EnvEcon Response to DECC Call for Expert Evidence

1. Introduction

The next iteration of the Climate Action Plan (CAP23) will place a heavy emphasis on implementation and deliver the established methods and timelines required to achieve defined actions. EnvEcon maintain modelling and analytic capabilities which can support the development and implementation of CAP23 by providing an understanding of how changes in certain parameters will influence environmental issues. In addition, our methodologies may also be used to design or modify policy interventions to manage such changes. EnvEcon have invested heavily in the development spatial analytical capacities, and we incorporate this into many facets of our research and consulting services. Examples of our spatial analysis work includes: the targeting of policy interventions to areas where the greatest impact can be achieved; the analysis of spill over effects and clustering; and the localised assessment of health and other social impacts from a given intervention. The remainder of this report will provide further information on our core models; analytical methodologies and annual challenge and compliance report – which analyses the multi-faceted environmental challenges that Ireland faces in regard to air and climate.

It is also important to note that EnvEcon team members will chair or otherwise participate in a number of the CAP 2023 chapter working groups, thus we will ensure that our potential contributions feed directly into those processes. Nonetheless we provide some overview points on the call for evidence below.

2. Core Models

Our core modelling tools are the GAINS Ireland model and FLEET Ireland model. In each case calibration of the model is an annual task with the objective of maintaining in any given year, a base scenario that is reflective of best available national data (current and outlook) at that point in time.

2.1. GAINS Ireland

GAINS Ireland is an integrated assessment model that can evaluate the impacts and interactions of scenarios in respect of both GHG and air pollution across all sectors of the economy. The GAINS Europe model has underpinned the development of air pollution policy in Europe and the broader UNECE region for over 20 years and has also played a central role in the ongoing development and evaluation of the European Commission's Effort Sharing Decision proposals, in particular dealing with non-CO_2 emissions and the agricultural sector. EnvEcon are the only team in Ireland, and one of the few in the world, that manage and run a national instance of this model.

2.2. FLEET Ireland

The FLEET Ireland model is based off the COPERT system which is the standard tool for road transport emissions estimation and analysis in Europe. Whilst powerful and detailed for emissions estimation, the system ideally requires external analysis and integration for policy support. In collaboration with the development team at COPERT, EnvEcon have evolved a connected approach for fleet analysis and road transport policy modelling. This approach has allowed us greater scope to incorporate a range of national data transport sets that we have assembled into our analyses, as well as to run exogenous policy assessments for fleet impacts that are then run back through the model for detailed emission outcomes. This tool is used extensively in much of our transport policy related research.

3. Analytical Methodologies

EnvEcon offer a number of specialised analytical methodologies. These methodologies align with the identified policy needs of climate and air action in Ireland, and importantly these methods can be tailored to specific dynamic queries in many thematic and sectoral areas. In each case we have the capacity to reapply the method with new data, new parameters, or new lines of investigation to support the evolving needs of policy decision making. We believe this dynamic approach to policy analysis and policy redesign will be essential for CAP 2023 and beyond.

3.1. Air Source Heat Pump Targeting

EnvEcon have developed a methodology to support synergistic policy design across climate, air, health and just transition policy goals for the deployment of air source heat pumps in Ireland. It spatially analyses emissions and air pollutant concentration outcomes for both targeted and non-targeted deployments of heat pumps and shows that a focused deployment of just 3% of the national heat pump target on solid-fuel homes could offer similar progress on climate goals but with a substantial impact in terms of reducing air pollution hot spots. For the Irish residential heating season (October–March), the targeted solid fuel scenario delivers average PM2.5 concentration decreases of 20–34%. The results identify targeted communities as often being in areas of relative deprivation, and as such, direct support for fabric retrofitting and heat pump technology installation offers the potential to simultaneously advance climate, air and just transition policy ambition.

