electricity in the country, has proclaimed the vision that all electricity should be produced from renewable energy sources by 2030. The government and the public support the vision of fossil-free electricity production by 2030 and to decarbonize other activities. A range of initiatives to support the energy transition in the Faroe Islands is summarized below.



National Funding

Government initiatives

For some years, the government has had a scheme where the 25% VAT on heat pumps and electric cars has been refunded. The VAT refund on heat pumps and electrical cars was lowered to 75% in 2025 and will again be lowered to 50% in 2026. Electrical cars have had a favourable and low registration tax. In 2026 the tax will be less favourable but cheaper than conventional cars. The Government allocate funding for 'green' projects: 2 mill DKK (€268,456) in 2024 and 1.6 mill DKK in 2025 (€214,228). The Faroese Environment Agency and the Faroese Geological Survey distribute the fund according to applications. The Government support electrical power to ships in harbours, 2 mill DKK (€268,456) in 2025 and 3 mill DKK (€401,678) in 2026.

SEV initiatives

SEV has introduced a 'green' electricity meter for heat pumps and electrical cars that gives 0.50 DKK (€6 cent)/kWh reduction on the price of electricity. SEV has provided free EV charge units for several years. From 2024 they have introduced a minor charge for the units. SEV has a high solar energy feed in tariff. For 2026 a tariff of 2 DKK (€30 cent)/kWh has been suggested. The target is to reach 60 MW by 2030. From 2027 SEV will introduce a flexible price on power. The minimum price will be during high renewable energy penetration (wind and solar).

Initiatives from banking sector

All banks give lowest interest rate (3%) on energy loans up to ½ mill DKK (€66,946) for replacement of oil burners to heat pumps and increased energy efficiency. Banks also give 0.2% bonus discount to the total house loan if the house is not heated by oil.

Other National Initiatives

The Faroese Research Council supports energy related projects mainly as PhD students. Umhvørvisstovan (Faroese Environment Agency) has over the years had activities for advising and encouraging the public to become more energy efficient and change to renewable energy solutions. From 2024 this work has



been extended and extra 1.8 mill DKK (€241,006) has been allocated and employees have been dedicated to this task. Faroese agencies have been seeking Nordic and EU funding for projects focusing on energy efficiency and increased use of renewable energy.

Regional Funding

Giving the size of the country green and sustainable energy initiatives can be categorised as either national or local.

Local Funding

Several municipalities have invested in renewable energy solutions such as solar, heat pumps, electrical cars, etc. In Tórshavn the public busses are free, and the first electrical busses have been introduced. All busses will be electrical in near future. Waste collection in Tórshavn will be carried out with electric vehicles from 2026. The industry, especially exporting companies like the fish farmers, have focus on CO2 accounting and have started several renewable energy initiatives.



8. Recommendations from the HYBES Project Outputs

Recommendations from some of the HYBES deliverables and project are included below.

8.1 Living lab process as an engagement tool for communities

1. Regions should seek to kick start, evolve and sustain place-based Decarbonization Living Labs as processes connected to local planning and development infrastructure at region level.
2. Decarbonization living labs should be anchored by partnerships between Higher Education, Municipalities and Energy Agencies progressing macro-meso-micro level strategies for systems approaches to the socio-technical transition.
3. Decarbonization living labs should be mission-oriented and focus on research, innovation, knowledge and learning (including CPD, Mutual Learning, Engaged Research and Policy).
4. Decarbonisation living labs should systematically enhance citizen and community engagement through and building capacity for transdisciplinary practices and approaches, including mobilizing training.
5. Decarbonisation living labs should engage with Artists, Creative and Cultural Sectors to enhance engagement strategies, co-creation processes and innovation spillover effects.
6. NPA should support trans-regional dialogue and actions that would seek to cohere a network and community of practice around a joint ambition and mission for decarbonization. The purpose would be to accelerate the opportunity and capacity to instrumentalize decarbonization living labs and transdisciplinary practice in the NPA region.



8.2 Curriculum change (second and third level) and meeting industry needs

1. Decarbonization living labs should be mission-oriented and focus on research, innovation, knowledge and learning including through CPD, Mutual Learning Exercises, Vocational Training, Schools Engagement and Engaged Research. This should be informed by and align with policy frameworks and foresights such as JRC Competencies Frameworks, European Research Area (ERA), European Education Area (EEA) and sector research on Future Skills for Green Transition.

8.3 Citizen's Guide to Decarbonisation

1. The partner regions need to consider their unique characteristics when developing their own citizen's guide to decarbonisation.
2. The partner regions need to prepare their decarbonisation guide drawing on local climate knowledge and energy improvement requirements.
3. The partner regions need to direct the readers of the decarbonisation guide to the relevant public and private authorities who provide grant aid for decarbonisation activities in their regions.
4. All information on the partner regions decarbonisation guides need to be up to date, reliable and straightforward.
5. It is advised that the partner regions decarbonisation guides be an online website platform.
6. The partner regions decarbonisation guides should include the following content streams:
 - (i) Impacts, Strategy and Plans
 - (ii) Toolkits
 - (iii) Idea Bank



(iv) Actions

(v) Funding

8.4 Recommendations from the Technical Work Packages

CPD for existing professionals – meeting needs of industry

It is recommended that kickstarting work can evolve and sustained place-based Living Labs connected to local planning and development infrastructure at region level. These should be anchored by partnerships between Higher Education and Municipalities, progressing macro-level strategies which should include a priority on creating enhanced CPD pathways and offerings.

Training of trainers within different settings (how to engage with communities)

It is recommended that the NPA initiate dialogue and actions that would seek to establish a missions-oriented approach to decarbonization, underpinned by a network and community of practice that seek to accelerate the opportunity and capacity for living labs and transdisciplinary practice in the NPA region.

Deliverable 2.1.1 - Technical report on macro energy analysis for delivery of Decarbonisation Zones (DZs) in Umea and Bodø

1. The partner regions that use relatively "climate neutral" fuel for electricity production should consider marginal approach into urban climate planning to design strategies that not only meet local sustainability targets but also contribute meaningfully to broader decarbonization efforts across interconnected energy systems.
2. To conduct meaningful simulations for energy and carbon dioxide emission scenario analysis, partner regions should gather data at regional and local level on aspects such as transportation, building stock, energy production technologies and utilisation.



3. Partner regions may consider using an open-source urban building energy modelling tool such as City Energy Analyst to study the energy use reduction potential at district level.

Deliverable 2.2.1 - Report on best practice models for energy efficiency, management and monitoring

1. Local conditions and level of target group must be considered in analysis and approach.
2. Collaborations and networking are crucial for the work to progress.
3. Choice of tools and methods should be adapted to function in the long term.

Deliverable 2.3.1 - Technical report on energy Monitoring and Management tool for social housing

1. CCC shall install smart meters in all their buildings for linkage with the Council's energy monitoring system.
2. The Icelandic Environment and Energy Agency and the Faroese Environment Agency to use the CCC energy monitoring system (or something similar) in their buildings to improve energy monitoring and efficiency.
3. CCC, Icelandic Environment and Energy Agency and Faroese Environment Agency to source funding either in their budgets or externally through funds, such as the EU Innovation Fund 2020-2030, to upgrade the energy monitoring system (or something similar), for installation and running costs, etc.

Deliverable 2.4.1 - Collaborative report on energy monitoring and behavioural change for educational facilities & Deliverable 2.4.2 - 12-week educational module

1. The partner region has a different administration policy for the school within that region. Therefore, the project outlined in 2.4.1 will need adjustment to the metrics of each region.
2. While the pilot project was aimed at 15–16-year-old students in the “optional” year of second-level education in Ireland, there is no reason

why this project cannot be adapted to educate and engage students at the 10–12-year-old students at primary level school.

3. The future design of new school buildings, the retrofit policy for existing buildings and the design of all buildings that will accommodate large numbers of students/workers, means it is important that carbon neutral building design is part of the third level architectural courses.
4. There is a cost of installing monitoring equipment in each school. This cost will vary from school to school depending on size. This cost should not be a burden on the individual school. It should be noted that once installed, the monitoring equipment has a life span of several years.
5. Should a second-level course be rolled out on a national level, the focus will need to be adjusted away from the actual school building, where proposed remedies, once implemented, cannot be replicated in successive years. The idea of developing an online building with multi potential solutions to the carbon reducing problem should be available.
6. The long-term education objective of contributing behavioural change in the greater community will need regular monitoring. A base line will need to be established. Progress or regression from this base line should be the responsibility of the municipal authorities, the Department of the Environment in Ireland and Department of Education. This responsibility may have to be adjusted in other partner regions.
7. Designing carbon neutral buildings should be integral part of third-level architectural and engineering courses.
8. Planning restrictions on outdated non-carbon neutral building and design of all municipal buildings should begin as soon as it is practical.

Deliverable 2.5.1 - Report on the potential for educational curriculum change for the delivery of decarbonisation goals

1. It is recommended that steps be taken to counter the limitations of the report, which had a single author with a third-level academic and

architectural focus. The conversation around the proposed expansion of any educational programme should be opened to a broader variety of voices and interests — to actors engaging with education in multiple or diverse ways who could add further expertise to the recommendations set out herein. This would expedite the transition to any subsequent expansion phase of the project.

Deliverable 3.1.1 - Report on solar energy solutions for decarbonisation

1. To document effects of implementing Solar energy installations is important to get valid baseline data and calculate a pre and post situation.
2. Continuous monitoring of energy data is important to achieve high energy efficiency and to guide both private and public owners of solar installations to obtain good performance of installed Renewable Energy Systems.
3. To achieve most efficient and flexible use of solar energy is important to integrate storage systems either with batteries or solar installations combined with thermos energy wells.
4. To scale up flexible Solar energy installations is important to ease grid capacity and overexerted grid infrastructure. This is needed to limit future expanding investments in regional grid infrastructure.
5. HYBES pilots shows that flexible solar energy solutions are recommendable because these solutions are cost effective and reduce CO₂ emissions contribution to regional and national climate goals.
6. Compared between HYBES pilots' Solar energy are even more profitable in Cork (Ireland) than in Bodø (Northern Norway) and Grimsey (Northwest of Iceland). This because Cork (Ireland) solar power production is 50 % higher than in the two other arctic district and energy cost is more than twice in Cork than in Norway and Iceland.
7. The comparison between the two technologies top roof PV installations versus building integrated PV installations shows that top roof installations have highest energy production, but that BIPV systems fit better to energy consumptions patterns of buildings,

because this technology has high effect in the spring and autumn periods. A combination of these two technologies therefor is recommendable.

