

Evidence Synthesis Report 14

Impacts and Opportunities of the Clean Industrial Deal in Ireland

Authors: J. Andrew Kelly, J. Peter Clinch
and Vishwajeet Pundkar

www.epa.ie



Rialtas na hÉireann
Government of Ireland

Environmental Protection Agency

The EPA is responsible for protecting and improving the environment as a valuable asset for the people of Ireland. We are committed to protecting people and the environment from the harmful effects of radiation and pollution.

The work of the EPA can be divided into three main areas:

Regulation: Implementing regulation and environmental compliance systems to deliver good environmental outcomes and target those who don't comply.

Knowledge: Providing high quality, targeted and timely environmental data, information and assessment to inform decision making.

Advocacy: Working with others to advocate for a clean, productive and well protected environment and for sustainable environmental practices.

Our Responsibilities Include:

Licensing

- > Large-scale industrial, waste and petrol storage activities;
- > Urban waste water discharges;
- > The contained use and controlled release of Genetically Modified Organisms;
- > Sources of ionising radiation;
- > Greenhouse gas emissions from industry and aviation through the EU Emissions Trading Scheme.

National Environmental Enforcement

- > Audit and inspection of EPA licensed facilities;
- > Drive the implementation of best practice in regulated activities and facilities;
- > Oversee local authority responsibilities for environmental protection;
- > Regulate the quality of public drinking water and enforce urban waste water discharge authorisations;
- > Assess and report on public and private drinking water quality;
- > Coordinate a network of public service organisations to support action against environmental crime;
- > Prosecute those who flout environmental law and damage the environment.

Waste Management and Chemicals in the Environment

- > Implement and enforce waste regulations including national enforcement issues;
- > Prepare and publish national waste statistics and the National Hazardous Waste Management Plan;
- > Develop and implement the National Waste Prevention Programme;
- > Implement and report on legislation on the control of chemicals in the environment.

Water Management

- > Engage with national and regional governance and operational structures to implement the Water Framework Directive;
- > Monitor, assess and report on the quality of rivers, lakes, transitional and coastal waters, bathing waters and groundwaters, and measurement of water levels and river flows.

Climate Science & Climate Change

- > Publish Ireland's greenhouse gas emission inventories and projections;

- > Provide the Secretariat to the Climate Change Advisory Council and support to the National Dialogue on Climate Action;
- > Support National, EU and UN Climate Science and Policy development activities.

Environmental Monitoring & Assessment

- > Design and implement national environmental monitoring systems: technology, data management, analysis and forecasting;
- > Produce the State of Ireland's Environment and Indicator Reports;
- > Monitor air quality and implement the EU Clean Air for Europe Directive, the Convention on Long Range Transboundary Air Pollution, and the National Emissions Ceiling Directive;
- > Oversee the implementation of the Environmental Noise Directive;
- > Assess the impact of proposed plans and programmes on the Irish environment.

Environmental Research and Development

- > Coordinate and fund national environmental research activity to identify pressures, inform policy and provide solutions;
- > Collaborate with national and EU environmental research activity.

Radiological Protection

- > Monitoring radiation levels and assess public exposure to ionising radiation and electromagnetic fields;
- > Assist in developing national plans for emergencies arising from nuclear accidents;
- > Monitor developments abroad relating to nuclear installations and radiological safety;
- > Provide, or oversee the provision of, specialist radiation protection services.

Guidance, Awareness Raising, and Accessible Information

- > Provide independent evidence-based reporting, advice and guidance to Government, industry and the public on environmental and radiological protection topics;
- > Promote the link between health and wellbeing, the economy and a clean environment;
- > Promote environmental awareness including supporting behaviours for resource efficiency and climate transition;
- > Promote radon testing in homes and workplaces and encourage remediation where necessary.

Partnership and Networking

- > Work with international and national agencies, regional and local authorities, non-governmental organisations, representative bodies and government departments to deliver environmental and radiological protection, research coordination and science-based decision making.

Management and Structure of the EPA

The EPA is managed by a full time Board, consisting of a Director General and five Directors. The work is carried out across five Offices:

1. Office of Environmental Sustainability
2. Office of Environmental Enforcement
3. Office of Evidence and Assessment
4. Office of Radiation Protection and Environmental Monitoring
5. Office of Communications and Corporate Services

The EPA is assisted by advisory committees who meet regularly to discuss issues of concern and provide advice to the Board.

EPA RESEARCH PROGRAMME 2021–2030

Impacts and Opportunities of the Clean Industrial Deal in Ireland

(FTP-2025-06)

EPA Research Evidence Synthesis Report

Independent scientific research funded by the Environmental Protection Agency and the Climate Change Advisory Council

Prepared by EnvEcon Decision Support

Authors:

J. Andrew Kelly, J. Peter Clinch and Vishwajeet Pundkar

ENVIRONMENTAL PROTECTION AGENCY
An Ghníomhaireacht um Chaomhnú Comhshaoil
PO Box 3000, Johnstown Castle, Co. Wexford, Ireland

Telephone: +353 53 916 0600 Fax: +353 53 916 0699
Email: info@epa.ie Website: www.epa.ie

ACKNOWLEDGEMENTS

This report is published as part of the EPA Research Programme 2021–2030. The EPA Research Programme is a Government of Ireland initiative funded by the Department of Climate, Energy and the Environment. It is administered by the Environmental Protection Agency, which has the statutory function of co-ordinating and promoting environmental research. This research study was funded under the EPA Research Fast-Track to Policy funding scheme, which is designed to support short-term, evidence-based research studies where an urgent policy need is demonstrated. The authors would like to acknowledge co-funding received from the Climate Change Advisory Council Secretariat. This research project was proposed for Fast-Track to Policy funding by the Climate Change Advisory Council Secretariat.

The authors would like to acknowledge the members of the project steering committee, namely Phillip O’Brien and Meabh Gallagher (Climate Change Advisory Council Secretariat), Catriona Power (Enterprise Ireland), Mairéad Fitzsimons (Department of Climate, Energy and the Environment), and Alan Dempsey and Hillary Brosnan (Department of Enterprise, Tourism and Employment). The authors would also like to acknowledge the support of the Research Project Manager on behalf of the Environmental Protection Agency, namely Niamh McCormack.

DISCLAIMER

Although every effort has been made to ensure the accuracy of the material contained in this publication, complete accuracy cannot be guaranteed. The Environmental Protection Agency, the authors and the steering committee members do not accept any responsibility whatsoever for loss or damage occasioned, or claimed to have been occasioned, in part or in full, as a consequence of any person acting, or refraining from acting, as a result of a matter contained in this publication. Any opinions, findings or recommendations expressed in this report are those of the authors and do not reflect a position or recommendation of the EPA. All or part of this publication may be reproduced without further permission, provided the source is acknowledged.

This report is based on research carried out in/data from October 2025 and March 2026. More recent data may have become available since the research was completed.

The EPA Research Programme addresses the need for research in Ireland to inform policymakers and other stakeholders on a range of questions in relation to environmental protection. These reports are intended as contributions to the necessary debate on the protection of the environment.

EPA RESEARCH PROGRAMME 2021–2030
Published by the Environmental Protection Agency, Ireland

ISBN: 978-1-80009-424-6

October 2026

Price: Free

Online version

Project Partner

EnvEcon Decision Support

Lonsdale House

Avoca Avenue

Blackrock

Co. Dublin

Ireland

Email: Admin@EnvEcon.eu

Contents

Acknowledgements	ii
Disclaimer	ii
Project Partner	iii
List of Figures	vii
List of Tables	viii
Executive Summary	ix
1 Introduction	1
1.1 Objectives	1
1.2 Defining the Clean Industrial Deal	1
2 Overview of the Research	3
2.1 Legislative Framework of the Clean Industrial Deal	3
2.2 Alignment with the Irish Policy Context	3
2.3 Irish Industrial Structure and Baseline Assessment	4
3 Examination of the Findings	11
3.1 Affordable Energy	11
3.2 Lead Markets	13
3.3 Financing through Public and Private Investment	15
3.4 Circularity and Access to Materials	17
3.5 Global Markets and International Partnerships	19
3.6 Skills and the Quality of Jobs Needed for Social Fairness and a Just Transition	22
3.7 Clean Energy Technology Deployment and Industrial Competitiveness	23
3.8 Large Energy Users: Connection Policy, Strategic Planning and Grid Integration	24
3.9 Clean Technology Manufacturing Capacity	25
3.10 Economic Impact and Environmental Assessment	25
4 Conclusions and Policy Recommendations	27
References	29

Appendix 1	Summary Tables	35
Appendix 2	Spatial Distribution of Employment in Ireland’s Pharmaceutical and Food and Beverage Industries	37
Appendix 3	Supplementary Material for Section 3.3: Financing through Public and Private Investment	39
Appendix 4	Supplementary Material for Section 3.4: Circularity and Access to Materials	41
Appendix 5	Supplementary Material for Section 3.5: Global Markets and International Partnerships	44
Appendix 6	Supplementary Material for Section 3.6: Skills and the Quality of Jobs Needed for Social Fairness and a Just Transition	47
Appendix 7	Electricity System Flexibility, Storage and Market Design	50
Appendix 8	Hard-to-abate Industries and Competitive Exposure	52
Appendix 9	Supplementary Material for Sections 3.7–3.10: Clean Energy, Large Energy Users, Clean Technology and Economic Impact	53
Abbreviations		55