Full methodology available at: https://www.sciencedirect.com/science/article/pii/S2590162122000090

3.2. Electric Vehicle Uptake Rate Timing

Vehicle electrification scenarios offer insight to guide policymakers on what may be expected if a given pathway can be realised from the array of policy options that may be deployed to deliver the scenario. EnvEcon have developed a methodology which explores the impact of timing for passenger car and commercial vehicle electrification. It can support policymakers in assessing the outcomes of different EV penetration scenarios, including outcomes in terms of GHGs emissions, air pollutants, and managing national progress to international targets. It delivers a granular assessment of multiple vehicle electrification scenarios to inform the degree of urgency, scale of support and the focus and timing of interventions appropriate for defined EV penetration ambitions. Results show that a faster electric vehicle uptake more than doubles the cumulative GHG emissions reduction by 2030.

Full methodology available at: https://www.sciencedirect.com/science/article/pii/S2590198221001834

3.3. Solid Fuel Regulation Analysis

In 2021 a suite of new nationwide solid fuel regulation were formally proposed to address the impacts associated with residential emissions of air pollutants. To provide a policy impact assessment, EnvEcon developed a methodology to estimate the associated emissions, health, and environmental impacts of the proposed changes included in the new regulations subject to specific defined assumptions. A time-series analysis was presented across the years 2023, 2024 and 2025 to capture the impacts of the transitions. This method characterises the outcomes of the proposed regulations principally in the form of fuel switches and changes in the associated emission factors of specific fuels.

EnvEcon has submitted the final report with full methodology and results to the DECC.

3.4. Total Cost of Ownership

This methodology, developed by EnvEcon can support policymakers in evaluating the current incentives for accelerated EV uptake. It calculates and contrasts the total cost of ownership (TCO) of a range of cars and driving profiles, in a given policy framework of taxes, grants and fuel prices using Ireland as a case study. It offers the capacity to analyse changes in TCO associated with specific policy intervention proposals, including travel patterns, car-segment pricing, taxation, grant policy, fuel costs, and carbon pricing. Notably, it is not limited to understanding the overall TCO; it can also demonstrate how policy may design or modify interventions to drive accelerated EV uptake rates. For example, the removal of an existing EV subsidy can be calculated to test the relevance of the current subsidy scheme for the TCOs of the selected cars and thereafter estimate the relative impact of its removal.

Full methodology available at: https://www.sciencedirect.com/science/article/pii/S277242472200021X

3.5. Working from Anywhere Index

The Working from Anywhere Index (WFAI) is a composite indicator which can produce a spatially refined analysis of feasibility to work from anywhere. It allows for an informed choice by decision makers regarding the success or possible need for adaption of a specific policy instrument. Analysis with the WFAI is undertaken using GIS software at Small Area level. The composite approach allows for a multidimensional analysis by combining six indicators which inform two weighted categories which relate to: 1) WFA Feasibility Factors (FWFA) and 2) WFA Personal Preference Factors (PWFA). The application of the WFAI is not limited to understanding how changes in certain parameters will influence feasibility to WFA; it can also demonstrate how policy may design or modify interventions to manage changes. For example, it can be used to assist policymakers in estimating the impact of enhanced access to high-speed broadband or the development of co-working locations. The overall WFAI, and the publicly available variables included within it, are structured in a manner that can accommodate recalibration and sensitivity analysis to provide a useful and dynamic decision support tool for policy within a GIS framework.

Full methodology available at: https://www.sciencedirect.com/science/article/pii/S26659627220000228

4. Challenge and Compliance Report

The CC report for Ireland is developed on an annual basis by EnvEcon to ensure a broad range of stakeholders can take stock of the multi-faceted environmental challenges that Ireland faces in a given year in regard to air and climate. The report synthesises in an accessible manner the current national position and trends under both air and climate targets – specifically the NECD and the climate targets under the non-emissions trading scheme Effort Sharing Regulation (NETS ESR). It presents the latest official national emissions data in a manner that integrates air and climate emissions inventory and emissions forecasts across all sectors in a harmonised structure and describes these air and climate emissions within comparable sub-sectoral groupings to offer support to multi-thematic policy targeting and action. In brief, one core objective of this report is to allow those who may not be familiar with all sectors or thematic contexts, to recognise interactions, overlap, opportunities and risk in regard to emissions and emissions mitigation policy. In this same context, the report also endeavours to offer insight on the relevant technical developments that relate to the nuances of emissions reporting and compliance strategy in an Irish and European context. These aspects are rarely intuitive, and as such the ambition is to provide an accessible overview to enhance awareness in that regard.