8. The Icelandic case shows that in remote and off-grid districts solar energy is essential for electrification, business development and decarbonization.
9. Regulation encouraging instruments increase educational capacity and competence and grant programmes are necessary when addressing bottlenecks in PV implementation and scale up.

Deliverable 3.3.1 - Technical report on geothermal energy solutions for decarbonisation

Norway, Iceland, and the Faroe Islands need to continue to emphasise the importance of applying for grant funding to further improve the utilisation of geothermal energy. It is necessary to identify areas within each country where improvements are possible and to provide targeted support, including guidance and mentoring on how to identify and apply for relevant funding opportunities.

1. This support should be communicated and channelled through municipalities. In addition, there is a need for an external actor to actively lobby and advocate for the continued availability and regular promotion of funding schemes that support geothermal energy utilisation.

Deliverable 3.4.1 - Report: Create an energy system for storage and energy sharing in city districts for EV

1. When planning energy solutions at district or energy system level, it is important to understand the existing energy system and what challenges the energy system should try to solve. The solutions and measures needed will differ between cities and regions depending on local system conditions.
2. Electricity is a good solution for decarbonization, but limited grid capacity is a critical challenge that need to be considered in the

planning process. Electrification should be combined with measures to reduce grid loads from an early stage.

3. It is important to define system boundaries for the energy system of interest. In Bodø, heat pumps are found to be the solution with the lowest grid load on a city level, while district heating is desired on a smaller city district level, due to grid constraints the location of the district heating plant. Impacts on other parts of the energy system needs to be considered in the planning.
4. Scenario-based energy system modelling tools, such as LEAP and CEA, are helpful to understand the energy system and identify challenges, goals, and solutions for energy planning.
5. Electrification of transport hubs and industry is economically and practically challenging due to high power demand in short periods of time. Flexibility solutions, cooperation between energy consumers and the combinations of complementary business cases are key to design economically feasible energy systems with rational grid loads.

8.5 Transnational Learning

Deliverable 2.1.1 - Technical report on macro energy analysis for delivery of Decarbonisation Zones (DZs) in Umea and Bodø

1. The study investigates scenarios within two spatial contexts for achieving carbon-neutral urban development: the city of Bodø in Norway and a neighbourhood in Umeå, Sweden. The activity 2.1.1 involved collaboration between Bodø in Norway and Umeå in Sweden. The study showed that similar methodology to create scenarios in different scales and also suggest possibility to learn from impact of strategies to achieve carbon neutral targets in different urban scale.

Deliverable 2.2.1 - Report on best practice models for energy efficiency, management and monitoring

1. National differences can be substantial, but through co-operation different approaches to solutions can both easier be found and give other angles on solving issues.



2. Due to different timelines in national transition work, transnational learning makes it easier to avoid common problems and re-inventing the wheel every time.

Deliverable 2.3.1 - Technical report on energy Monitoring and Management tool for social housing

1. Partners need to rigorously compare and contrast their energy monitoring software that can lead to important upgrades of their existing systems and improved energy efficiency and better decisions and behaviours to energy use, etc.

Deliverable 3.1.1 - Report on solar energy solutions for decarbonisation

1. Analysis of actual energy pilot across different arctic areas through monitoring, is essential to shape target transnational learning.
2. Cross regional energy pilots give the possibility of more targeted policy recommendations enabling cost effective, climate efficient and regional sustainable solutions.

Deliverable 3.3.1 - Technical report on geothermal energy solutions for decarbonisation

1. It is important to ensure a broad and diverse knowledge base that can be shared among partners. In Iceland, for example, there are several electrically heated areas where valuable lessons were learned from the experiences of the Faroe Islands and Norway. This type of knowledge exchange enables partners to apply proven approaches to similar challenges and strengthens the overall effectiveness of transnational cooperation.

Deliverable 3.4.1 - Report: Create an energy system for storage and energy sharing in city districts for EV

1. Cities with different energy system characteristics can benefit from shared system-level learning, even where local solutions differ.
2. HYBES demonstrates the value of linking insights from smaller pilots with strategic planning to scale solutions from buildings to districts and energy systems – locally and between regions.



3. Collaboration between municipalities, research institutions and energy companies provide an important fact. Based on a system-wide perspective is helpful for development of robust energy strategies.
4. Northern and peripheral regions can jointly develop transferable approaches for low-carbon energy districts, particularly in relation to cold climates, seasonal variation and constrained grid capacity.
5. Collaboration on specific topics often reveal additional common challenges and solutions that can foster more collaboration.



9. Conclusion

The need to continue and / or replicate the project activities post HYBES has been clearly identified in all the deliverable reports and summaries that are referenced and included in the Capitalisation Plan (activity 1.8 / deliverable 1.8.1 of work package 1 in the HYBES Joint Action Plan). Singularly and cumulatively these projects, discoveries, results, findings, etc. will contribute towards the decarbonisation of the EU continent by 2050.

To strengthen and officialise the HYBES deliverable activities, the project partners will monitor all relevant emerging legislation and policy in their local territories to ascertain whether there are any opportunities to include the projects, discoveries / results in these statutory documents. This will also pay dividends when providing positive examples in other relevant EU project applications.

HYBES has been a breathing ground for positive transnational learning and cooperation / engagement. This has been evident in the project's living labs organisation, participation, attendance, etc. (online and in-person meetings (with those who are both internal and external to the project)), online and in-person workshops (with those who are both internal and external to the project), online and in-person events and co-creation cafés (with those who are both internal and external to the project) and festivals, etc.). HYBES living lab activities have brought / shared knowledge between the project partners and their region's citizens (of all ages) which carried the message of HYBES and need to decarbonise the continent through more sustainable behaviours and habits.

Transnational learning and cooperation / engagement in HYBES was also evident in the partner pilot projects / activities and deliverables where best practices in energy monitoring and efficiency, renewable energy generation and conservation, etc. were tested with positive results achieved and areas of further work identified. Another positive method of informing and engaging members of the public (of all ages) on the green transition in Europe is through the HYBES citizen's guide to decarbonisation that can be developed and tailored to reflect the climate action and sustainable development and renewable energy and energy efficiency requirements of a country.



The volume of climate action and environmental funding and projects / programmes (worth more than €1 trillion), through the EU and its member states and other countries, is vast and encouraging. These funds and projects / programmes, in the next MFF cycle (2028-2034) and EU and national budgets, can be used for the HYBES activities and deliverables and other similar projects to contribute towards the decarbonisation and carbon neutrality of the EU continent by 2050 (in accordance with EU Legislation).



10. Appendices

Appendix 1

Table 1 - Changes in the Regions Legislation and Policy

Ireland – Cork County Council			
Relevant National Legislation - The Climate Action and Low Carbon Development (Amendment) Act 2021			
Relevant JAP Excerpt	Update	Review	Implications / Potential for HYBES
The Climate Action and Low Carbon Development (Amendment) Act 2021 is a critical piece of legislation which will support Ireland's transition to Net Zero and achieve a climate neutral economy by no later than 2050. It establishes a legally binding framework with clear targets and commitments set in law and ensures that the necessary structures and processes are embedded on a statutory basis to ensure Ireland will achieve national, EU and international climate goals and obligations in the near and long term. Some of the key elements of the Act include: • A commitment to pursue and achieve no later than 2050, the transition to a climate resilient, biodiversity-rich, environmentally sustainable, and climate-neutral economy. • The requirement for national Government to adopt a series of economy-wide five-year carbon budgets, including sectoral targets for each relevant sector, on a rolling 15-year basis, starting in 2021.	No update.	There has been no recent update to the legislation. This will be monitored closely.	Implications : None. Potential: To be monitored.

• The preparation of a National Long Term Climate Action Strategy every five years. • A total reduction of 51% emissions over the period to 2030. • The requirements for each local authority to prepare a Climate Action Plan, which will include both mitigation and adaptation measures and be updated every five years.			
Relevant National Policy - Climate Action Plan 2025 (CAP25): Changing Ireland for the Better			
Relevant JAP Excerpt	Update	Review	Implications / Potential for HYBES
The Climate Action Plan 2023 is a critical national government policy underpinning climate action in Ireland and is the second annual update to Ireland's Climate Action Plan 2019. This plan is the first to be prepared under the Climate Action and Low Carbon Development (Amendment) Act 2021, and it is also the first plan prepared following the introduction of economy-wide carbon budgets and sectoral emissions ceilings in 2022. CAP23 implements the carbon budgets and sectoral emissions ceilings and sets a roadmap for taking decisive action to halve emissions in Ireland by 2030 and reach net zero no later than 2050. CAP23 crosscuts across all sectors of society and economic activity in Ireland and makes specific reference to objectives and actions	Climate Action Plan 2025 (CAP25). The Climate Action Plan 2025 is a critical national government policy underpinning climate action in Ireland and is the fourth annual update to Ireland's Climate Action Plan 2019. This plan is the third to be prepared under the Climate Action and Low Carbon Development (Amendment) Act 2021, and it is also the third plan prepared following the introduction of economy-wide carbon budgets and sectoral emissions ceilings in 2022. CAP25 implements the carbon budgets and sectoral emissions	It is likely that the Irish Government will publish a Climate Action Plan 2026. This will be monitored closely.	Implications : To be reviewed. Potential: To be monitored.