List of Figures

Figure 2.1.	Legislative framework, objectives and key policy instruments of the CID	3
Figure 2.2.	Concentration of net selling value across Irish industries (2012 and 2023)	4
Figure 2.3.	Change in net selling value across top-selling industries (2012–2023)	5
Figure 2.4.	Manufacturing energy consumption by sector (2017–2023)	6
Figure 2.5.	Manufacturing energy use by energy product type (2017–2023)	6
Figure 2.6.	Metered electricity consumption, GWh (2015–2024)	7
Figure 2.7.	Productivity and emissions intensity across selected Irish sectors	8
Figure 2.8.	Electrification in Ireland and the EU (2017–2023)	10
Figure 3.1.	Six pillars of the CID	11
Figure 3.2.	Total energy use across Irish industries and services sectors (2017–2023)	12
Figure 3.3.	Change in labour and electricity costs in Ireland and across EU Member States	14
Figure 3.4.	Distribution of Innovation Fund projects across EU Member States	16
Figure 3.5.	CMUR (2024) across EU Member States	17
Figure 3.6.	Concentration of Irish trade by top-20 export partners and industries	20
Figure 3.7.	Concentration of exports to the USA across the top-five exporting sectors (2015–2025)	21
Figure A2.1.	Employment in pharmaceuticals, medicinal chemicals and botanical products manufacturing by county (2022)	37
Figure A2.2.	Employment in food and beverage manufacturing by county (2022)	38

List of Tables

Table A1.1.	Summary of major financing instruments	35
Table A1.2.	Summary of coordinated regulatory initiatives and CID alignment	35
Table A1.3.	The status of Ireland’s progress on key environmental targets	36
Table A1.4.	Summary of transition costs and long-term benefits	36

Executive Summary

The European Union's (EU) Clean Industrial Deal (CID), adopted in early 2025, marks a decisive shift in European industrial policy, integrating decarbonisation with competitiveness, supply chain resilience and strategic autonomy under a single framework. Responding to the central finding in Draghi's 2024¹ report on EU competitiveness that decarbonisation can strengthen industrial competitiveness when policies are well aligned, the CID structures its response through six interdependent pillars: affordable energy; lead markets; financing; circularity and access to materials; global markets and international partnerships; and skills for a just transition. Against an estimated €480 billion annual investment gap in clean energy and industrial innovation, European Commission and International Monetary Fund simulations project a 6% increase in EU output within 15 years from a sustained investment push.

For Ireland, the CID arrives at a structurally consequential moment. Irish manufacturing is dominated by three sectors, accounting for over 70% of manufacturing output: pharmaceuticals (42.5% of net selling value), food processing (17.2% of net selling value) and chemicals (11.5% of net selling value). Industrial emissions must fall 35% from 2018 levels by 2030.² Yet, at approximately 6.0MtCO₂eq in 2025, having already exceeded the sector's first carbon budget ceiling by 9.1%,³ and current projections indicate it remains off track to meet its target, reaching only 6.4MtCO₂eq under the With Existing Measures scenario and 6.3MtCO₂eq under the With Additional Measures scenario by 2030, reductions of just 10.1% and 11.8% respectively against the 35% target.

Energy affordability is Ireland's most acute vulnerability in this context. Ireland recorded the highest industrial electricity prices (excluding taxes and levies) in the EU in the second half of 2025 at approximately €0.247/kWh, compared with roughly €0.182/kWh in Germany and €0.129/kWh in France, and an EU average of €0.151/kWh. An energy import dependency of 78.4% further amplifies exposure to price volatility. The CID's Affordable Energy Action Plan, Clean Industrial Deal State Aid Framework (CISAF) and European Grids Package provide relevant instruments, but their effectiveness depends on accelerating grid expansion, currently requiring 7–10 years for large industrial connections, and on resolving structural competition between data centre load (27% of electricity generation in 2025) and industrial electrification. The Celtic Interconnector, with commercial go-live planned for Q1 2028, is a significant near-term development.

Ireland's exposure to the financing pillar is characterised by strong domestic instruments but underperforming EU fund capture. The €300 million Environmental Aid Scheme, the Sustainable Energy Authority of Ireland's Excellence in Energy Efficiency Design programme and the Strategic Banking Corporation of Ireland's Growth and Sustainability Loan Scheme provide accessible national pathways. Furthermore, Ireland has surpassed the €1 billion milestone in Horizon Europe funding,⁴ securing €1.02 billion in research and innovation awards to date, putting it on track to exceed its €1.5 billion Impact 2030 target. However, only two Irish projects have received EU Innovation Fund support to date, reflecting a structural gap between early-stage

1 Draghi, M. (2024). *The Future of European Competitiveness: Part A – A competitiveness strategy for Europe*. Publications Office of the European Union, Luxembourg.

2 EPA (Environmental Protection Agency) (2026b). *Ireland's Greenhouse Gas Emissions Projections 2025–2030*. EPA, Johnstown Castle, Ireland.

3 EPA (Environmental Protection Agency) (2026a). Ireland's greenhouse gas emissions decrease by 2.2% in 2025. News release. Available online: <https://www.epa.ie/news-releases/news-releases-2026/irelands-greenhouse-gas-emissions-decrease-by-22-in-2025-.php> (accessed 7 July 2026).

4 DFHERIS (Department of Further and Higher Education, Research, Innovation and Science) (2025a). Ireland reaches €1 billion milestone in Horizon Europe funding. Press release. Available online: <https://www.gov.ie/en/department-of-further-and-higher-education-research-innovation-and-science/press-releases/ireland-reaches-1-billion-milestone-in-horizon-europe-funding/> (accessed 4 December 2025).

enterprise support and the deployment-ready project maturity required by EU competitive instruments; filling this gap is a prerequisite to bridging access to the proposed Industrial Decarbonisation Bank.

Circularity and critical raw materials represent Ireland's deepest structural deficit. Ireland's circular material use rate (CMUR) is among the lowest in the EU, standing at approximately 2% against an average of around 12%. Murtaza *et al.*'s 2025 report⁵ identified 20 materials with a high supply risk (high criticality) status out of 42 critical raw materials assessed for Ireland, with import reliance approaching 100% for many materials used in electronics, medical devices and pharmaceuticals. Ireland's national geological assessment, mandatory under the Critical Raw Materials Act, will not be completed until 2027. The Whole of Government Circular Economy Strategy 2026–2028 target is a 2-percentage-point annual improvement to reach 12% CMUR by 2030, requiring step-change action across construction waste, electronic waste and battery materials recovery.

Ireland's trade exposure gives the CID's global markets pillar particular urgency. Goods exports reached a record €224 billion in 2024, with pharmaceuticals accounting for 45% of export value. The Carbon Border Adjustment Mechanism, in force since 1 January 2026, and its proposed extension to 180 downstream products from 2028 (unofficial indications from Irish departmental sources suggest that this could eventually be extended to as many

as 600 downstream products), introduced new compliance obligations across key supply chains. The concentration of Irish exports in two markets, the EU (€88.4 billion) and the USA (€73.5 billion), and in a single dominant product category, pharmaceuticals, underscores the relevance of the market diversification agenda.

Regarding skills for a just transition, green skills demand grew 22.1% in Ireland in 2024, approximately double the global average, with one in eight job postings now requiring a green skill. The retrofit sector alone is estimated to require approximately 23,000 additional workers by 2030.

Overall, Ireland enters the CID implementation period with important advantages, including political stability, credible climate legislation, strong enterprise agencies and established multinational clusters in high-value manufacturing. However, these strengths are offset by practical delivery constraints: high electricity costs, slow grid connection timelines, limited readiness for EU funding pipelines, weak circularity performance, and exposure to concentrated export markets and critical raw material dependencies. The CID therefore presents both an opportunity and an implementation test. The CISAF, which is valid until December 2030, and forthcoming EU legislative instruments create a narrow, time-limited policy window. Ireland's priority should be to convert policy alignment into coordinated delivery.

5 Murtaza, A., Mahnoor, M., Inam, A., Shah, A. A., Obeidi, M. A. and Ul Ahad, I. (2025). *Critical Raw Materials for Ireland for a Resource-Efficient Circular Economy (CIRCLE)*. Environmental Protection Agency, Johnstown Castle, Ireland.

1 Introduction

The European Union's (EU's) Clean Industrial Deal (CID), published in early 2025, represents a significant reorientation of European industrial policy, integrating decarbonisation objectives with industrial competitiveness, supply chain resilience and strategic autonomy within a unified regulatory and financing framework (European Commission, 2025a). The CID responds directly to the findings of the Draghi 2024 report on EU competitiveness (Draghi, 2024). The report identified the potential for decarbonisation to support productivity and industrial competitiveness where industrial, competition, economic and trade policies are well aligned. It also cautioned that a failure to coordinate across these domains could result in adverse competitiveness outcomes. For Ireland, the CID arrived at a structurally consequential moment, given the nation's industrial exposure to energy costs, critical raw material (CRM) dependencies and near-term decarbonisation obligations under the Climate Action Plan 2024.

