Policy Simulation Modelling to Inform National Carbon Budget Pathways

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Ireland’s Green House Gas Emissions
Where do they come from?

- LULUCF: 11%
- Energy Industries: 15%
- Manufacturing: 7%
- Residential: 10%
- Agriculture: 33%
- Transport: 16%

69 MtCO$_2$eq

Source: Environmental Protection Agency, (Ireland) 2022 accessible at https://www.epa.ie/ghg
GHG Emissions in Ireland by sector
(Past: 1990 - 2021, Targeted: 2025, 2030, 2050)

Carbon Budget 1
(59 MTCO2eq. avg. p/a)

Carbon Budget 2
(40 MTCO2eq. avg. p/a)

Net Zero
GHG Emissions in Ireland by sector
(Past: 1990 - 2021, Targeted: 2025, 2030, 2050)

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Net Zero
Simulation Modelling

Activity x Intensity

Private cars
Active modes
Public Transport
Navigation & Aviation
Freight
Simulation Modelling

Data Sources
- Irish Car Stock Model
- National Travel Survey
- Public Transport Reporting
- Irish Passenger Transport Emissions and Mobility Model
- Central Statistics Office Freight Statistics

LEAP Ireland Model Transport Sector
- Demand – Passenger kilometres
- Demand – Vehicle Kilometres
- Demand – Tonne Kilometres
- Fuel Types
- Mode Types
- Technologies

Activity

Intensity

Results
- Scenarios
- Emissions (MTCO₂eq.)
- Energy Consumption (MWH)
Simulation Modelling

Transport Policies

Biofuel Blending

Working from Home
845,000 EVs

Eco-driving with HGVs
95,000 Electric LGVs
3500 Electric HGVs

Rail electrification

Electric buses

Additional 1,500,000 public & active trips

Increased biofuel blending rates for ethanol (10%) and biodiesel (12%)
Simulation Modelling

Transport Policies

Biofuel Blending
Working from Home
845,000 EVs

Eco-driving with HGVs
95,000 Electric LGVs
3500 Electric HGVs

Rail electrification

Electric buses

Additional 500,000 public & active trips

Working from home 2 days per week, where possible
Simulation Modelling

Transport Policies

Biofuel Blending
Working from Home
845,000 EVs
Eco-driving with HGVs
95,000 Electric LGVs
3500 Electric HGVs
Rail electrification
Electric buses
Additional 500,000 public & active trips

Introduction of 854,000 Electric vehicles by 2030
Transport Policies

Biofuel Blending
Working from Home
845,000 EVs
Eco-driving with HGVs
95,000 Electric LGVs
3500 Electric HGVs
Rail electrification
Electric buses

Additional 500,000 public & active trips

10% improvement in fuel efficiency due to training/improved practices
Transport Policies

Biofuel Blending

Working from Home
845,000 EVs

Eco-driving with HGVs
95,000 Electric LGVs
3500 Electric HGVs

Rail electrification

Electric buses

Additional 500,000 public & active trips

Increased electrification of Freight transport (Heavy & Light Goods)
Simulation Modelling

Transport Policies

Biofuel Blending
Working from Home
845,000 EVs
Eco-driving with HGVs
95,000 Electric LGVs
3500 Electric HGVs
Rail Electrification
Electric Buses

Additional 1,500,000 public & active trips

Increased electrification of Public transport (Rail & Buses)
Simulation Modelling

**Transport Policies**

- **Biofuel Blending**
- **Working from Home**
  - 845,000 EVs
- **Eco-driving with HGVs**
  - 95,000 Electric LGVs
  - 3,500 Electric HGVs
- **Rail electrification**
- **Electric buses**

Additional 1.5 million public & active trips

Rapid increase in use of public transport and active modes
Do these policy measures meet the carbon budgets?

- 50% emissions public service efficiency
- 500K journeys walking and cycling
+ Working from home 2 day per week
+ 500K retrofitting
+ 3,500 HGV (freight) electrification
& more!
Data and Assumptions

Carbon Budget targets
Services
Agriculture
Fuel Types
Industry
Residential

Results
Do these policy measures meet the carbon budgets?

Iteration

- 50% emissions public service efficiency
- 500K HGV (freight) electrification
- 3,500 HGV (freight) electrification & more!

+ Working from home 2 day per week
+ 500K retrofitting
+ 500K journeys walking and cycling

Iteration Slide 6/10
Cumulative Carbon Budget Comparison - UCC SC Scenario VS Carbon Budgets (MTCO₂)

Carbon Budget 1 target: 295 MTCO₂eq.
- Agriculture Sector Emissions (EPA WAM)
- Transport Emissions
- Electricity Sector Emissions
- Residential Emissions
- Industry Emissions
- Avoided Emissions

Carbon Budget 2 target: 200 MTCO₂eq.
- Agriculture Sector Emissions (EPA WAM)
- Transport Emissions
- Electricity Sector Emissions
- Residential Emissions
- Industry Emissions
- Avoided Emissions

LULUCF

2021 - 2025

294 MTCO₂eq

2026 - 2030

248 MTCO₂eq

Carbon Budget 1 target: 295 MTCO₂eq.
Carbon Budget 2 target: 200 MTCO₂eq.
Policies Synergies – the bonus effect

Modal Shift + Public Transport Electrification

Passenger Transport Emissions (MTCO₂eq.)

6.4

REF
Diminishing Returns – the double counting effect

EVS + Biofuel Blending

Passenger Transport Emissions (MTCO2eq.)

6.4

REF
Reflections and Future Work

Impact of early action and delays on carbon budgets

Behavioural changes and new technologies beyond those targets in the Climate Action Plan 2023

Climate Action Plan 2023 policies
Climate Action Plan 2024 policies
Questions & suggestions welcome,
Thanks for listening!

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Dr. Fionn Rogan
Senior Research Fellow
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<table>
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<th>Carbon Budget 1</th>
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<td>Non-Energy (%)</td>
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• Multi-sector energy and emissions simulation model methodology with carbon budget analysis is presented
• Interaction effect between public transport and modal shift showing additional savings of 0.1 MTCO2 passenger transport decarbonisation policies is examined
• Interaction effect showing emissions savings overlap and ‘double counting’ effect between EVs uptake and biofuel blending of 0.3 MTCO2, and EVs and modal shift 0.2 MTCO2
• Transport, Residential, Industry and Electricity sectors meet Carbon Budget 1 (2021 – 2025) in the scenario presented
• Residential and Services sector meets Carbon Budget 2 (2026-2030) sectoral ceilings in scenario presented