required in meeting national goals and priorities in areas such as Transport, Agriculture, Industry and the Public Sector. Decarbonisation is evidently a key factor underpinning the plan, with a strong focus on the opportunities that a climate neutral Ireland can facilitate, particularly in green employment. CAP23 recognises that climate action presents opportunities for existing supply chains and new business formation, as well as the creation of new jobs with new skills requirements in a few sectors, such as building retrofits, renewable energy generation, the move to sustainable mobility, and new farming practices. Citizen engagement in decarbonisation and climate action is central to achieving the goals of CAP23, with the plan affirming that <i>“delivering on our climate ambition requires that the Government and the people of Ireland come together in a strengthened social contract for climate action and the cocreation of real solutions to these challenges”</i>. To support citizen engagement and the cocreation of climate action solutions, four Government-funded Local Authority Climate Action Regional Offices (CAROs) have been established, and these will have an enhanced role in supporting and facilitating citizen engagement across the State.	ceilings and sets a roadmap for taking decisive action to halve emissions in Ireland by 2030 and reach net zero no later than 2050. CAP25 crosscuts across all sectors of society and economic activity in Ireland and makes specific reference to objectives and actions required in meeting national goals and priorities in areas such as Transport, Agriculture, Industry and the Public Sector. Decarbonisation is evidently a key factor underpinning the plan, with a strong focus on the opportunities that a climate neutral Ireland can facilitate, particularly in green employment. CAP25 recognises that climate action presents opportunities for existing supply chains and new business formation, as well as the creation of new jobs with new skills requirements in a number of sectors, such as building retrofits, renewable energy generation, the move to sustainable mobility, and new farming practices. Citizen engagement in decarbonisation and climate action is central to achieving the goals of CAP25. To support citizen		
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	engagement and the cocreation of climate action solutions, four Government-funded Local Authority Climate Action Regional Offices (CAROs) have been established, and these will have an enhanced role in supporting and facilitating citizen engagement across the State.		
Relevant National Policy - Project Ireland 2040: National Planning Framework First Revision April 2025			
Relevant JAP Excerpt	Update	Review	Implications / Potential for HYBES
The National Planning Framework (NPF) is Ireland's overarching policy and planning framework for the social, economic, and cultural development of the State over the next 20+ years. The NPF draws upon lessons learned from the National Spatial Strategy 2002-2022 and sets out a new vision based on a set of values that will ensure Ireland's long-term economic, environmental, and social progress for all parts of the country. The NPF also sets the context for Ireland's three regional assemblies to develop their Regional Spatial and Economic Strategies. The NPF aims to create a single vision, a shared set of goals for every community across the country.	The National Planning Framework (NPF) Revision is Ireland's overarching policy and planning framework for the social, economic, and cultural development of the State over the next 15+ years. The NPF draws upon lessons learned from the National Spatial Strategy 2002-2022 and sets out a new vision based on a set of values that will ensure Ireland's long-term economic, environmental, and social progress for all parts of the country. The NPF also sets the context for Ireland's three regional assemblies to	Part 20C(5) of the Planning and Development Act 2024 (as amended) states: <i>"Every 6 years after the date of publication of the National Planning</i>	Implications : None. Potential: To be determined.

The NPF stipulates that Ireland's planning system provides an established means through which to implement and integrate climate change objectives, including adaptation, at regional and local level and the transition to a low carbon and climate resilient society. One of the key National Strategic Outcomes for the NPF is to promote and facilitate the transition to a low carbon and climate resilient society (NSO 8) and this is in direct compliance with the CAP23. The NPF recognises that new energy systems and transmission grids will be necessary for a more distributed, renewables-focused energy generation system, harnessing both the considerable on-shore and off-shore potential from energy sources such as wind, wave and solar and connecting the richest sources of that energy to the major sources of demand. In addition to NSO 8 (and climate action and decarbonisation) underpinning the entire NPF, the framework specifically references several key National Policy Objectives (NPOs) in relation to climate action: • NPO53 – Support the circular and bioeconomy including through greater efficiency in land management, greater use of renewable resources and by reducing the rate of land use change from urban sprawl and new development. • NPO54 – Reduce our carbon footprint by integrating climate action into the planning system in support of national targets	develop their Regional Spatial and Economic Strategies. The NPF aims to create a single vision, a shared set of goals for every community across the country. The NPF stipulates that Ireland's planning system provides an established means through which to implement and integrate climate change objectives, including adaptation, at regional and local level and the transition to a low carbon and climate resilient society. One of the key National Strategic Outcomes for the NPF is to promote and facilitate the transition to a low carbon and climate resilient society (NSO 8) and this is in direct compliance with the CAP25. The NPF recognises that new energy systems and transmission grids will be necessary for a more distributed, renewables-focused energy generation system, harnessing both the considerable on-shore and off-shore potential from energy sources such as wind, wave and solar and connecting the richest sources of that energy to the major sources of demand. In addition to NSO 8 (and climate action and decarbonisation) underpinning the entire	<i>Framework, the Government shall either—</i> <i>(a) revise the Framework or replace it with a new one, or</i> <i>(b) publish a statement explaining why the Government has decided not to revise the Framework and include in the statement an indication of a date by which it will be revised or a new National Planning</i>	
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for climate policy mitigation and adaptation objectives, as well as targets for GHG emissions reductions. • NPO55 – Promote renewable energy use and generation at appropriate locations within the built and natural environment to meet national objectives towards achieving a low carbon economy by 2050. • NPO56 – Sustainably manage waste generation, investing in different types of waste treatment and support circular economy principles, prioritising prevention, reuse, recycling and recovery, to support a healthy environment, economy and society. The goals and objectives of the NPF are supported by the National Development Plan 2021 - 2030 (NDP), which sets out the investment priorities that will underpin the implementation of the NPF through a total investment of approximately €165 billion. The NDP has been designed to ensure that it supports the Irish Government’s climate ambitions.	NPF, the framework specifically references several key National Policy Objectives (NPOs) in relation to climate action: • NPO67 – Support the circular and bio economy including through greater efficiency in land and materials management, promoting the sustainable re-use and refurbishment of existing buildings and structures while conserving cultural and natural heritage, the greater use of renewable resources and by reducing the rate of land use change from urban sprawl and new development. • NPO69 – Reduce our carbon footprint by integrating climate action into the planning system in support of national targets for climate policy mitigation and adaptation objectives, as well as targets for greenhouse gas emissions reductions as expressed in the most recently adopted carbon budgets. • NPO70 – Promote renewable energy use and generation at appropriate locations	<i>Framework will be published.”</i> The revised NPF has been published since 8th April 2025, therefore the next revision and public consultation will not take place until April 2031, the latest.	
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	within the built and natural environment to meet national objectives towards achieving a climate neutral economy by 2050 • NPO76 – Sustainably manage waste generation including construction and demolition waste, invest in different types of waste treatment and support circular economy principles, prioritising prevention, reuse, recycling and recovery, to support a healthy environment, economy and society. The goals and objectives of the NPF are supported by the National Development Plan 2025 (NDP), which sets out the investment priorities that will underpin the implementation of the NPF through a total investment of approximately €275.4 billion to 2035. The NDP has been designed to ensure that it supports the Irish Government’s climate ambitions.		
Relevant Regional Policy - Regional Spatial & Economic Strategy: for the Southern Region (RSES)			



Relevant JAP Excerpt	Update	Review	Implications / Potential for HYBES
The Regional Spatial & Economic Strategy for the Southern Region (RSES) sets out the strategic regional development framework for the Southern Region, with a primary aim to implement Project Ireland 2040 - the National Planning Framework, at a regional level and to support a balanced and equitable regional growth plan. As such, the RSES is required to be directly in line and in compliance with the goals and objectives of the NPF, including the actions related to climate action and the transition to a low carbon and climate resilient society. The RSES identifies Cork County amongst the fastest-growing locations in the State over the next 20 years, and has an overall vision for the Southern Region to: • Achieve economic prosperity and improved quality of life for all our citizens • Accommodate expanded growth and development in suitable locations; and • Make the Southern Region one of Europe's most creative, innovative, greenest and liveable regions The RSES identifies the need to transition to a Low Carbon, Climate Resilient and Sustainable Society as key strategic priority of the	No update.	In accordance with part 26(1) of the Planning and Development Act 2024 (as amended), the regional assembly shall not review the regional spatial and economic strategy (RSES) until 6 years after it came into effect. The RSES for the Southern	Implications : To be reviewed. Potential: To be monitored.



regional plan (RP 8), and the Regional Assembly will work in partnership with the Climate Action Regional Offices (CARO) to support the development of long-term solutions and extensive adaptation measures in three key areas: decarbonisation, climate resilience and resource efficiency. Several specific Regional Policy Objectives (RPOs) with accompanying actions are identified in the plan in relation to climate action and decarbonisation, including: • RPO87 - Low Carbon Energy Future • RPO88 - National Mitigation Plan and National Adaptation Framework • RPO89 - Building Resilience to Climate Change • RPO90 - Regional Decarbonisation • RPO91 - Decarbonisation in the Transport Sector • RPO92 - Electric Vehicle Infrastructure • RPO93 - CNG & EV Infrastructure • RPO94 - Decarbonisation in the Agricultural Sector • RPO95 - Sustainable Renewable Energy Generation • RPO96 - Integrating Renewable Energy Sources		Region came into effect on 31st January 2020 and therefore will not be reviewed until 31st January 2026 (the latest). This will be closely monitored.	
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• RPO106 - Future Proofing and Retrofitting			
Relevant Local Policy - Cork County Development Plan 2022-2028			
Relevant JAP Excerpt	Update	Review	Implications / Potential for HYBES
The County Development Plan guides the future growth and sustainable development of Cork County over the plan period from 2022 to 2028. The plan sets out an approach centred on the core principle of sustainability with a focus on creating vibrant, liveable, climate-resilient communities. The Cork County Development Plan is a document which details the overall strategy of the planning authority for the proper planning and sustainable development of Cork County considering national and regional planning guidelines, strategies and policy documents. As such, it is consistent with both the National Planning Framework and the Regional Spatial and Economic Strategy and is therefore in compliance with national climate action policies and legislation. At a high level, the Cork County Development Plan 2022-2028 aims to “provide for the development of County Cork as an attractive, competitive and sustainable place to live, visit and do business, where the quality of its economy, natural and built environment,	No update.	In accordance with part 11(1(ab) of the Planning and Development Act 2024 (as amended), the Cork County Council shall review its county development plan 4/5 years after it came into effect. The Cork County Development Plan 2022-	Implications : To be reviewed. Potential: To be monitored.