1.1 Objectives

This project provides an overview of the CID, assessing the key impacts, opportunities and challenges it presents for Ireland through a desk-based analysis of its six pillars, alongside their interaction with related policies in the Irish context. The research also examines the potential impacts of clean energy deployment on the competitiveness of Irish industries and the development of manufacturing capacity, supply chains and services in Ireland. The five specific objectives of the research are to (1) review the legislative framework of the CID and its alignment with Irish policy priorities across the climate, energy, enterprise and trade domains; (2) examine Ireland's industrial structure, energy consumption patterns and competitiveness baseline; (3) assess each of the six CID pillars in the Irish context; (4) analyse the implications of clean energy technology deployment for industrial competitiveness, grid integration and manufacturing capacity; and (5) assess the

broader economic and environmental implications of the CID for Ireland, including transition costs and emissions performance.

1.2 Defining the Clean Industrial Deal

The CID, adopted through Commission Communication COM(2025) 85, constitutes the European Commission's overarching strategy for accelerating industrial decarbonisation while maintaining and strengthening European industrial competitiveness (European Commission, 2025a). It builds directly on the European Green Deal and the Net-Zero Industry Act, while also responding to the Draghi report's finding that European industry faces a structural competitiveness gap, driven primarily by high and volatile energy costs, fragmented capital markets and insufficient coordination between climate and industrial policy (Draghi, 2024; European Commission, 2025a).

The CID is structured around six pillars: (1) affordable energy; (2) lead markets for clean industry; (3) financing through public and private investment; (4) circularity and access to materials; (5) global markets and international partnerships; and (6) skills and quality jobs for a just transition. These pillars aim to reduce energy costs, create demand for low-carbon products, mobilise decarbonisation investment, strengthen resource security, support trade and Carbon Border Adjustment Mechanism (CBAM) implementation, and develop workforce capabilities. The framework is supported by horizontal enablers, including regulatory simplification, single market integration and enhanced coordination between EU institutions and Member States, and is operationalised through three primary instruments: (1) the Affordable Energy Action Plan (COM(2025) 79 final); the Clean Industrial Deal State Aid Framework (CISAF); and the Industrial Decarbonisation Accelerator Act (IDAA) (European Commission, 2025b,c,d).

This report is structured as follows. Chapter 2 provides an overview of the research, covering the CID legislative framework and its alignment with Irish policy priorities, and providing an assessment of Ireland's industrial and energy baseline. Chapter 3 presents an examination of the findings across all six CID

pillars, an evaluation of clean energy technology deployment as a competitiveness measure, and an economic and environmental impact assessment. Finally, Chapter 4 sets out the conclusions and policy recommendations arising from the evidence synthesis.

2 Overview of the Research

2.1 Legislative Framework of the Clean Industrial Deal

The CID is operationalised through three primary legislative instruments, each addressing dimensions of the industrial transition challenge. These instruments are underpinned by dedicated financial mechanisms, including the Innovation Fund, the proposed Industrial Decarbonisation Bank and InvestEU amendments (Figure 2.1).

First, the Affordable Energy Action Plan (COM(2025) 79 final), adopted in 2025, targets structural inefficiencies that inflate industrial energy costs across European electricity systems through measures to lower energy bills, accelerate clean energy deployment and reduce gas market volatility (European Commission, 2025b). Second, the CISAF simplifies state aid rules to support renewable energy roll-out, industrial decarbonisation investments and cleantech manufacturing capacity (European Commission, 2025c). Building on the Temporary Crisis and Transition Framework, it introduces support

for industrial electrification and energy efficiency improvements, while maintaining safeguards against competition distortions and enabling accelerated approval for projects receiving Strategic Technologies for Europe Platform seals under the Innovation Fund (European Commission, 2025c). Finally, the IDAA addresses permitting bottlenecks and market barriers constraining decarbonisation (DETE, 2025a; European Commission, 2025d). Building on approaches established in the Net-Zero Industry Act and the Critical Raw Materials Act (CRMA) (European Union, 2023, 2024), it introduces streamlined procedures for industrial energy access and decarbonisation projects, alongside sustainability and resilience criteria for public procurement in energy-intensive sectors (European Commission, 2025d).

2.2 Alignment with the Irish Policy Context

In terms of policy alignment, Ireland's framework is broadly consistent with CID objectives across

1	Affordable Energy Action Plan	Objective: Target structural inefficiencies inflating industrial energy costs. Policy Instruments: Lower energy bills via PPAs & CfDs • Accelerate clean energy deployment through permitting & grid investment • Promote well-functioning gas markets & storage coordination
2	Clean Industrial Deal State Aid Framework	Objective: Simplify state aid rules to support renewable energy rollout, decarbonisation investments, and cleantech manufacturing capacity. Policy Instruments: Adapt provisions from Temporary Crisis & Transition Framework • New aid categories for electrification & energy efficiency • Safeguards against subsidy races & competition distortions • Accelerated State aid approval for STEP-sealed projects (Innovation Fund)
3	Industrial Decarbonisation Accelerator Act	Objective: Address permitting bottlenecks and market barriers constraining industrial decarbonisation. Policy Instruments: Streamlined procedures for industrial energy access & decarbonisation projects • Extend NZIA non-price criteria to intermediate industrial products for public procurement • Voluntary carbon intensity labelling for steel & cement based on ETS data & CBAM methodologies

Figure 2.1. Legislative framework, objectives and key policy instruments of the CID. CfD, contract for difference; ETS, Emissions Trading System; NZIA, Net-Zero Industry Act; PPA, power purchase agreement; STEP, Strategic Technologies for Europe Platform.

climate, energy and industrial domains, but implementation gaps remain. The Climate Action Plan 2024 establishes legally binding sectoral emission reduction targets and provides a credible long-term policy signal that reduces regulatory uncertainty and supports investment. These targets are broadly consistent with the EU's longer-term decarbonisation trajectory, including the 90% net greenhouse gas (GHG) reduction objective proposed for 2040 (European Commission, 2025a). However, Ireland's industrial decarbonisation trajectory remains heavily dependent on energy system transformation, with industrial emissions needing to decline by 35% by 2030 through accelerated electrification across key manufacturing sectors (CSO, 2024a). Ireland's ability to translate CID objectives into industrial competitiveness is also constrained by infrastructure bottlenecks. Ireland's National Energy and Climate Plan, currently under revision to reflect updated 2030 targets, will be critical for translating CID energy measures into investment pipelines. The Sustainable Energy Authority of Ireland (SEAI) has identified substantial energy transition investment opportunities through 2030, but Ireland's capacity to realise these opportunities and, by extension, the affordable energy benefits envisaged under the CID is constrained by persistent infrastructure bottlenecks, particularly lengthy grid connection timelines and limited interconnection capacity (SEAI, 2025a).

In terms of industrial competitiveness and enabling conditions, Ireland's enterprise and resource frameworks are partially aligned with CID priorities but face structural constraints. Enterprise strategies, including Industry 4.0 and IDA Ireland's foreign direct investment (FDI) mandate, support cleantech and innovation investment (DETE, 2019; IDA Ireland, 2025). However, rising labour costs and exposure to carbon pricing create competitiveness pressures for energy-intensive sectors (McInerney *et al.*, 2019a; NCPC, 2025). Resource constraints also persist, with Ireland's circular material use rate (CMUR) being below the EU average and high supply risks having been identified across 20 of the 42 CRMs assessed as relevant to key industrial sectors (Murtaza *et al.*, 2025). Despite the CISAF's pathways for electrification, energy efficiency and cleantech manufacturing support, Ireland has historically underutilised state aid instruments for industrial decarbonisation (European Commission, 2025c).

2.3 Irish Industrial Structure and Baseline Assessment

2.3.1 Industrial structure and sectoral composition

Industrial manufacturing in Ireland has become increasingly concentrated in a small number of high-value industries dominated by FDI. According to Central Statistics Office (CSO) data, in 2023, three sectors accounted for over 70% of manufacturing net selling value, namely pharmaceuticals and pharmaceutical preparations, food products and chemicals excluding pharmaceuticals (CSO, 2024a). This concentration is illustrated in Figure 2.2, which compares the distribution of net selling value across industries in 2012 and 2023. As seen in Figure 2.3, this increased concentration reflects Ireland's successful attraction of multinational corporations in patent-intensive, high-margin activities (particularly pharmaceuticals), rather than diversified industrial development across materials processing, engineering and consumer goods manufacturing (CSO, 2024a; IDA Ireland, 2025).

The pharmaceutical sector's dominance has intensified over the past decade, driven by multinationals' strategic decisions to locate intellectual property assets in Ireland, favourable corporate tax treatment and agglomeration effects in established clusters, including in Cork, Dublin and Limerick (CSO, 2024a;

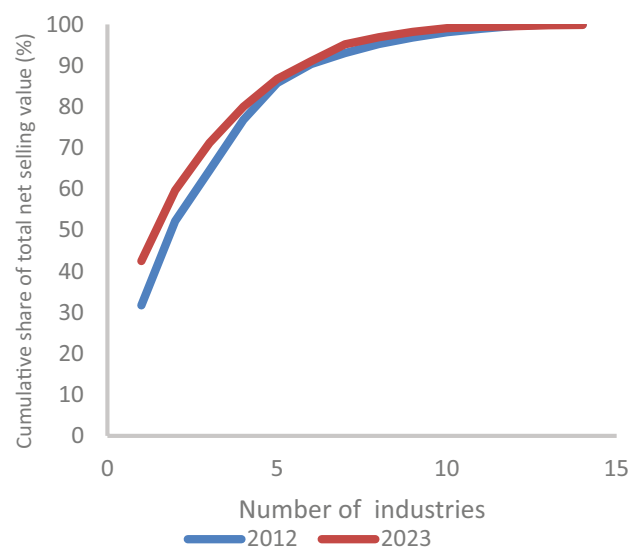


Figure 2.2. Concentration of net selling value across Irish industries (2012 and 2023). Source: Authors' calculations based on CSO (2026a) data.