5. Transport Poverty Risk Index

The key objective of EnvEcon's Transport Poverty Risk Index (T-PRI) is to provide a robust evidence base to help ensure effective measurement and management of this particular form of poverty risk. The conceptual similarities between the problems of energy poverty and transport poverty, and their significance for policy design, is receiving much greater recognition in recent energy and social science research.

The T-PRI builds upon EnvEcon's HH-EPRI. It is a composite index which combines a set of proxy indicators of transport poverty, based on both relevant literature and publicly available Irish datasets, including: 2016 Census data; POWSCAR data; and National Car Testing Service Data. Analysis with the T-PRI is undertaken using GIS software at Small Area (SA) level. In total, there are 18,641 SAs in Ireland each containing, on average, 80 to 120 households. The T-PRI accounts for all aspects of transport poverty risk encompassing spatial indicators across three key transport related sub-concepts: affordability; mobility; and accessibility. Transport affordability in this case refers to the inability to meet the cost of transport required for essential travel. Transport mobility refers to difficulties encountered in travel due to a systemic lack of sufficient transport. Finally, transport accessibility focuses on the degree of difficulty involved in reaching key activities including education and employment at reasonable time, convenience and cost.

Importantly, as with each of EnvEcon's composite indices the T-PRI is dynamic. It therefore offers the capacity to analyse changes in overall transport-poverty risk associated with specific policy intervention proposals, including major contemporary environmental policy transitions such as car fuel price changes and carbon taxation. The T-PRI also has the capacity to model changes in levels and spatial distribution of transport-poverty risk based on future car market share scenarios such as increased levels of EV's on the national car fleet.

6. Home-Heating Energy Price Index

In an era of great transition, which will impact heavily on energy and energy use, it is important that policymakers understand who is at risk of energy poverty, where they are, and how ongoing transitions and changes may affect energy poverty risk. The Home-Heating Energy Poverty Risk Index (HH-EPRI), designed by EnvEcon can be used to identify this information and support policymakers in mitigating energy poverty. It is a composite indicator which can produce a spatially refined analysis of home-heating energy poverty risk which allows for an informed choice by decision makers regarding the success or possible need for adaption of a specific policy instrument. As applied to the Irish case, it is based on both relevant literature and publicly available Irish datasets that are routinely updated in the system.

Analysis with the HH-EPRI is undertaken using GIS software at Small Area (SA) level. In total, there are 18,641 SAs in Ireland each containing, on average, 80 to 120 households. The composite approach allows for a multidimensional analysis of energy poverty by combining ten indicators which inform three weighted categories which relate to: **1) Heating Requirements (HR) of the building; 2) Building Characteristics**

(BC) and 3) Householder Characteristics (HC). The application of the HH-EPRI is not limited to understanding how changes in certain parameters will influence energy poverty; it can also demonstrate how policy may design or modify interventions to manage changes. For example, if carbon taxes were to increase to 100 euro per tonne by 2030 as part of the national climate action strategy, how and in which specific areas does this affect energy poverty risk across Ireland?