culture and the strength and viability of its rural and urban communities are to the highest standards. In terms of alignment with national climate action policy and legislation, the Cork County Development Plan 2022-2028 focuses on delivering proper and sustainable planning policy for Cork County by placing three critical principles at the forefront of all decision-making and strategic planning: Reducing Energy Demand, Reducing Anthropogenic Greenhouse Gas Emissions and Addressing Adaptation Measures. This is realised in several objectives specifically related to climate action, including: • CA 17-1: Support national and local climate change objectives. • CA 17-2: In order to achieve a reduction in greenhouse gas emissions, an increase in renewable energy production, an increase in energy efficiency and enhanced biodiversity, support the transition to a low carbon, competitive, climate resilient and environmentally sustainable economy by 2050 through implementation of the policies of this plan that seek to deliver the following: (i) compact growth, (ii) integrated land use and transport, (iii) sustainable transport choices, (iv) liveable settlements, (v) renewable energy production and reduced energy consumption, (vi) enhanced ecological biodiversity and (vii) climate adaptation measures such as through flood risk		2028 came into effect on 6th June 2022. It will therefore not be reviewed until 6th June 2026 / 2027 (the latest). This will be monitored closely.	
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management, sustainable urban drainage systems and high quality placemaking and design. • CA 17-3: Enhance awareness of climate action issues by promoting and facilitating behavioural change at an individual level. • CA 17-4: Cooperate with the Climate Action Regional Office (CARO) to develop monitoring of climate action achievement and to inform future policy direction. • CA 17-5: Support the Council's identification and development of decarbonising zones in line with the national Climate Action Plan. • CA 17-6: The Council will undertake the preparation of a Climate Action Plan as required by the Climate Action and Low Carbon Development (Amendment) Act 2021.			
Relevant Local Policy - Cork County Council Climate Adaptation Strategy, 2019-2024			
Relevant JAP Excerpt	Update	Review	Implications / Potential for HYBES
This Cork County Adaptation Strategy (2019- 2024) is Cork County Council's first step in the climate adaptation process. This strategy sets out the Local Authority's strategic priorities, measures and	No update.	No review date has been announced by the Cork	Implications : To be reviewed.

responses for climate adaptation in the county over the next 5 years. Cork County Council provides a wide range of services, many of which are already and will increasingly be affected by climate change. The Local Authority will continue to play a critical role in responding locally to the impacts of extreme weather events and other impacts that are likely to emerge over the coming decades. This Cork County Council Adaptation Strategy is set against the background of increasing risks associated with climate change and seeks to reduce and manage these risks at local levels in all Local Authority activities. The strategy is aligned with all national and regional climate action policies and legislation and provides a local response to the high-level actions and objectives related to climate adaptation in the national policies. The strategy supports the definition of climate mitigation as <i>“human intervention to reduce the sources or enhance the sinks of greenhouse gases”</i>, while climate adaptation is defined as <i>“the process of adjustment to actual or expected climate and its effects”</i>. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects. The Cork County Council Climate Adaptation Strategy is the primary instrument at local level to: • Ensure a proper understanding of the key risks and vulnerabilities of climate change.		County Council for the climate adaptation strategy. This will be monitored closely.	Potential: To be monitored.
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• Advance the implementation of climate resilient actions in a planned and proactive manner. • Ensure that climate adaptation considerations are mainstreamed into all plans and policies and integrated into all operations and functions of the Local Authority. Based on the risk register and the priority risks categorised by Cork County Council, the Strategy identifies seven high level goals: • Goal 1, Local Adaptation Governance and Business Operations: To support implementations of adaptation planning in all Council activities and operations. To build resilience within Cork Co Co to support service delivery. • Goal 2, Infrastructure and Built Environment: To increase resilience of roads and transport infrastructure and of Council owned assets housing stock. • Goal 3, Landuse and Development: To integrate climate action considerations into landuse planning. • Goal 4, Drainage and Flood Management: To adapt to the increased risk and impact of flooding. To liaise and work with other bodies responsible for management of water resources.			
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• Goal 5, Natural Environment, Built & Cultural Heritage: To develop approaches to protect the natural and key cultural assets in Cork County Council. • Goal 6, Community, Health & Wellbeing: To build capacity & resilience within communities regarding climate adaptation. • Goal 7, Other Sectors & Agencies: To collaborate with other Sectors and Agencies in programs relating to climate action and adaptation planning. These high-level goals are supported by 58 actions which aim to address the risks identified in the Strategy and support Cork County Council in achieving its objectives and targets in relation to Climate Adaptation.			
Relevant Local Policy - Cork County Council Climate Action Plan, 2024-2029			
Relevant JAP Excerpt	Update	Review	Implications / Potential for HYBES
Cork County Council is currently in the process of preparing a Climate Action Plan for the local authority, as is legislated for under The Climate Action and Low Carbon Development (Amendment) Act 2021. Guidelines to support the preparation of each local authorities' Climate Action Plan have recently been published by	The Cork County Council Climate Action Plan ('the Plan') 2024-2029 was adopted on 12th February 2024. The Plan was prepared by the Cork County Council Climate Action Response Unit and the Atlantic Seaboard South -Climate Action	In accordance with part 16 (14B)(2)(b) of the Climate Action and Low Carbon Development	Implications : To be reviewed.

The Minister for the Environment, Climate and Communications (March 2023). Cork County Council will work directly with the Atlantic Seaboard South Climate Action Regional Office (CARO) to develop the Climate Action Plan for the local authority, support the delivery of the national objectives and goals of climate action and decarbonisation, and aid the transition to a climate resilient, biodiversity-rich, environmentally sustainable, and climate-neutral economy by 2050.	Regional Office (CARO), who are based at the Cork County Council. The Plan is aligned with the Climate Action and Low Carbon Development (Amendment) Act 2021 to deliver a reduction in greenhouse gas (GHG) emissions by half to 2030 (based on levels recorded in 1990) and to climate neutrality by 2050. The Plan reflects the Government's National Climate Objective to make the country a climate resilient, biodiversity rich, environmentally sustainable and climate neutral state by 2050. A reduction and elimination in GHG emissions for the Council and the county's society and economy is the primary requirement of the Plan. Energy efficient practices and behaviours and changes in approach is required at council and county level to achieve the objectives and goals in the plan. Ambitious climate action projects will be developed and rolled out by the Council and its citizens to achieve national climate transformations at a local level. Funding from the EU and the Government will be	(Amendment) Act 2021, the Cork County Council can publish a subsequent climate action plan once within the 5-year period to 2029. In accordance with part 16 (14B)(10) of the Climate Action and Low Carbon Development (Amendment) Act 2021, the Cork County Council may vary or revise their Climate Action Plan at any time.	Potential: To be monitored.
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	sourced to develop and kick-start these projects. The Council have designated a decarbonisation zone in Macroom, which will act as a test bed for the development of a range of climate mitigation, adaptation and biodiversity measures in the town and surrounding area and that can be replicated in other parts of the county, if proven to be successful.		
Norway – Bodø Municipality			
Relevant National Legislation - The Climate Change Act 2021			
Relevant JAP Excerpt	Update	Review	Implications / Potential for HYBES

The Climate Change Act 2021 promotes the implementation of Norway's climate targets as part of its process of transformation to a low-emission society by 2050 (Climate Change Act 22.07.2021). The purpose of the Act is also to promote transparency and public debate on the status, direction, and progress of this work. The Norwegian Government's climate policy is intended to improve welfare standards at the same time as cutting emissions. Climate policy must not be considered in isolation, but as the sum of policy in many areas. Close coordination and an integrated policy for sustainable development in all sectors are an essential basis for achieving climate targets. The Government will therefore pursue an ambitious climate policy that will make it possible to achieve climate targets and at the same time provide a good framework for more jobs, greater welfare, and sustainable growth of the Norwegian economy. The effect of Norway's participation in the EU Emissions Trading System (ETS) contributes when assessing progress towards this target. The agreement with the EU does not set national targets for ETS emissions in the same way as for non-ETS emissions. The installations covered by the EU Emissions Trading System (EU ETS) must collectively reduce their emissions to achieve the overall target. Climate action and decarbonization Transition to Net Zero and achieve a climate neutral economy by no later than 2050. In its annual reporting to the Storting (Norwegian Parliament) under the Climate Change Act, the Government will assess the implementation of Norway's progress towards the 2030 target. In	No significant changes.		
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its budget proposal for the following year, the Government shall give an account of: A. how Norway can achieve the climate targets set out B. the expected effect of the proposed budget on greenhouse gas emissions. Each year, the Government shall, based on scientific information, provide the Storting with the following, in a suitable manner: • an account of changes in emissions and removals of greenhouse gases, projections of emissions and removals, and progress towards the climate targets, • an account of how Norway is preparing for and adapting to climate change, • an overview showing sectoral emission trajectories for emissions that are not covered by the EU Emissions Trading System and the types of measures that will be necessary to achieve them, and • status report on Norway's carbon budget, considering relevant arrangements within the framework of joint fulfilment with the EU.			
Relevant National Policy - Norway's Climate Action Plan for 2021–2030			
Relevant JAP Excerpt	Update	Review	Implications / Potential for HYBES
Climate action plan 2021-2030 puts Norway on track to achieve its enhanced target of cutting greenhouse gas emissions by 50–55 %	No significant changes.		