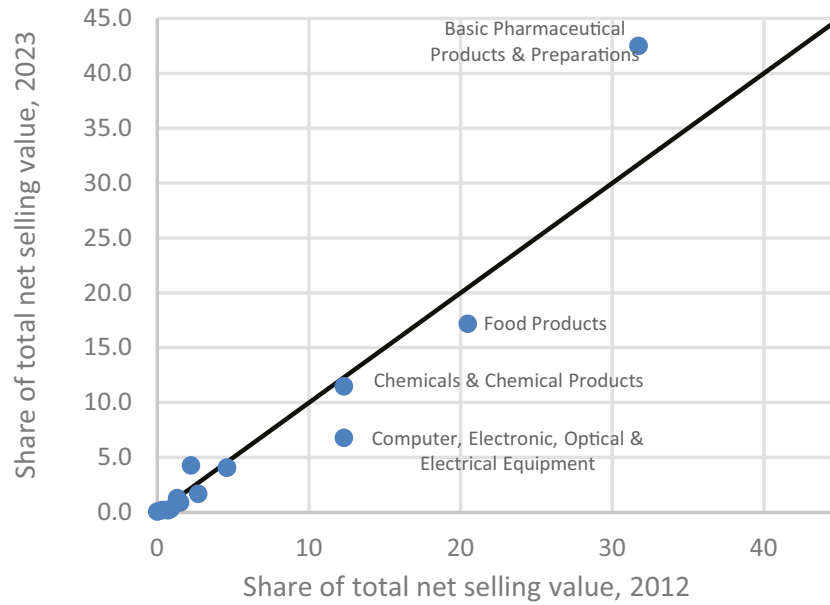


Figure 2.3. Change in net selling value across top-selling industries (2012–2023). Source: Authors' calculations based on CSO (2026a) data.

IDA Ireland, 2025). Major pharmaceutical facilities undertake both active pharmaceutical ingredient production and finished dose manufacturing, generating substantial value added but relatively modest direct employment, given capital intensity and automation levels (CSO, 2024a; IDA Ireland, 2025). The sector's energy consumption patterns are characterised by process heating requirements, controlled environment ventilation and purified water production, with limited potential for the electrification of high-temperature processes using current technologies (McInerney *et al.*, 2019a; SEAI, 2025b).

Food processing represents Ireland's second-largest manufacturing sector, encompassing dairy products, meat processing, prepared foods and beverages (CSO, 2024a). Unlike pharmaceuticals, the sector maintains stronger linkages to domestic agricultural production and is geographically distributed across regions (CSO, 2024a; Enterprise Ireland, 2024a) (see Appendix 2). Energy intensity varies across subsectors, with processing activities requiring substantial thermal energy, refrigeration and cooling capacity (CSO, 2024a; SEAI, 2025b). Decarbonisation pathways centre on electrification where technically feasible, complemented by renewable heat adoption and energy efficiency improvements, with low-carbon technologies such as solar photovoltaics and heat pumps being increasingly deployed across the sector.

Finally, chemicals manufacturing (excluding pharmaceuticals) exhibits a relatively high energy intensity per unit of value added, with process emissions from chemical reactions in industrial gases, organic chemicals and fertilisers exacerbating energy-related CO₂ emissions (McInerney *et al.*, 2019a; CSO, 2024a). Beyond these dominant sectors, Ireland maintains a smaller manufacturing presence in medical devices, computer and electronics products, electrical equipment, fabricated metal products and machinery (CSO, 2024a). Several facilities fall within the scope of the EU Emissions Trading System (ETS), creating direct exposure to carbon pricing and competitiveness pressures that CID financing and state aid mechanisms aim to address (McInerney *et al.*, 2019a; European Commission, 2025a,c).

This national industrial structure creates specific CID implementation challenges within Ireland. The dominance of multinational corporations means that investment decisions on decarbonisation are made within global production networks and valued against alternative locations across the EU, North America and Asia, increasing the importance of energy costs and state aid availability (IDA Ireland, 2025; NCPC, 2025). At the same time, indigenous firms in agriculture, food processing and construction often lack the scale and financial resources needed to access CID financing instruments and implement

capital-intensive decarbonisation technologies (Enterprise Ireland, 2024a).

2.3.2 *Energy consumption patterns and decarbonisation requirements*

Industrial energy consumption for manufacturing in Ireland accounts for a significant proportion of final energy demand, primarily driven by electricity, natural gas and oil products (CSO, 2024b; SEAI, 2025b).

As illustrated in Figure 2.4, the manufacture of food, beverages and tobacco products, followed by basic metals and fabricated metal products, and rubber, plastics and non-metallic mineral products, accounted for the largest shares of sectoral energy consumption from 2017 to 2023. The energy profile and fuel mix shown in Figure 2.5 reflect the substantial process heating requirements across these industries, which rely heavily on fossil fuel combustion (CSO, 2024a).

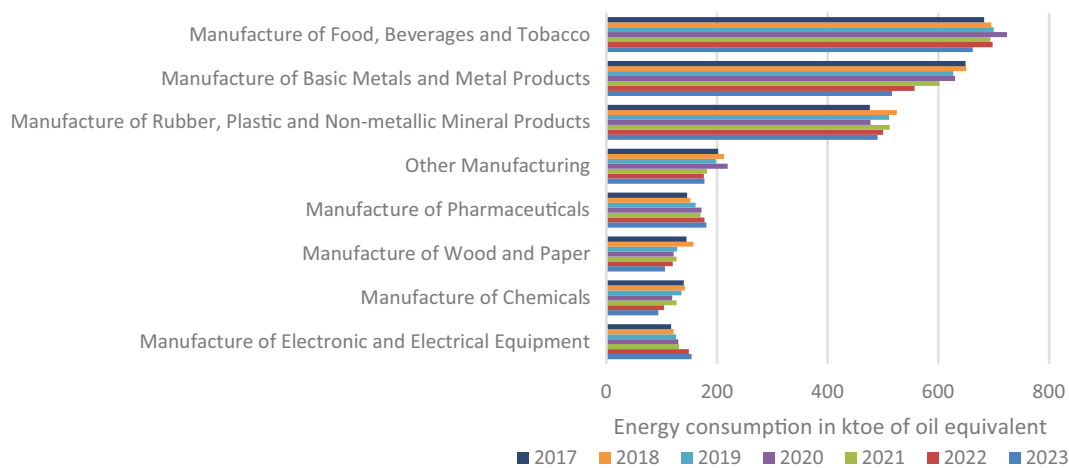


Figure 2.4. Manufacturing energy consumption by sector (2017–2023). Source: Authors’ calculations based on CSO (2025a) data.

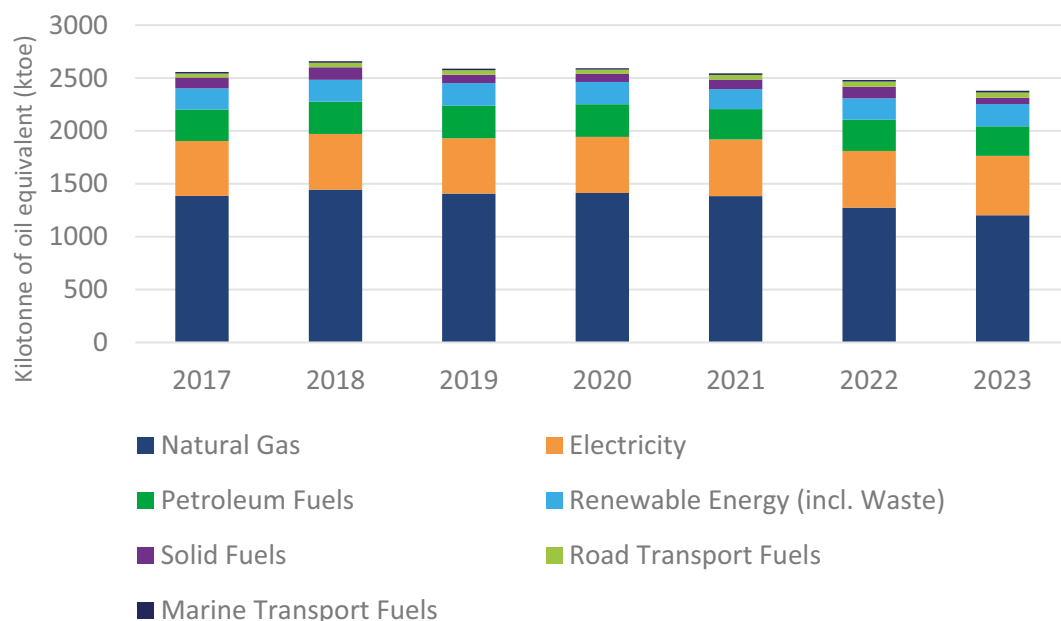


Figure 2.5. Manufacturing energy use by energy product type (2017–2023). Source: Authors’ calculations based on CSO (2026b) data.