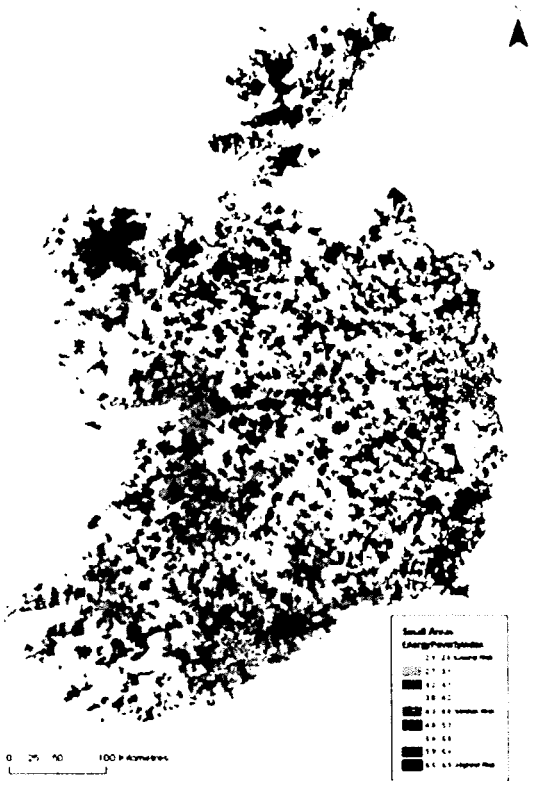
6.1. Static Index Results

The current spatial distribution of the composite HH-EPRI scores at SA level in Ireland is illustrated in **Map 1.** The approach applied on the national scale for Ireland is to divide the HH-EPRI scale into three shades each of red, blue, and green. The darkest red represents the highest EPRI risk category, whilst the lightest green represents the lowest EPRI risk category. Value Ranges are set out in **Table 1.**

Table 1 – Map Colour Key:

Category	Value Range
1. Higher Red	6.45–6.90
2. Medium Red	5.90–6.44
3. Lower Red	5.35–5.89
1. Higher Blue	4.80–5.34
2. Medium Blue	4.25–4.79
3. Lower Blue	3.70–4.24
1. Higher Green	3.15–3.69
2. Medium Green	2.60–3.14
3. Lower Green	2.05–2.59

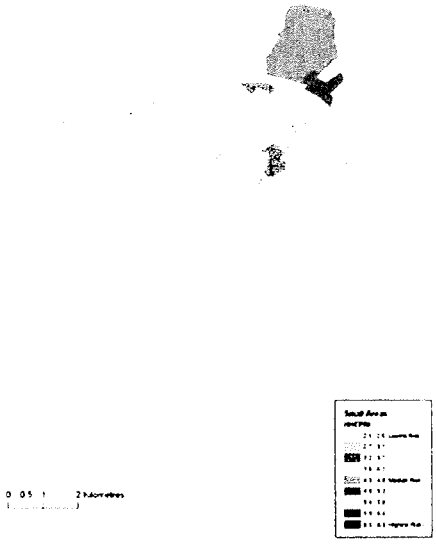
Map 1 - Overall Energy Poverty Index:



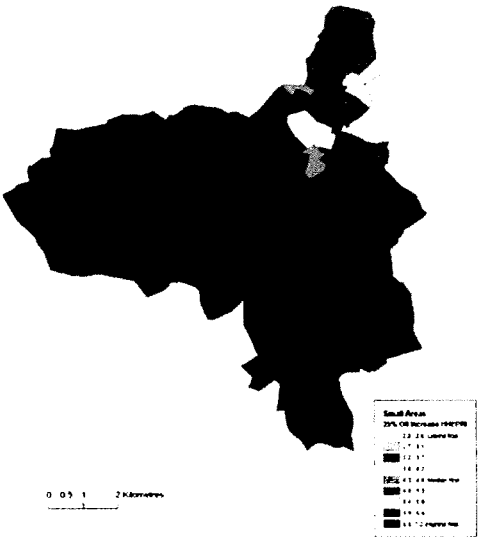
6.2. Dynamic Policy Support Tool

The HH-EPRI can also operate in a more dynamic manner to inform decision makers as to how certain developments may affect energy poverty risk across the country. **Map 2** and **Map 3** present the impact of a 25% oil price increase in a small town in the Midlands region of Ireland. This town is made up of 12 SAs containing a total of 1075 households. The 25% increase in oil price will result in 43% of all households in the town moving into Category 8 - Highest Risk (Medium) **(Table 1).**

Map 2 – 0% Oil Price Index:



Map 3 – 25% Oil Price Index:



Full methodology available at: https://www.sciencedirect.com/science/article/pii/S0301421520305127