by 2030, and its long-term target of reducing them by 90–95 % by 2050. The plan includes measures and instruments for reducing both ETS (Emissions Trading System) and non-ETS emissions, and for increasing CO₂ removals and reducing emissions from forest and other land categories. Specific measures and instruments to cut non-ETS emissions by 45 % from a key element of the plan. The Government's target is for Norway to reduce its non-ETS emissions by 45 % between 2005 and 2030. Converted into an emission budget, this corresponds to total emissions over the next ten years of no more than 201.8 million tonnes CO₂eq. Under its climate agreement with the EU, Norway has an additional commitment to ensure that emissions from the land use, land use change and forestry (LULUCF) sector over the period 2021–2030 do not exceed removals. Preliminary calculations indicate that Norway's net emissions may be around 18 million tonnes CO₂eq, if the managed forest land flexibility (often referred to as the compensation mechanism) that is part of the EU accounting rules is included. Today, climate-related taxes combined with emissions trading are proving effective in cutting greenhouse gas emissions across sectors. These two policy instruments apply to more than 80 % of greenhouse gas emissions in Norway. Cross-sectoral instruments such as taxation of greenhouse gas emissions and emissions trading are the main instruments of Norwegian climate policy. These instruments put a price on emissions and give every household and company incentives to reduce emissions and to develop and deploy climate-friendly solutions.			
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Government intends to make stepwise increases in the taxation level for non-ETS greenhouse gas emissions, reaching NOK 2000 per tonne CO₂eq in 2030. The Government will make use of the purchasing power of the public sector to speed up the pace of development, for example by including climate-related requirements in public procurement processes in the transport sector. Norway is at the forefront in the use of electric vehicles. Various other regulatory measures have also been adopted, such as a prohibition on using mineral oil to heat buildings and biofuel quota obligations for both road transport and aviation. Norway is already making good progress. Since the peak year 2015, annual greenhouse gas emissions from road traffic have declined from 10.1 million tonnes CO₂eq to 8.5 million tonnes CO₂eq in 2019. Buildings where people live and work must be climate-friendly both in the construction phase and when they are in use. By re-using materials and buildings for new purposes, it is possible to reduce raw material and energy use and cut waste generation and greenhouse gas emissions. The central government administration owns large numbers of buildings across the country and will provide a good example by seeking to achieve a common set of climate and environmental aims for public buildings. It will not be possible to achieve national and international climate targets without reducing greenhouse gas emissions from construction and buildings. In Norway, the sector accounts for roughly 40 % of			
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energy consumption and a large proportion of resource use and waste generated. The energy requirements in Norway's Technical Construction Regulations have thus far dealt with energy efficiency and the use of renewable energy largely by requiring an energy-efficient building structure and the use of renewable energy supplies. It is important to reduce energy consumption as far as possible and reasonable in financial terms. Energy efficiency is still important in all sectors, and it often pays for individual people to improve their energy efficiency. Smart meters provide better information on electricity consumption and are important as a tool for facilitating other technological solutions, for example smart charging of electric cars. If energy now used in buildings is freed up, it could be used in other sectors to replace fossil energy and reduce the need for new electricity production and developments in undisturbed areas. The aim is that in 2030, Norway will be a major producer of renewable energy. Norway has plentiful supplies of renewable energy resources, mainly in the form of flexible hydropower production. About 98 % of Norwegian electricity production is renewable. In addition, market design and the structure of the power grid ensure that the overall power system is used effectively. A flexible energy system can speed up electrification and result in lower costs for households and the business sector. Optimal use of grid capacity is an essential basis for the success of electrification. If the grid is not used effectively, there is a risk that it will be expanded more than necessary. This can result in environmental			
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disturbance that could have been avoided and in higher tariffs than necessary for households and businesses. Expanding production of renewable energy from offshore wind and solar power and making greater use of hydrogen and battery technology will offer opportunities for new commercial activities related to production, maintenance, control systems and other services. The development of battery technology and battery production are vital for further electrification of the transport sector both in Norway and internationally. Hydrogen technology is another area where Norway has considerable potential. The white paper on long-term value creation from Norwegian energy resources will include a roadmap for hydrogen technology. The Norwegian Public Roads Administration will include a requirement to use hydrogen technology for the ferry service Bodø–Røst–Værøy–Moskenes, which is part of the national road system. Progress and emission reductions will also depend on the ability to take other considerations into account, for instance relating to the economy, food security, biodiversity, and adaptation to climate change. The Government is using tax breaks and grants through Enova to ensure that businesses have the freedom and opportunity to choose electric vehicles. Facilities for shoreside electric power, charging infrastructure and later, infrastructure for alternative transport fuels such as hydrogen, ammonia, and biofuels, must be			
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developed to facilitate zero-emission maritime transport. Enova is supporting the development of this type of infrastructure. Since its establishment in 2001, Enova has supported the implementation of more than 7,000 energy and climate projects. The Government has given Enova a clearer climate profile for the next four-year period, so that its purpose is to contribute to Norway's emission reduction commitment and contribute to Norway's transition to a low-emission society. Enova will contribute to the development of technologies necessary towards 2030 and the low emission society in 2050. Enova's activities focus on late-phase technology development and early market introduction. Grants for late-phase technology development help to speed up the pace and scale of pilot and demonstration projects and full-scale testing, so that new technologies and solutions reach the market more quickly. Enova has a role to play in finding good solutions that meet the need for an energy system that is effective during a period of major change. For instance, coordination between thermal energy and the power system needs to be improved, and new technologies and solutions for energy storage and demand response must be developed.			
Relevant Regional Policy - Regional plans and decarbonisations objectives and goals of Nordland County Council			
Relevant JAP Excerpt	Update	Review	Implications / Potential for HYBES

Regional plan for climate and environment is anchored in the regional strategic plan 2016-2020, but it also reflects the strategies and goals of the ongoing strategic plan 2021-2024 and underpins actions towards Sustainable Nordland 2030. As a link between state, municipal and other regional authorities, Nordland County Council is responsible to contextualize national goals and guidelines. December 2020: The county council decided and implemented a climate budget of its own activity. This is to support the ambition of the Nordland County administration (NFK) to reduce its own greenhouse gas emissions. Climate accounting can have different perspectives such as direct emissions perspective or footprint perspective. Direct examples are fossil fuels and footprints. Indirect examples are through trade of goods and services. A climate budget should be integrated into the financial budget to be an effective management tool. Objectives and sub-goals until 2030: • Greenhouse gas emissions in NFK must be reduced by 60% by 2030, compared to 2009. • In 2030, industry and business in Nordland will be a global player in green transition. • Nordland has municipalities that are capable of adaptation, that manage climate risks and utilizes the opportunities of a changing climate.	No significant changes.		
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• In 2030, the infrastructure in Nordland for fossil-free fuels is well developed. • In 2030, the transport sector in Nordland has reduced its greenhouse gas emissions by 70% compared to 2009. • In 2030, the energy demand for the building stock in Nordland has been reduced by 20% compared to 2009. • In 2030, construction and construction sites in Nordland will be fossil-free. • In 2030, the agricultural and aquaculture industry in Nordland has reduced fossil emissions by 50% compared to 2009. These objectives are obtained through instruments as green public procurement, energy efficiency and a transition to fossil-free transport. Renewable energy is the key to sustainable growth and zero emissions. Furthermore, the use of short-distance power will reduce the need for power lines and reduce energy loss in the transmission network. The action program of NFK is revised every one or two years and an assessment is made on whether the Climate action plan is on track to achieve its goals. The implemented Climate Budget tool is important to make this assessment. The climate and environmental plan will be a guide for other regional plans such as the regional transport plan and ariel plans. The Nordland County administration plays a decisive role to facilitate networks and partnerships, to encourage dialogue, cooperation, and exchange of experience. Changing attitudes and			
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actions is an important element in bringing about a transition to a climate-adapted low-emission society. 5 strategies for good climate communication: • Motives through social networks. Motivation for climate- and environment-friendly choices should therefore take place through existing networks and groups. • Relate climate to other important topics. Must show which options exist and what those options lead to. • Point people in the right direction. Make it easier to make climate- and environment-friendly choices. • Use the power of stories to reach more people with knowledge about climate and to change behaviour and attitudes, we should open up more ways to talk about climate change. • Who delivers the message matters. Networks, meeting places and partnerships are recommended to mobilize the public, private and civil society in work on transitioning to a low-emission society. Collaboration in networks such as Klimapartnere Nordland, which includes various industries and the public sector, is a good example of a forum for developing new solutions and increasing competence.			
Relevant Regional Policy - Regional strategies for decarbonisation of Nordland County Council			
Relevant JAP Excerpt	Update	Review	Implications / Potential for HYBES

In Nordland, electric power is today the dominant source of energy with approx. 57% of total consumption. Other major energy sources are petrol and auto diesel (10%), fossil fuel industry (8%), marine gas oil and jet paraffin (7%) and wood, district heating and heat pumps (7%). Stationary energy consumption (mainly construction and industry) accounts for approximately 78% and the transport sector for 22% of consumption. Strategy 1: The environment and climate challenges require investment in education, research, and innovation. Climate and environmental perspectives should be incorporated into educational plans and curricula from kindergarten to higher education. The upper secondary schools will also be important arenas for communicating the climate message. Strategy 2: Public procurement is a powerful tool for reducing the footprint of public enterprises and for establishing and promoting markets for circular products and services. By setting requirements in procurement within construction, food, transport, electronics, office furniture, etc. the public creates a demand for circular products with a low climate footprint. Strategy 3: Green industrial development based on renewable energy. Industry in Nordland plays an important role in production. Renewable energy carriers such as hydrogen and biogas and minerals and metals as well as the production of new technologies such as batteries. At the same time, the industry is a source of almost half of all greenhouse gas emissions to the air in Nordland, and it is important that arrangements are made for the industry to	No significant changes.		
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develop and adopt low and zero emission technology, as well as to streamline the use of energy and raw materials. Strategy 4: Building infrastructure for future energy systems. Distribution of grid costs is a challenge in the current user-financed model and investment in power grids is a high financial threshold for many sectors when it comes to converting to electric operation. We also follow developments in the use of batteries as grid support, and as a possible alternative to provide greater flexibility in the grid with lower costs and planning requirements. To meet electric car drivers' needs for charging, arrangements must be made for charging along transport corridors and at workplaces, visitor buildings and housing associations. Ships that are docked can reduce their emissions by using shore power instead of their own diesel engines. Strategy 5: Create greater flexibility in the energy system. Local production of renewable energy is part of today's and future's energy system. Today, there are various sources of renewable energy. The largest sources come from hydro and wind power. Of other sources of renewable energy, the most common are heat pumps, district heating, wood burning, geothermal heating and solar energy. These can have great potential and are used as energy supplies for both construction and industry. Little space-consuming, Solar energy on roofs and other existing surfaces is a good example. Contribute to creating greater flexibility in the energy system by providing both electricity and heat without major losses in the power grid. District heating plays an important role by utilizing waste resources and waste heat and provides greater			
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flexibility in the energy system by relieving the power grid and reducing the need for investment in the power grid. Strategy 6: Use efficient transport systems and climate-friendly forms of transport. To reach the climate targets, requirements must be set for zero or low emission solutions based on technological neutrality. It is likely that the solutions within road traffic will be different, but electrification will play a key role and as a supplement where electrification is not appropriate, other energy carriers such as hydrogen, hybrid technology will be used. In collaboration with Vestland, Trøndelag, Nordland and Troms and Finnmark county council in the project Fremtidens hurtigbåt, work is being done to develop the world's first zero-emission speedboat. Strategy 7: Energy efficiency of buildings. Energy efficiency measures in buildings reduce greenhouse gas emissions and are often economically profitable. Freeing up energy use in the building stock is also crucial to cover the growing need for electricity in the transport sector. Tools such as energy management and smart energy management systems and systems for energy storage must be used to reduce energy use in buildings.			
Relevant Local Policy - Local plan and decarbonisation goals of Bodø Municipality			
Relevant JAP Excerpt	Update	Review	Implications / Potential for HYBES
Bodø Municipality will create good local communities for its residents and is an active contributor to achieving the UN Sustainable Development Goals. This is due to its responsibility as a	Recently Bodø municipality has approved the new climate and energy plan (2025-2035). Bodø Municipality, in its role as a community		