While Figures 2.4 and 2.5 highlight the concentration of energy demand in energy-intensive manufacturing activities, pressures on Ireland's electricity system are also increasingly shaped by electricity-intensive services outside the industrial sector. In particular, data centres, while classified under services rather than manufacturing, consume an increasingly considerable share of total electricity generated (Figure 2.6), creating significant constraints on electricity availability for industrial electrification (SEAI, 2025a). This competition for grid capacity and renewable electricity supply directly challenges Ireland's affordable energy objectives (European Commission, 2025b; SEAI, 2025a).

Achieving the required industrial emissions reductions by 2030 depends substantially on grid decarbonisation through renewable deployment. Electrified industrial processes can then achieve proportionate reductions as the grid becomes cleaner. Yet, process emissions from chemical reactions and high-temperature heating remain unaddressed by electrification alone, limiting the pace of decarbonisation (McInerney *et al.*, 2019a; SEAI, 2025b).

Beyond decarbonisation, energy costs remain a critical competitiveness factor for energy-intensive industries (McInerney *et al.*, 2019a; NCPC, 2025). Industrial electricity prices in Ireland have historically exceeded EU averages (NCPC, 2025; SEAI, 2025a). Additionally, natural gas prices, which remain a driving cost determinant of Irish energy prices, experienced substantial volatility following Russia's invasion of Ukraine, undermining investment certainty and increasing hedging costs for manufacturers (McInerney *et al.*, 2019a; SEAI, 2025a).

These energy affordability challenges are compounded by critical infrastructure constraints. Grid connection capacity emerges as a cause of bottlenecks, with connection timelines substantially exceeding those in competitor jurisdictions (SEAI, 2025a). EirGrid must balance increasing renewable generation, growing data centre demand and expanding industrial electrification within existing transmission infrastructure (SEAI, 2025a). Distribution network upgrades require substantial capital investment, creating tension between short-term cost control and the long-term capacity expansion necessary for industrial decarbonisation (SEAI, 2025a).

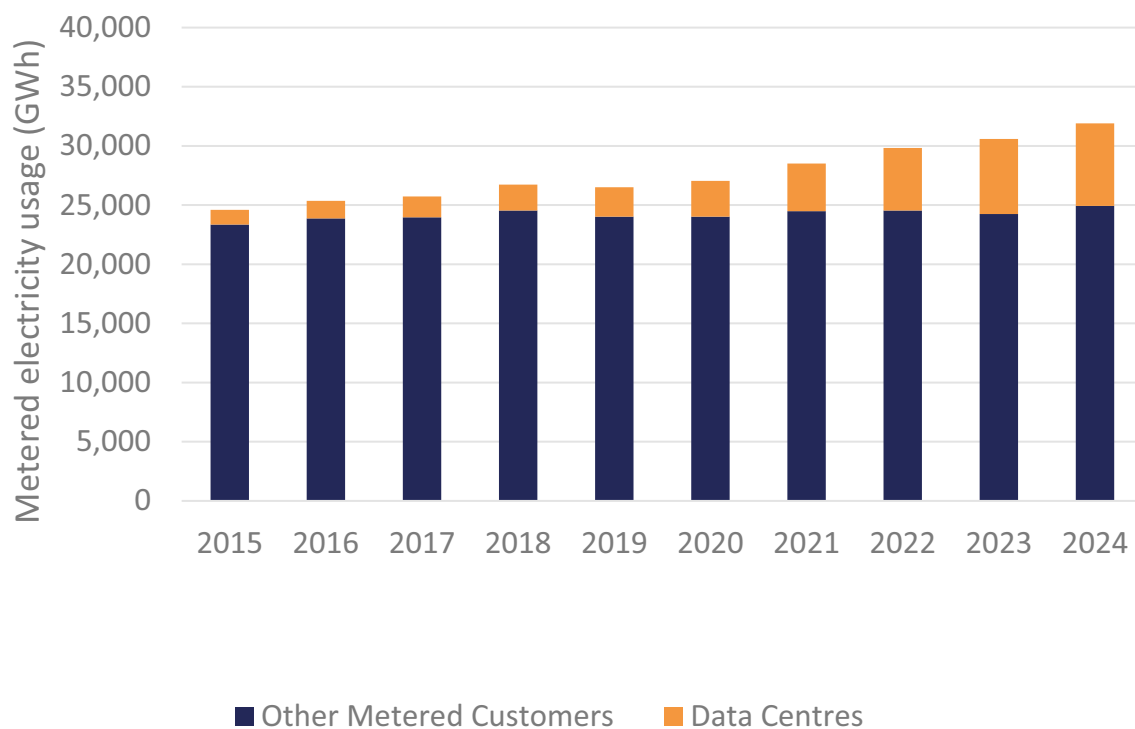


Figure 2.6. Metered electricity consumption, GWh (2015–2024). Source: Authors' calculations based on CSO (2025b) data.

Finally, renewable energy self-generation by industry remains limited, reflecting broader economic viability challenges, including grid curtailment, insufficient storage capacity and connection bottlenecks, rather than site-specific factors, such as planning restrictions on on-site wind turbines, constrained roof space at older facilities or Ireland's comparatively low solar irradiation levels. While corporate power purchase agreements (PPAs) have expanded among pharmaceutical manufacturers seeking off-site renewable generation, and commercial demand for PPAs is already substantial, market development lags on the supply side, reflecting credit risk concerns and insufficient standardisation of contract terms.

2.3.3 Competitiveness challenges and baseline positioning

Ireland's industrial competitiveness faces structural headwinds that shape CID opportunity realisation. Labour costs have increased across all economic sectors. While productivity in the pharmaceutical and information and communications technology (ICT) sectors justifies premium labour costs, energy-intensive and lower-margin manufacturing faces competitive disadvantages that may intensify as carbon pricing strengthens under the EU ETS (NCPC, 2025). Knowledge-intensive sectors such as pharmaceuticals and ICT combine a high value added per worker with relatively low emissions per euro of output, allowing firms to absorb carbon costs more easily. In contrast, energy-intensive sectors with lower productivity, such as construction

and food manufacturing, generate fewer economic returns per unit of emissions, implying higher carbon cost exposure relative to margins. As carbon prices increase under the EU ETS, this divergence may widen competitiveness pressures for lower-productivity sectors unless offset by efficiency improvements, innovation or policy support (Figure 2.7).

McInerney *et al.* (2019a) identified that carbon-intensive firms face significant competitiveness challenges when investing in abatement capital, with financial constraints and information barriers limiting the adoption of available decarbonisation technologies. Survey analyses from other domains confirm these challenges, with a 2024 Uisce Éireann report finding that 43% of Irish small and medium-sized enterprises (SMEs) cite a "lack of information or Government supports" as a barrier to investing in sustainable practices (Uisce Éireann, 2024). These findings highlight the importance of CID financing instruments and state aid frameworks that reduce upfront capital requirements and provide technical assistance alongside financial support (European Commission, 2025a,c). Enterprise Ireland currently aims to overcome these barriers through providing technical assistance, training, energy monitoring and metering grants for Irish manufacturing and EU ETS clients.

Ireland's competitive strengths include political stability, a common law legal system, the English language, a skilled workforce, a well-established multinational presence and a competitive corporate tax environment (IDA Ireland, 2025). The IDA Ireland FDI model has successfully attracted investments in high-value

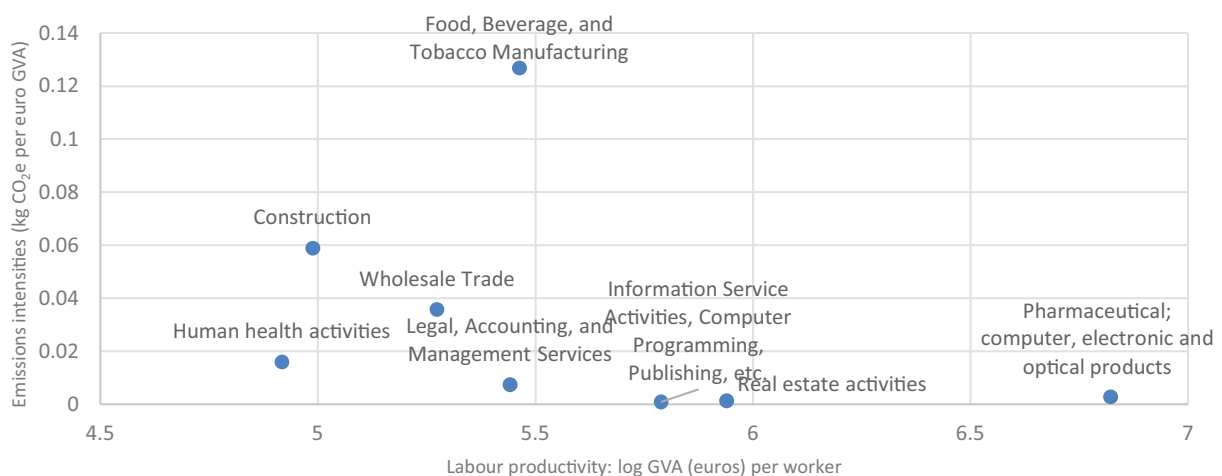


Figure 2.7. Productivity and emissions intensity across selected Irish sectors. GVA, gross value added.
Source: Authors' calculations based on CSO (2024c) data.

activities, including research and development (R&D), biologics manufacturing and digital services (IDA Ireland, 2025). However, the narrow sectoral base creates vulnerabilities: pharmaceutical patent expirations, corporate tax policy changes or investment diversification by multinational parents could disproportionately impact industrial output and employment (IDA Ireland, 2025; NCPC, 2025).