planning authority, a buyer and developer, as owner and operator of infrastructure, buildings, and roads, and its key role in sustainable social development. The Climate and Energy Plan 2019-2030 is the governing document for Bodø Municipality's efforts relating to climate and energy. The Climate and Energy Plan is also part of the municipality's overall 'smart initiative', which defines an area of opportunity for sustainable growth. The Climate and Energy Plan is strongly linked to the municipality's Smart City initiative and its vision to create a more human-and environmentally friendly city. One of the key areas of the smart initiative focuses precisely on climate and environmental considerations and renewable and efficient solutions relating to energy use. The Climate and Energy Plan is a cross-sectoral thematic plan which borders on many of the municipality's priority areas and other plans: 1. The municipal master plan's societal section (KPS) sets out guidelines and anchoring for the municipality's planning and project work. Bodø Municipality shall facilitate the development of a compact city and local communities where new solutions create attractive residential and living conditions, within the framework of climate and environmental considerations.	developer, government executive and planning authority, purchaser, owner and operator, can influence various climate measures, and act as a driver, initiator and facilitator for climate change in the Bodø community. The Climate and Energy Plan outlines the strategic direction for Bodø's transition to a circular, area-neutral low-emission society. The plan presents 5 climate goals for Bodø, in addition to 9 focus areas with sub-goals and strategies. The climate and energy plan guides the entire municipality's activities and municipal enterprises, in addition to providing guidance for the area part of the municipal plan. Decarbonisation objectives for Bodø municipality-- 1. Significantly reduce indirect greenhouse gas emissions and strengthen the circular economy 2. Bodø will be area-neutral and have compact urban development 3. Reduce direct greenhouse gas emissions by 70% by 2031. Bodø will be a low-emission society in 2050.		
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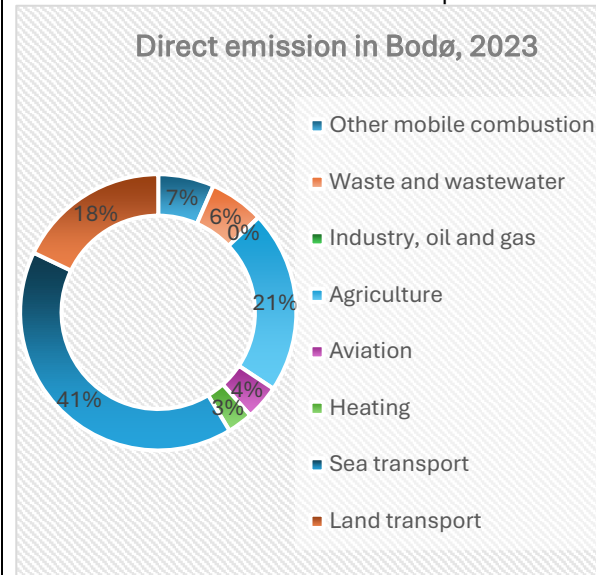
2. The municipal master plan's land-use section (KPA) is the municipality's management tool for the use and protection of land. 3. The municipal sector plan for cycling describes how Bodø Municipality is working to achieve the goal of a 25% cycling share in 2025. 4. The plan states that an action plan will be prepared for stormwater management in the municipality. 5. The Regional Transport Plan for Nordland 2018-2029 sets out transport policy guidelines for the county, with action plans relating to public transport, commercial transport, county roads and cycling and walking. Decarbonisation objectives Bodø Municipality: • 2030 - Reduction in direct greenhouse gas emissions by 70% compared with the 2009 level. • 2030 - Bodø Municipality shall have a recycling rate of 70% as regards household and industrial waste. • 2050 - Bodø shall be a low-emission society. Sub goals of Bodø Municipality its own enterprises: • 2025 - Bodø Municipality shall reduce its greenhouse gas emissions from new buildings and the refurbishment of existing buildings by at least 35% compared with the industry norm in 2017.	4. Bodø will be an energy-efficient society that uses emission-free energy 5. Bodø will be a climate-robust city Other measures regarding building, energy and transport- - Thermal energy with low greenhouse gas emissions should be sought for heating purposes rather than electricity. Continue the requirement for new buildings to connect to the district heating network in areas close to a district heating facility. - All new municipal buildings with a cost frame above 100 million shall meet the requirements for the BREEAM-NOR Very Good standard, or equivalent. The additional cost of achieving the Excellent level shall be considered. All new buildings shall be constructed as zero-emission buildings. - A transformation project shall be carried out where the building meets the requirements for BREEAM In-use or equivalent, with the aim of introducing this as a standard in all transformation projects.		
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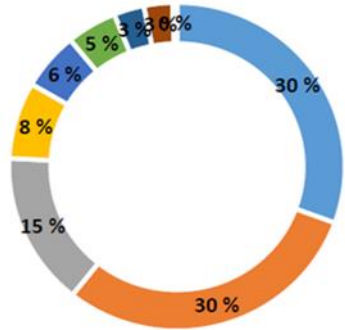
2025 - Energy consumption in Bodø Municipality's existing building portfolio shall be reduced by at least 25% compared with the 2009 level. 2030 - Bodø Municipality shall reduce its overall climate footprint by 50% compared with 2017.	- Map and utilize the potential for placing renewable energy production on developed land, including urban areas (solar panels, near-shore/small-scale wind power, and other alternatives). - All new cars must be emission-free. Introduce a fleet management system and a car-sharing scheme. Encourage walking, cycling, and public transport, and facilitate this through measures such as bicycle parking.		
Relevant Local Policy - Status of Direct emissions in Bodø Municipality			
Relevant JAP Excerpt	Update	Review	Implications / Potential for HYBES
Direct emissions of carbon dioxide (CO₂), methane (CH₄) and dinitrogen oxide (N₂O) within Bodø Municipality's boundaries was in 2016 measured to 204,000 tonnes CO₂e. Compared to baseline of 2009 and based on population development for this period, emissions have been reduced by 10% per capita in Bodø Municipality. Road transport and shipping are two other largest sources of emissions in Bodø Municipality. Emissions from road transport are mainly linked to light vehicles such as cars, and these emissions were reduced by 7% between 2009 and 2016. Emissions from shipping rose by 15% from 2013 to 2016. The 'passengers' category	Direct emissions of carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O) within Bodø Municipality's boundaries in 2023 amounted to approximately 20,011.6 tonnes CO₂-equivalents (CO₂e). The distribution of direct greenhouse gas emissions in Bodø municipality in 2023. The largest source is other mobile combustion, accounting for 41% of total emissions, mainly from construction machinery, equipment, and other non-road engines. The second-		

(ferries, high-speed ferries, and cruise ships) accounts for this increase. The statistics also include through traffic. DNV GL has estimated that around 7% of national emissions from inland shipping originate from ships in port. By providing onshore power to Hurtigruten alone, we will be able to save almost 4% of the total emissions originating from shipping in Bodø Municipality.

3% of Bodø Municipality's direct greenhouse gas emissions originate from industry. Bodø sildoljefabrikk AS accounts for 84% of emissions from industry in Bodø.

largest contributor is aviation, which makes up 21%, reflecting the significant airport activity in Bodø. Land transport follows with 18%, showing that road traffic is still a major emission source. Smaller but notable contributors include waste and wastewater (7%), agriculture (6%), sea transport (4%), and heating (3%). Industry, oil, and gas represent almost no emissions. Overall, the graph highlights that mobile sources—both road and non-road—together with aviation dominate Bodø's direct emissions profile.



	- Sjøfart - Veitrafikk - Annen mobil forbrenning - Luftfart - Jordbruk - Avfall og avløp - Industri, olje og gass - Oppvarming - Energiforsyning		
- Shipping - Road transport - Other mobile combustion - Aviation - Agriculture - Waste and wastewater - Industry, oil and gas - Heating - Energy supply			
Buildings and infrastructure account for just under 42% of the climate footprint (including investments, operations, maintenance, as well as the production and transport of construction materials). The largest emissions in this category are attributed to transport, housing, primary and lower secondary schools, the health service and roads, sewage and waste disposal (see Figure 3). 20% of the climate footprint of the municipality's operations stem from purchases of consumables, particularly in the health sector. Purchases of services contribute 17% of the municipality's climate			



footprint. The climate footprint of Bodø Municipality's operations by 21% between 2009 and 2017.			
Relevant Local Policy - Local strategies and decarbonisation tasks for Bodø Municipality			
Relevant JAP Excerpt	Update	Review	Implications / Potential for HYBES
Procurement: Procurement regulations will have clear requirements and guidelines concerning environmental considerations, which must be documented in all procurements. Bodø Municipality has decided that new procurement praxis will address environmental and climate considerations, as well as social and ethical requirements. Energy, buildings, and construction: Bodø Municipality has implemented a strategy that encourage to choose construction materials that is: • Short travel/locally sourced • Sustainable materials, with a high recycling rate and low climate footprint. • RES energy solutions in new-build projects. • High energy efficiency in existing buildings. After 1st of July the following energy and environmental requirements is enforced for the municipality's buildings: • New build: passive house standard			

• Refurbishments: passive house standard, provided that the buildings are not protected • Partial refurbishments: passive house standard, provided that the buildings are not protected • Existing buildings: Up one class from the previous energy classification in 2010 Review energy-intensive processes on construction sites that can be replaced: • Construction machinery and equipment at the construction site • Building heating and drying • Transportation of personnel and materials to/from construction sites An emission inventory shall be prepared for all municipal new-build projects, which will show the measures that are needed to reduce emissions by at least 30% relative to a reference building in accordance with the industry norm (TEK-17). A ZEB building will be constructed according to the ambition level ZEB - O. Furthermore, Bodö Municipality will introduce a certification system such as BREEAM for new buildings, minimum level "Good". Through stakeholder engagement and dissemination of information the municipality will ensure that local construction industry is competitive about new requirements in planning and implementation of zero-emission buildings and zero-emission neighbourhoods.			
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To increase the use of wood materials in construction projects is also a priority. • wood materials to always be competitive, in terms of emission inventories, indoor climate and economics and from a life-cycle perspective. Transport and land use: A central strategy of Bodø Municipality is to reduce emissions from transport. This is done by: • Enabling and influencing other major players to reduce car use and demand. • Utilising the municipality's roles and instruments to reduce emissions from shipping. Land-use section of the municipal master plan is the strongest instruments for reducing demand for transport and is facilitating walking, cycling and travel by public transport. Furthermore, the following concrete task will support sustainable sea transportation: • Roll out onshore power to piers no. 1, 3, 4 and 5 in the Port of Bodø. • Explore the possibility of onshore power for ships which require a high-voltage power supply (cruise ship size) in the Port of Bodø. Implemented by Nordlandsnett AS latest 2025. • Continue the study of hydrogen as a fuel for heavy transport vehicles, rail and shipping – instigate the establishment of a hydrogen refuelling station in Bodø Municipality.			
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• Work to promote a smarter system for the high-speed ferries to reduce demand for transport in the inner harbour between the high-speed ferry terminal, the freight terminal and bunkering. • Urban growth agreement in Bodø, will help to achieve the goal of zero growth of car use in the city. • Use the scope open to the municipality to ensure that the Nordland Line is operated by hydrogen-powered traction in the future.			
Sweden – Umeå Municipality			
Relevant National Legislation - Sweden's Climate Act and Goals			
Relevant JAP Excerpt	Update	Review	Implications / Potential for HYBES
The Climate Act establishes the following: • The government's climate policy must be based on the climate goals. • The government is required to present a climate report every year in its Budget Bill. • Every fourth year, the government is required to draw up a climate policy action plan to describe how the climate goals are to be achieved. • Climate policy goals and budget policy goals must work together. The framework contains several climate goals for Sweden:	Aligned with the EU Commission's recommendation, the Swedish government has presented a position supporting the reduction of net emissions by 90 percent by 2040, compared to 1990, but under certain conditions. For the Swedish government to support this target level, it assesses that the implementation of the climate target needs to be realistic and that:		