Cleantech and green technology manufacturing represent a key diversification opportunity. Ireland possesses advantages, including offshore wind resources estimated at 30 GW technical potential, marine energy potential exceeding 1 GW, and established engineering capabilities in precision manufacturing and process control systems applicable to electrolyser and battery component production (SEAI, 2024b, 2025a). The *Powering Prosperity – Ireland's Offshore Wind Industrial Strategy Implementation Progress Report*, published in April 2025, identifies supply chain development priorities, including floating wind turbine components, subsea cabling and operations and maintenance services (DETE, 2025a). However, realising these opportunities will require coordinated state aid deployment, skills development and infrastructure investment that exceed historical policy intensity.

CRM dependencies also present strategic vulnerabilities. Murtaza *et al.* (2025) identified 20 materials as having high supply risk (high criticality) status and affecting Irish manufacturing, out of 42 raw materials assessed overall; these include rare earth elements for electronics and medical devices, lithium and cobalt for batteries, and platinum group metals for catalysts and hydrogen technologies. Ireland's CMUR of 2.0% indicates limited material recovery and recycling capacity compared with the EU average of 12.2%, though the absence of primary extraction industries partially explains this gap (McCarthy *et al.*, 2024). Developing circular economy capabilities in electronics refurbishment, battery material recovery and construction material reuse could reduce import dependencies while creating economic value (European Commission, 2025a; Murtaza *et al.*, 2025). Ireland's Whole of Government Circular Economy Strategy 2026–2028, published in February 2026, directly supports these ambitions by positioning circularity as central to Ireland's economic competitiveness, environmental sustainability and social well-being (DCEE, 2026a). The strategy moves

Ireland from a linear “take–make–waste” model towards a regenerative, closed-loop system, with 81 actions and 43 targets spanning sectoral and cross-cutting priorities, including electronics remanufacturing and increased circularity in the construction sector, underpinned by a robust governance and monitoring mechanism (DCEE, 2026a).

Institutional capacity for CID implementation varies across government departments and agencies. The Department of Climate, Energy and the Environment (DCEE) leads climate policy development and energy regulation, while the Department of Enterprise, Tourism and Employment (DETE) oversees industrial policy and enterprise support. Coordination mechanisms, including interdepartmental climate committees, facilitate policy integration; however, the Climate Change Advisory Council (CCAC) has consistently highlighted the need for a step change in policy implementation, delivery and coordination across government departments and agencies, with Ireland being at risk of failing to meet its EU climate commitments without accelerated action (CCAC, 2025; IFAC and CCAC, 2025). Enterprise Ireland and IDA Ireland possess the technical capacity needed for project appraisal and investment facilitation, but adapting to CID instruments, including CISAF aid scheme design and Innovation Fund application support, requires capability development.

Ireland's baseline positioning on CID key performance indicators reveals mixed readiness. As illustrated in Figure 2.8, the economy-wide electrification rate of approximately 25% aligns with the EU average, but substantial acceleration of electrification will be required to reach the 32% target by 2030 (European Commission, 2025a; SEAI, 2025b).

Annual renewable electricity capacity additions averaged approximately 500–700 MW in recent years, below the installation rates necessary to achieve 100 GW EU-wide annual deployment (SEAI, 2025a,b). The External Vulnerability Index for clean industrial products, which measures import dependencies, places Ireland above the EU average due to limited domestic manufacturing of solar panels, wind turbines, batteries and electrolysers (Murtaza *et al.*, 2025).

Research and innovation capabilities provide competitive foundations. Irish universities and research institutions maintain strengths in materials science, sustainable chemistry, energy systems and

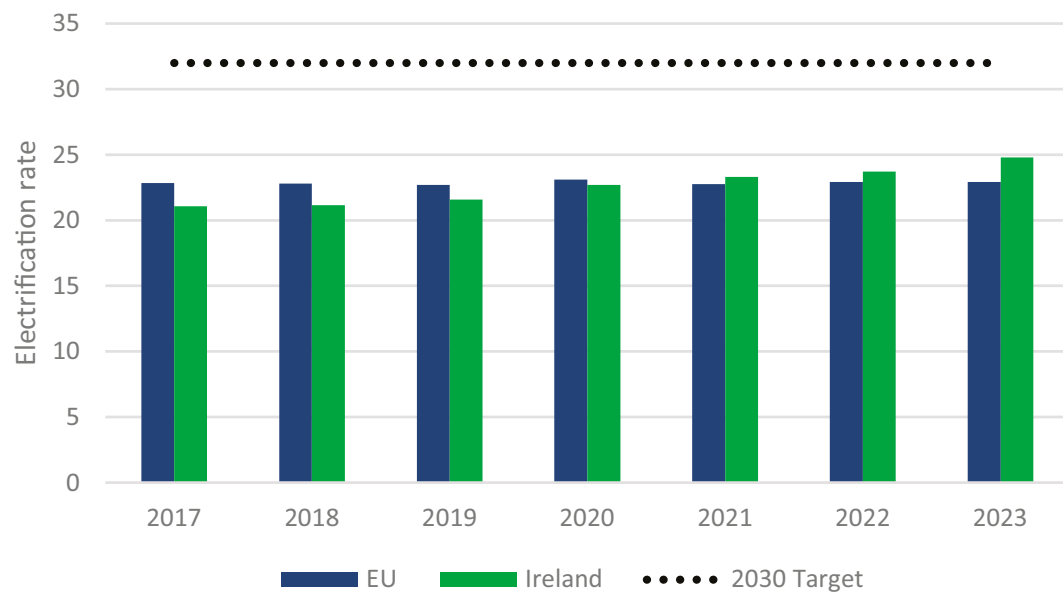


Figure 2.8. Electrification in Ireland and the EU (2017–2023). The electrification rate is represented as a percentage of electricity in total aggregate energy consumption. The 32% electrification target, established through the CID in 2025, is represented by a dotted black line. Source: Authors’ calculations based on Eurostat (2026a) data.

industrial biotechnology relevant to clean technology development. However, commercialisation pathways from research to scalable manufacturing remain underdeveloped, with limited venture capital being available for hardware-intensive cleantech startups and public funding being constrained for EU-wide

demonstration and pilot facilities (EIB, 2024). The CID’s Horizon Europe flagship call and Innovation Fund mechanisms could address these gaps if Irish institutions were to successfully compete for project selection (European Commission, 2025a).

3 Examination of the Findings

The CID structures policy interventions through six interdependent pillars (Figure 3.1), each addressing distinct dimensions of industrial decarbonisation and competitiveness. This chapter provides an overview of each pillar's objectives, policy instruments and relevance to Ireland's industrial context, drawing on the most recent Irish evidence.

3.1 Affordable Energy

The affordable energy pillar addresses the fundamental competitiveness challenge posed by European industrial energy costs, which significantly exceed those of major trading partners (European Commission, 2025a,b). The pillar operates through three mechanisms: accelerating electrification and renewable energy deployment to reduce dependence on volatile fossil fuel imports; completing the internal

energy market through enhanced interconnection and grid infrastructure; and implementing structural electricity market reforms to transmit lower generation costs to industrial consumers (European Commission, 2025b).

Key CID instruments include financial guarantees for corporate PPAs, enabling energy-intensive industries and SMEs to secure long-term clean electricity supply at predictable prices (European Commission, 2025b). The European Grids Package will streamline Trans-European Networks for Energy planning, prioritise interconnector delivery and enhance distribution grid capacity to accommodate increased renewable generation (European Commission, 2025a,b). State aid simplification under CISAF enables Member States to support renewable deployment and industrial electrification without extended approval procedures (European Commission, 2025c). Guidance on