By 2045, Sweden is to have zero net emissions of greenhouse gases into the atmosphere. This means that greenhouse gas emissions from activities in Sweden should be at least 85 percent lower than in 1990. The remaining 15 percent can be achieved through supplementary measures such as increased carbon sequestration in forest and land, carbon capture and storage technologies (CCS) and emission reduction efforts outside of Sweden. After 2045 Sweden should achieve negative emissions, meaning that the amount of greenhouse gas emitted is less than what can be reduced through the natural eco-cycle or through supplementary measures. By 2030, emissions from domestic transport will be reduced by at least 70 per cent compared with 2010 (excluding domestic aviation which is included in the European Union Emissions Trading System). By 2030, emissions in Sweden in the sectors covered by the EU Effort Sharing Regulation should be at least 63 per cent lower than in 1990, out of which 8 percent may achieved through supplementary measures. By 2040, emissions in Sweden in the sectors that will be covered by the EU Effort Sharing Regulation should be at least 75 per cent lower than in 1990, out of which 2 percent may be achieved through supplementary measures. These goals also reflect Sweden's aim to show international climate leadership, and to show that Sweden undertakes to achieve	• The framework must be designed so that all EU member states achieve climate neutrality by 2050. • The EU should not rely on difficult-to-achieve commitments for net uptake in LULUCF but should consider the central role of the bioeconomy in the climate transition and create conditions for long-term increased and sustainable food production. • The systems for trading emission allowances should be the main track, and national commitments under the Effort Sharing Regulation should cease after 2030. • Incentives should be created for permanent negative emissions after the 2030 framework, and new climate targets should be combined with a technology-neutral energy policy where all fossil-free alternatives, including nuclear power, are included.		
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emission reductions that far exceed the requirements under the EU Effort Sharing Regulation.			
Relevant National Policy - Sweden's climate policy framework			
Relevant JAP Excerpt	Update	Review	Implications / Potential for HYBES
In 2017, Sweden's Riksdag decided by a large political majority to introduce a climate policy framework with a climate act for Sweden. This framework is the most important climate reform in Sweden's history and sets out implementation of the Paris Agreement in Sweden. By 2045, Sweden's mission is to have zero net emissions of greenhouse gases into the atmosphere. Current government has stated that Sweden's ambitious climate goals remains, and that the climate policy framework remains valid. The framework contains ambitious climate goals, a climate act and a climate policy council. The framework aims to create order and stability in climate policy. It provides business and society with the long-term conditions to implement the transition needed to address the challenge of climate change. For the first time, Sweden also has an act under which each elected state government has an obligation to pursue a climate policy based on the climate goals adopted by the Riksdag. Each government must provide clear reports on how work to achieve the goals is progressing, and an independent climate policy council reviews how well the government's overall policy meets the climate goals. The reform is a key component of Sweden's efforts to comply with the Paris Agreement. The new government has however announced a major overview of the Swedish climate work			

and instigated an inquiry which will provide the new guidelines for the climate work in Sweden.			
Relevant Regional Policy - Regional development and climate strategy 2020-2030			
Relevant JAP Excerpt	Update	Review	Implications / Potential for HYBES
The Region council of Västerbotten has committed to a regional development strategy. In the partial prioritization 4.4 named <i>"Sustainable consumption, inclusive energy use"</i> states that <i>"All actors in society are consumers, from individuals to companies, authorities and organisations. The consumption choices they do is decisive for the environmental and climate impact that occurs globally, at all stages of the chain, from raw material to final use. To achieve sustainable consumption, a circular approach is required, such as reusing and recycling."</i> Another important environmental gain, in which there is solid experience in Västerbotten, is energy efficiency and energy recycling. Through its renewable energy resources, Västerbotten has unique prerequisites for the establishment of electricity-intensive industry, which in turn creates further opportunities for efficient energy recovery. A large part of the electricity production takes place in the northern parts of the county, where wind and hydropower are the main sources. Large energy losses in connection with the transmission of			

electric power and bottlenecks in the infrastructure create advantages for establishment close to the electricity production in the north. Access to sustainable energy is also important from a climate perspective, as well as a circular perspective. The climate strategy states that the region must reduce its climate impact by 60 percent by 2030. In 2045, the region must be climate neutral, which means that it must reduce their emissions by 8 percent per year. Overall areas where the region has the greatest impact on the environment and where activities will be carried out are: - Climate neutrality and mitigation - Healthy and non-toxic environment - Sustainable use of resources			
Relevant Regional Policy - County administrative board climate role and strategy			
Relevant JAP Excerpt	Update	Review	Implications / Potential for HYBES
The County Board's role is to coordinate the regional work with the environmental goals. They work together with municipalities, businesses, voluntary organizations and other actors, so that the environmental goals will have an impact in the county and the environment will improve. The County administration board also follow up on how the environmental work is going. The County Administrative Board shall: - coordinate the regional target and follow-up work			

- develop, coordinate and implement regional action programs with broad roots in the county to achieve the generational goal and environmental quality goals - support the municipalities with data in their work with the generation target and the environmental quality targets - work to ensure that the generational goal and the environmental quality goals are reflected in local and regional social planning and contribute to their consideration in the regional growth work. The county administrative boards in Sweden have been commissioned by the government to produce regional plans for infrastructure for electric vehicles and renewable fuels and work on implementing these plans. The purpose of this plan is to promote and coordinate an expedient expansion of distribution facilities for renewable fuels (filling and charging stations).			
Relevant Local Policy - Umeå climate roadmap			
Relevant JAP Excerpt	Update	Review	Implications / Potential for HYBES
Umeå's climate roadmap is two things at the same time: a compilation of what needs to be done to reduce climate emissions in Umeå, and a platform where the whole city of Umeå can strengthen each other and work together for climate change in accordance with the Paris Agreement.			



The climate roadmap is coordinated by the City of Umeå, but the content is created jointly with companies and organizations who joined the endeavor. The roadmap has five focus areas where everyone in Umeå is needed to reduce emissions: 1. Mobility and transport 2. Energy and the built environment 3. Consumption and circular economy 4. Food and agriculture 5. Other supplementary measures Signatory organizations commit to sharing information annually on activities and results in their climate work. These can be reported through one or more of the following: a) The organization's external sustainability report b) Open on the Umeå climate roadmap website c) Other way specified in the undertaking The aim is a climate-neutral municipality in 2040 and that the City of Umeå is climate-neutral in 2030.			
Relevant Local Policy - Umeå climate action plan			
Relevant JAP Excerpt	Update	Review	Implications / Potential for HYBES

To limit the global temperature increase to 2 degrees Celsius, and ideally to no more than 1.5 degrees, everyone must contribute to reducing greenhouse gas emissions. At a local level, everyone who lives and work in Umeå must contribute by reducing our climate-impacting emissions. Greenhouse gas emissions from energy use per inhabitant in Umeå has been steadily decreasing since 1990, however as the population of Umeå is growing, the actual emissions have remained essentially the same since the 1990s. The same is true for consumption-related emissions which have remained stable at the national level in recent years. In Umeå, consumption-related emissions in 2018 were 11.5 tonnes per person per year, according to a survey of consumption habits commissioned by City of Umeå. A long-term sustainable level is 1 tonne per person per year, which must be achieved by 2050 if we are to meet the goals of the Paris Agreement. Activities and goal in Umeå Climate Action plan: - Municipality of Umeå will be climate neutral 2040, net zero emissions of greenhouse gases. - The Umeå municipal group will be climate neutral by 2025, net zero emissions of greenhouse gases. - The climate impact of transport in Umeå will be reduced, this will be done by fuels that are fossil-free by 2030 and through increases in sustainable travel. - City of Umeå consumption-based climate impact is reduced to 2 tonnes of CO₂ equivalent per equivalent per person by 2040 and 1 tonne by the year 2050.			
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- By 2025, the share of journeys by public transport, bicycle or on foot combined is at least 65 per cent of all trips for residents in the Umeå urban area. - By 2040, the air in Umeå is so clean that human health and animals, plants and cultural values are not harmed. - By 2025, green corridors and areas have been developed in Umeå's urban centres with new and existing parks and green public spaces. - In 2025, the inhabitants of Umeå have good access and accessibility to parks, squares, and recreational environments with good sound environment. - By 2025, Umeå has buildings with low energy use and environmental impact.			
Relevant Local Policy - Umeå Digital Climate road map			
Relevant JAP Excerpt	Update	Review	Implications / Potential for HYBES
The municipality is working to reduce emissions of greenhouse gases and to phase out fossil fuels. To achieve this, changes are required throughout society, where the municipality, companies, organizations and residents must work together. To gather companies and organizations around a common goal, Umeå municipality works with a digital tool called Climate OS. In the tool, one can see what the emissions in Umeå look like today and possible solutions to deal with them. The tool currently shows a selection of measures and does not yet provide a complete picture of what is being done in Umeå to reduce emissions. The tool is			



continuously developed with new solutions, better data, and more actions.			
Relevant Local Policy - Climate Neutral Umeå 2030			
Relevant JAP Excerpt	Update	Review	Implications / Potential for HYBES
Umeå Municipality is one of 23 municipalities and six authorities that have signed the Climate Contract 2030. It is a contract between cities and authorities to accelerate the development of climate neutral cities. To achieve the big change in the short term, we will require unprecedented cooperation between citizens, politicians, businesses, and civil servants. National, regional and local levels must work together in the same direction. The Treaty sets out the way forward. Climate Contract 2030 is part of the Climate Neutral Cities 2030 initiative within the Viable Cities strategic innovation programme, of which Umeå is a part. It is also part of the European Commission's initiative for 100 climate neutral cities by 2030. It will contribute to the transition by bringing many people together and testing new ways of working. The Climate Contract will be revised every year in December. Umeå municipalit's commitments:	Umeå Municipality is one of 48 municipalities and six authorities that have signed the Climate Contract 2030.		



- Implement the Umeå Local Group Action Programme to achieve agreed climate targets. - Gather strength for Umeå's climate transition together with business, civil society and academia, by coordinating and implementing the Umeå Climate Roadmap, Umeå's local climate contract. - Create a force for change in the region by establishing Umeå as a hub for innovation in sustainable and equitable urban planning, including by supporting innovation projects in cooperation with other cities in northern Sweden. - Establish a creative hub where different competences are cross-fertilised, strengthening creativity and innovation, and playing an important and cross-sectoral role in the green and digital transition, in line with the New European Bauhaus. - Strengthen Umeå as a logistics and energy hub in the region by enabling sustainable transport and logistics solutions. - Develop a new energy plan for the City of Umeå, based on scenario analyses of Umeå's future energy system. - Actively participate in the EU mission - 100 climate neutral and smart cities by 2030. - Continue to develop the <i>"System demonstrator for a climate-neutral Umeå based in the new Tomtebo strand district"</i> and the <i>"Roadmap for mobility hubs"</i> system demonstrator together with Uppsala and Linköping. - Continue to develop forms of cooperation with civil society and residents, for example in UMECOM - Umeå's Citizens' Workshop.			
Iceland – Akureyri Municipality			

Relevant National Policy - Sustainable Energy Policy towards year 2050			
Relevant JAP Excerpt	Update	Review	Implications / Potential for HYBES
The energy policy states: <i>“By 2050, fossil fuels will have been entirely replaced by renewable energy sources. The country will have achieved carbon neutrality by 2040, as planned. Energy security has been achieved through a supply of varied renewable energy options and sound infrastructure.”</i> This goal will be achieved through various actions directed towards different sectors. Actions within each sector to achieve energy transition is currently being developed and the Energy Fund is being expanded to support the transition with increased funding.	Iceland's Climate Action Plan lists 150 actions divided into four systems. 86 actions related to community emissions, 14 actions related to the trading system, 16 actions related to land use and finally 34 actions that are classified as cross-sectoral. The changes that have occurred since the previous action plan are the number of actions has been increased by 102. The funding status of the actions is that within the framework of the current financial plan there are 68 actions, 20 actions are partially funded, and 62 actions are outside the current financial framework of the government. The status of the actions themselves is as follows: 59 actions have been implemented, 9 actions that have been approved but not implemented, 16 actions are planned, and 66 actions are still at the conceptual stage. The updated action plan assumes that climate action will be assessed with respect to equality and their social impact, and all actions have been roughly assessed based on the following categories: equality, public health, regional affairs,	We are on the right track, but there has recently been a change of government, so there may be some changes in emphasis in the coming years regarding which actions have priority and what actions will be included in the budget, but it is too early to say yet.	Very little impact on the project

	household finances, and labour market issues.		
Relevant Regional Policy			
Relevant JAP Excerpt	Update	Review	Implications / Potential for HYBES
Iceland is treated as one region when it comes to the transition from fossil fuel to renewable energy. More renewable energy will need to be provided and that this energy will need to be produced in different regions in Iceland and distributed with improved power grid. Debate is on-going between government and municipalities on how to achieve this goal with minimum impact (concerns are mostly due to increased tourism, since power plants may have negative visual impacts). Only one hydropower plant of 95 MW can be expected to be installed within the next few years and one 120 MW wind farm. Even those two projects struggle to get approval from the municipalities. A larger share of the electricity sales going to municipalities is being discussed.	It has been difficult to get a permit for a hydroelectric power plant planned by Landsvirkjun through the legal system, and the case is now before the Supreme Court. It is hoped that this will be resolved as soon as possible so that construction can begin on Hvammsvirkjun as soon as possible, as the country is expected to experience an energy shortage if major energy measures are not taken in the coming years. The wind farm is being prepared, but not all permits have been obtained for it, and there is still controversy over the role of municipalities in the operation of energy facilities.	When little has been done, the importance of energy-saving projects on a larger scale increase, and public support for this process by the public and municipalities is important. Both report on the projects that have been successful and outline the	Very little impact on the project

		methodology from project idea to final product and list the economic and environmental savings that result from the project.	
Relevant Local Policy			
Relevant JAP Excerpt	Update	Review	Implications / Potential for HYBES
Iceland has 64 municipalities, ranging from only 42 individuals in the smallest municipality to 136 thousand in the largest one (Reykjavík capital). The most urban municipalities usually have published their environmental policies. On January 1st, 2023, new legislations came in force addressing the circular economy, honouring the Paris agreement and forcing all municipalities to publish their climate policy.	Most municipalities in the country have presented a climate policy and action plan. It is mainly the smallest municipalities that have not come as far in this regard. But in connection with the circular economy, a uniform classification system has been established throughout the country so that all households in the country classify their waste into the same categories and have the same bins outside their homes. Harmonizing classification is part of increasing the rate and quality of recycling in the country. Now all households have four categories outside their homes, general waste, organic waste,	Increased emphasis could be placed on energy efficiency in the municipalities' climate actions and energy transitions and energy efficiency	Very little impact on the project

	plastic and paper. Other categories must be taken to local recycling centres that should be in every town.	projects should be pushed forward, especially in those areas of the country where there is no geothermal energy supply. It is important to use as little electricity as possible for heating, as it has been difficult to increase energy production in the country in recent years. But this requires investing in energy-saving infrastructure	
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		in the municipalities , which will improve energy efficiency and the operation of the municipalities in the long term, but it can be difficult to get this through the government system when each municipal council is only in office for four years and has difficulty investing large amounts of capital in	
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		long-term investments.	
Relevant Local Policy - Akureyri municipality			
Relevant JAP Excerpt	Update	Review	Implications / Potential for HYBES
In 2016, an environmental and transport policy was put forward. A dedicated sustainability focus company called Vistorka (vistorka.is) was established in 2015 by Norðurorka (local power distributor, owned by the municipality). Recent activities include a pre-feasibility study for a biomass plant and overseeing electric vehicle charging infrastructure.	At the end of 2024, Norðurorka, the owner of Vistorka, made the decision to close the company in its current form. Vistorka's board was given the task of sharing Vistorka's projects with other parties as appropriate. Projects related to the municipality were transferred to the appropriate department of the municipal corporation, and a new employee was hired to take over projects that had previously been handled by Vistorka. This employee had previously worked at Vistorka and is therefore well-versed in the projects that the person in question will manage for the municipality related to environmental issues and energy transition. Other Vistorka projects were transferred to SSNE, EIM and the Environment and Energy Agency.	It is too early to say what impact this will have on the environmental issues in Akureyri, which Vistorka was responsible for. Vistorka was working hard for the entire region and, for example, applied for countless grants that returned over 100 million	Vistorka worked on projects for HYBES but had delivered all the work assigned to that company and had settled with the company before it was closed. The projects related to HYBES are now the responsibility of the

		ISK to the area related to environmentally friendly projects. The Líforkuver project is still active, has its own board and website, and is now more connected to the state than to the municipality.	Environment and Energy Agency and there will therefore be no significant change to HYBES projects upon the closure of Vistorka. Ireland was interested in using Vistorka's school projects and approach to developing projects related to education and then related to dissemination
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			ng information to the public. These projects were managed on the Vistorka website, and it is now owned by the Environmen t and Energy Agency so we can still share those projects in the HYBES partnership .
Faroe Islands – Municipalities			
Relevant Local Policy			

Relevant JAP Excerpt	Update	Review	Implications / Potential for HYBES
Many of the larger municipalities in the Faroe Islands have in recent years formulated policies for environment and energy with targets for reduction of emission of greenhouse gases. The goal of the municipality of Klaksvík is to reduce the emission of greenhouse gases by 20 % in 2030 compared to 2005. In the Energy Policy 2021-2027 for the institutions in the municipality of Tórshavn the goal is to reduce the emission of greenhouse gases by 50 % in 2027 compared to 2016 and with focus on 1) reduction in use of fossil fuels to heat institution within the municipality, 2) a shift to more energy saving street lightning and to 3) a shift from fossil fuel cars to electric cars. Tórshavn municipality has in 2020 installed three 15kWp solar panels on different buildings and several buildings have replaced oil burners with heat pumps in the most recent years. In April 2023 a new heating system for a school and an elderly home in the village of Lórvík (1040 inhabitants) was inaugurated. In this system ground source heat pumps replaces oil burners. The system also includes large hot water storage tanks that can utilise excess wind energy. The large industrial companies, including fish factories and fish farming facilities, are preparing for a decarbonised future. Hiddenfjord, one of the main fish farming companies, installed in 2022 a 195kWp solar system on the roof of one of their buildings and are preparing for more. nBakkafrost, another main fish farmer,	In Tórshavn Municipality the work to decarbonise all activities is ongoing and in accordance with The Energy Policy 2021-2027. There are several busses that service all parts of the Municipality. One route is now operated by electrical busses, and the goal is to replace all busses running on fossil fuel. A recent decision was made in the Municipality council that the next contract on garbage collection should be based on an electric vehicle. Solar energy has an increasing interest in the Faroe Islands and around 30 smaller systems (3-11kWp) have been installed and Hiddenfjord has added another 962kWp solar panels to their 195kWp from 2022. Meetings have been held between the authority, the utility company SEV and the House of Industry to develop a more attractive remuneration to solar panel owners.		



built a new 15m fish farming service boat in 2022 that runs on electricity, and the concept is prepared for using excess wind for charging. The Australian magazine Baird Maritime announced this boat to be 'Best Small Fish Farm support vessel 2022'. Several fish factories are preparing to produce process heat and steam from excess wind energy rather than oil burners.	The heating system that Leirvík Municipality has installed to heat the school, and a nursing home is in continuous operation. Some difficulties with the internet link interrupted data collection for a period. Learnings until now indicate that using resistive heating even with low electricity price cannot compete with using heat pumps alone.		
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