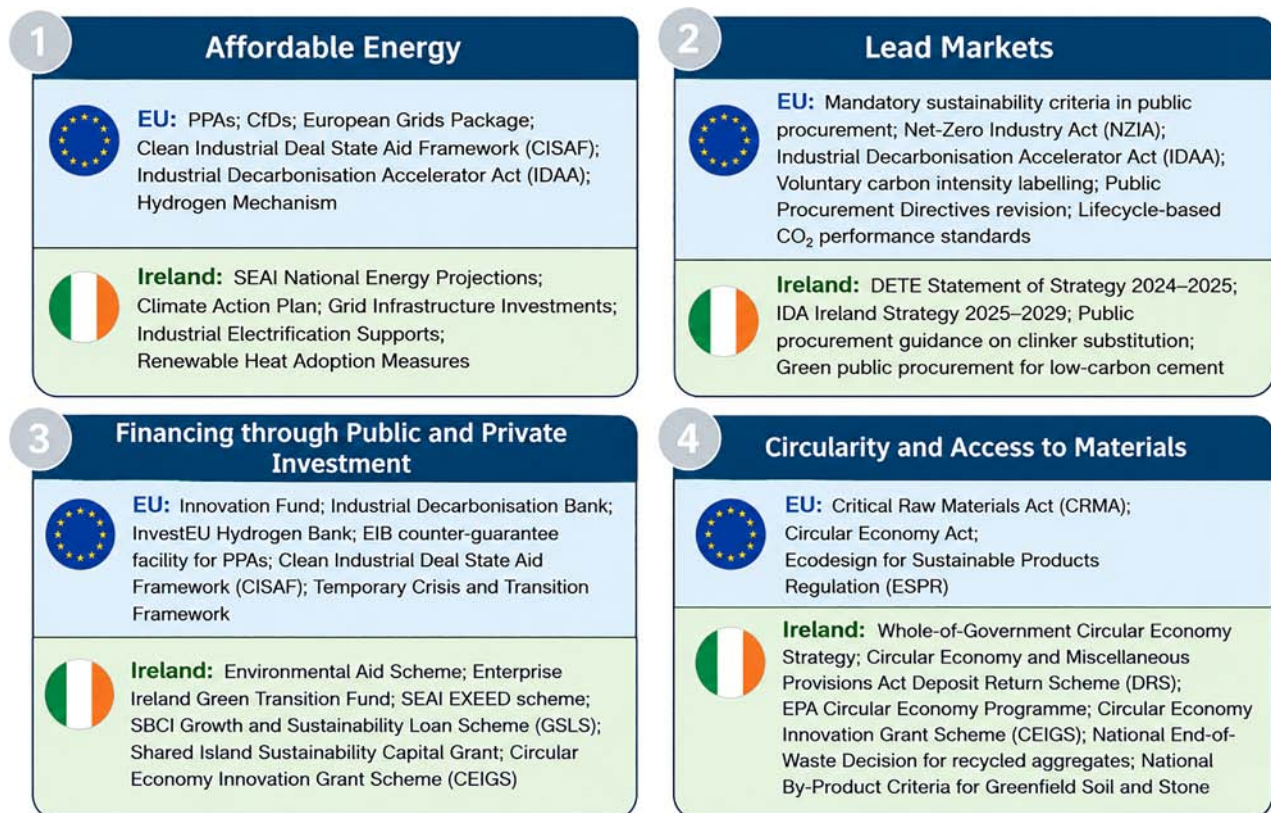


Figure 3.1. Six pillars of the CID. CfD, contract for difference; EIB, European Investment Bank; EXEED, Excellence in Energy Efficiency Design; SBCI, Strategic Banking Corporation of Ireland; SOLAS, Further Education and Training Authority.

combining contracts for difference with PPAs aims to reduce industrial exposure to short-term wholesale price volatility while providing revenue certainty for renewable generators (European Commission, 2025b).

Ireland's baseline position reveals significant affordability challenges. The CSO's business energy use data for 2023 documents total enterprise energy expenditure of €17 billion, with industrial energy use declining by 12% while services sector consumption increased by 7% from 2022 to 2023 (CSO, 2024b) (Figure 3.2).

This pattern reflects both efficiency improvements and production volatility in multinational-dominated sectors sensitive to global demand fluctuations (CSO, 2024a,b). Energy costs represent disproportionate competitiveness burdens for local manufacturers relative to high-margin pharmaceutical and ICT multinationals that dominate value-added statistics (CSO, 2024a,b; NCP, 2025).

The SEAI's *National Energy Projections 2025* establish quantitative trajectories under "with existing measures" (WEM) and "with additional measures" (WAM) scenarios (SEAI, 2025b). Both scenarios project significant exceedance of the industry sectoral emissions ceiling, with cumulative overshoots of 17% and 14% under the WEM and WAM scenarios, respectively, by the end of the second carbon budget period in 2030 (SEAI, 2025b). On renewable electricity, the WEM scenario projects a renewable energy share in electricity of 60% by 2030, while the WAM

scenario projects 68%, both falling materially short of the 80% Climate Action Plan 2024 target, with delays in offshore wind deployment being identified as the primary risk factor (SEAI, 2025b). Industry decarbonisation pathways centre on electrification of heat demand, fuel switching to sustainable biomethane and energy efficiency improvements, though risks of delayed delivery are embedded in both reported scenarios (SEAI, 2025b). These supply-side constraints directly relate to CID affordable energy instruments, particularly grid infrastructure investment and streamlining permitting (European Commission, 2025a,b,d).

EPA provisional GHG emissions data indicate that manufacturing, combustion and industrial processes emissions have decreased in recent years (EPA, 2025a). However, Ireland's industrial sector faces binding emissions reduction targets by 2030 that require accelerated progress beyond current trajectories. Projections under existing measures suggest that the sector will fall short of its commitments, highlighting a substantial gap between current decarbonisation pathways and outcomes. This emissions trajectory gap highlights the urgency of the CID affordable energy measures promoting industrial electrification and renewable heat adoption (European Commission, 2025a,b).

Grid connection capacity remains a critical constraint. The SEAI supply chain assessment identified delayed connection timelines for large industrial loads in constrained network areas, substantially exceeding

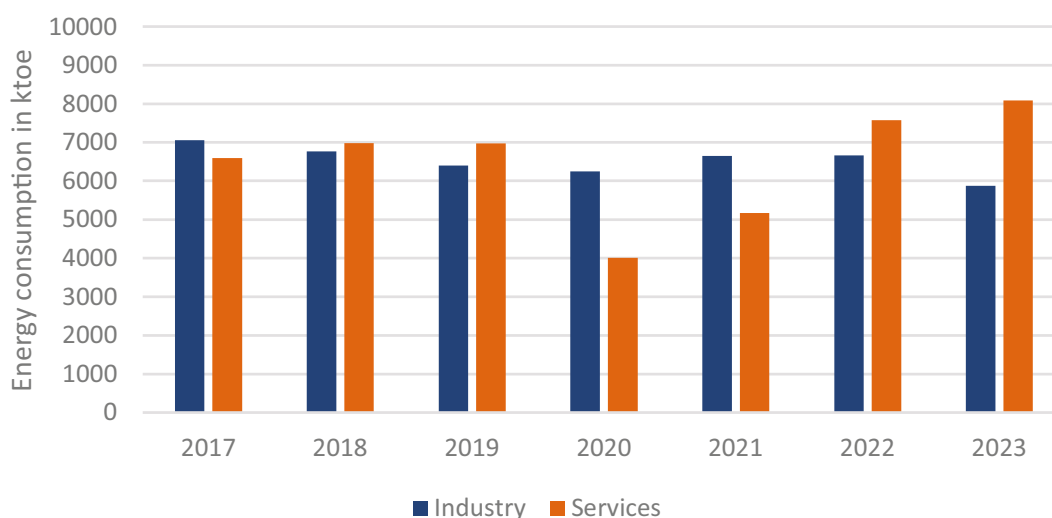


Figure 3.2. Total energy use across Irish industries and services sectors (2017–2023); ktoe, kilotonnes of oil equivalents. Source: Authors' calculations based on CSO (2025a) data.

timelines in competitor jurisdictions (SEAI, 2025a). Transmission system limitations, exacerbated by data centre load growth consuming 27% of electricity generation in 2025, create structural competition for grid capacity between different economic sectors (SEAI, 2025a). The CID European Grids Package and IDAA permitting provisions provide policy frameworks, but national implementation intensity will determine whether or not Ireland can overcome infrastructure bottlenecks constraining affordable energy access (European Commission, 2025a,b,d).

3.2 Lead Markets

The lead markets pillar seeks to create demand-side incentives for decarbonised industrial products, addressing the investment risk that manufacturers face absent guaranteed markets for higher-cost low-carbon goods (European Commission, 2025a). The pillar combines public procurement reforms with incentive mechanisms to establish purchasing preferences for sustainable, resilient and EU-produced industrial materials and components (European Commission, 2025a,d).

Central CID instruments include mandatory sustainability criteria in public procurement for strategic sectors, building on the Net-Zero Industry Act's approach to cleantech and extending it to energy-intensive industries through the IDAA (European Union, 2024; European Commission, 2025a,d). Voluntary carbon-intensity labelling, initially for steel and cement, will enable differentiation of low-carbon products based on EU ETS and CBAM methodologies, creating foundations for targeted fiscal incentives and premium pricing (European Commission, 2025a,d). The 2026 revision of the EU's public procurement directives will consolidate non-price criteria provisions across legislation and extend their application to private procurement through measures including life cycle-based CO₂ performance standards in product regulation and building codes (European Commission, 2025a).

Ireland's policy framework aligns with the objectives of the lead markets pillar. DETE's *Statement of Strategy 2024–2025* prioritises industry transformation, productivity enhancement and the deployment of innovation as core enterprise policy objectives (DETE, 2024a). Specific targets include supporting

1200 companies to adopt sustainability practices, facilitating 800 research collaborations between enterprises and higher education institutions, and enhancing sectoral competitiveness through digitalisation and green transition programmes (DETE, 2024a). Progress against these targets is being delivered through a suite of instruments that offer learning for CID mechanism design. Enterprise Ireland has approved combined funding of over €60 million under the Environmental Aid Scheme and Green Transition Fund since June 2022, benefiting more than 500 Irish companies and reducing CO₂ emissions by an estimated 130,000 tonnes, demonstrating the effectiveness of grant-based demand stimulation for industrial decarbonisation (Enterprise Ireland, 2024b). The Disruptive Technologies Innovation Fund, with over €530 million having been awarded across 131 projects to date, supports industry–research collaboration in areas including advanced manufacturing and clean technology, providing a model for translating research and innovation investment into commercial capacity. The Research, Development and Innovation Fund further supports enterprise-level product and process innovation, while the Green Transition Finance scheme of the Strategic Banking Corporation of Ireland (SBCI) provides loan financing for SMEs investing in clean energy, circular economy and resource efficiency (SBCI, 2024; Enterprise Ireland, n.d.). Collectively, these instruments illustrate how demand-side incentives, blended finance and collaborative research and innovation funding can be layered, informing how Ireland might structure its response to CID mechanisms such as the CISAF and the Innovation Fund. These commitments provide national foundations for implementing CID lead market instruments; however, translating these commitments into concrete procurement criteria and product standards will require detailed regulatory development (DETE, 2024a).

IDA Ireland's 2025–2029 strategy positions FDI attraction and development around five strategic pillars: talent and skills, innovation and sustainability, regional development, strategic sectors and global connectivity (IDA Ireland, 2025). The strategy explicitly targets cleantech manufacturing, advanced manufacturing and sustainable industries as priority investment categories (IDA Ireland, 2025).

Manufacturing clusters in pharmaceuticals (Cork, Dublin, Limerick), medical technologies (Galway, Limerick) and engineering (Shannon, Athlone) provide potential foundations for the development of supply chains serving lead EU markets in decarbonised industrial products (CSO, 2024a; IDA Ireland, 2025). However, realising this potential requires the coordinated deployment of state aid for manufacturing capacity investment and public procurement commitments that provide demand certainty (European Commission, 2025a,c).

The National Competitiveness and Productivity Council's *Ireland's Competitiveness Challenge 2025* identifies cost pressures constraining industrial performance (NCPC, 2025). Labour costs increased by 31% between 2016 and 2023, significantly exceeding competitor economy averages, while energy and property costs remain elevated relative to trading partners and the EU as a whole (Figure 3.3).

Infrastructure deficits, including housing shortages affecting workforce recruitment, grid connection delays and regional transport limitations, undermine competitiveness across sectors (NCPC, 2025; SEAI, 2025a). These structural challenges indicate that

the development of lead markets through demand-side policies must be complemented by supply-side interventions addressing cost competitiveness if Irish manufacturers are to capture opportunities (European Commission, 2025a; NCPC, 2025).

Ireland's relatively limited domestic public procurement market constrains the direct scaling up of lead market effects (NCPC, 2025). However, Irish manufacturers supplying EU markets, particularly in construction materials, food ingredients, pharmaceutical intermediates and medical device components, could benefit substantially from sustainability criteria rewarding decarbonisation investments (CSO, 2024a; European Commission, 2025a,d). The concentration of multinational corporations in Irish industry may facilitate private procurement adoption if parent companies implement life-cycle CO₂ standards across global supply chains, creating spillover benefits for Irish facilities demonstrating low carbon intensity (CSO, 2024a; IDA Ireland, 2025).

The CID's emphasis on hydrogen market development presents specific opportunities (European Commission, 2025a,b). Ireland's offshore wind resources and potential for renewable electricity

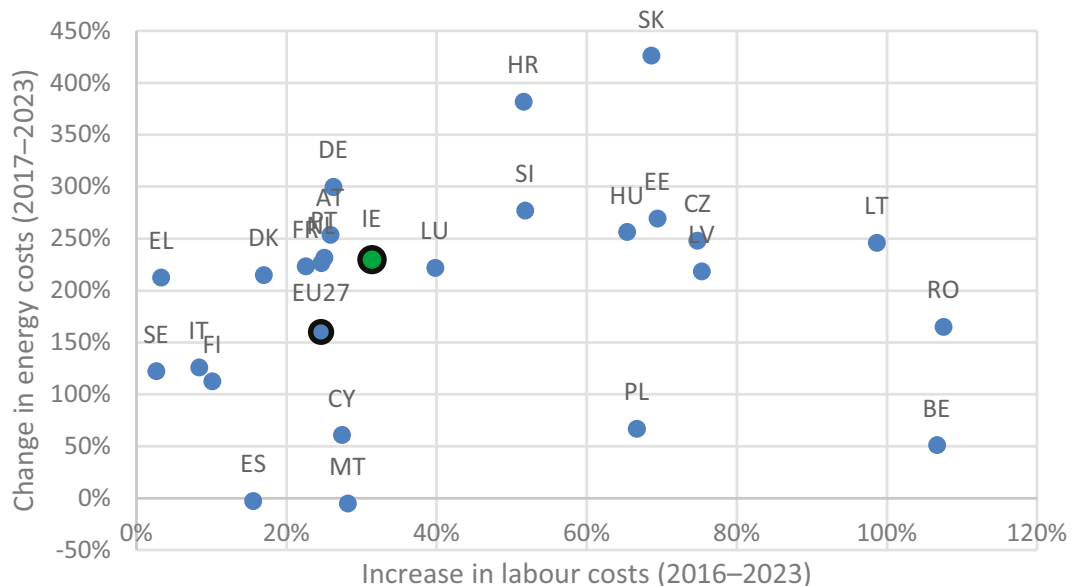


Figure 3.3. Change in labour and electricity costs in Ireland and across EU Member States. Percentage increases in electricity prices are based on prices in euros per kWh, exclusive of tax. The price applies to the less-than-20 MWh consumption band for non-household consumers only and is recorded on an annual basis. The percentage increase in labour costs reflects the increase in the hourly compensation of employees, plus tax and minus subsidies, and inclusive of industry, construction and services (excluding public administration, defence and compulsory social security). Source: Authors' calculations based on Eurostat (2026b,c) data.

surplus during high-generation periods create technical foundations for green hydrogen production (SEAI, 2025a). However, economic viability depends on demand aggregation, with the Hydrogen Mechanism's offtaker coordination function addressing chicken-and-egg challenges (European Commission, 2025a,b). Irish industrial sectors with difficult-to-electrify processes, including high-temperature heating in food processing and chemicals, represent potential early adopters if production costs decline through scaled-up deployment supported by CID financing (European Commission, 2025a,c).

3.3 Financing through Public and Private Investment

This pillar is grounded in the findings set out in Draghi's report on EU competitiveness, which estimates that achieving the EU's decarbonisation, digitalisation and defence objectives will require additional annual investment of approximately €750–800 billion, equivalent to 4.4–4.7% of EU gross domestic product (Draghi, 2024). The CID translates this into a more specific estimate of approximately €480 billion in additional annual investment requirements for the clean transition alone, with European Commission and International Monetary Fund (IMF) simulations projecting a 6% increase in EU output within 15 years from an investment push of this scale. However, the simulations also indicate that delivering private investment of this magnitude through market financing alone would require a reduction in the private cost of capital of approximately 250 basis points, a reduction unlikely to be achieved through capital market integration alone, making fiscal support a necessary complement to direct public expenditure (Draghi, 2024).

A structural constraint underlies this challenge. People in the EU are estimated to save a high share of their income, around 13% in 2023 compared with approximately 8% in the USA; yet a disproportionate share of these savings remains in low-yielding cash and deposits: approximately €11.5 trillion, representing one-third of EU households' total financial assets, compared with only one-tenth in the USA. This has left EU households significantly less wealthy than they could be: since 2009, US household wealth has grown around three times more than EU household wealth. According to ECB analysis, if EU households

aligned their deposit-to-financial-assets ratio with that of US households, a stock of up to €8 trillion could be redirected into long-term, market-based investments equivalent to an annual flow of around €350 billion (Lagarde, 2024). The EU's structural reliance on bank financing, reflected in EU banks lending more than €600 billion to real estate companies but less than €100 billion to technology companies, despite comparable contributions to value added, is poorly suited to capital-intensive projects with largely intangible collateral (Lagarde, 2024). Closing the investment gap therefore requires EU-level risk-sharing instruments as a necessary complement to national grant and concessional finance (Draghi, 2024).

At the European level, the CID's primary instruments are the Innovation Fund, the proposed Industrial Decarbonisation Bank and the revised InvestEU programme. The European Commission committed €6 billion from the Innovation Fund in 2025 for clean technology, battery manufacturing, the Hydrogen Bank and industrial decarbonisation (CINEA, 2025a). The proposed Industrial Decarbonisation Bank targets €100 billion, drawing on Innovation Fund resources and additional EU ETS revenues; ahead of the wider reform, a €1 billion pilot auction was launched in 2025 for industrial process heat decarbonisation through electrification and renewable heat (European Commission, 2025a). InvestEU has mobilised over €400 billion in public and private capital to date, following the adoption of the Omnibus II Regulation in December 2025, which is set to unlock at least €55 billion in additional financing capacity, with a further agreement between the European Commission and EIB Group in June 2026 projected to raise total impact to approximately €70 billion by the end of the current Multiannual Financial Framework (EIB, 2026). These instruments are complemented by the CISAF, adopted in June 2025 and valid until December 2030, which simplifies and accelerates Member State approval for industrial decarbonisation and clean technology aid; more than €85 billion was approved under its predecessor framework, indicating the scale at which simplified state aid rules can increase utilisation (European Commission, 2025c).

Ireland's national financing landscape offers accessible entry points but underperforms at the EU competitive level. DETE allocated €300 million under the Environmental Aid Scheme for 2023–2026,

deployed through Enterprise Ireland and IDA Ireland for large Scope 1 emissions reduction projects in dairy, cement and pharmaceuticals (DETE, 2024d). In 2024, €41 million was allocated towards 20 approved decarbonisation projects under the programme, projected to abate over 70,000 tonnes of CO₂ eq, approximately 1% of total industry emissions, with a further pipeline of €64 million in approvals projected between the two agencies for 2025 (DETE, 2025f). SEAI's Excellence in Energy Efficiency Design (EXEED) scheme provides grants of up to €3 million per project for energy-efficient industrial design, and the SBCI Growth and Sustainability Loan Scheme offers up to €500 million in long-term, low-cost lending to SMEs, with at least 30% being allocated to environmental sustainability projects (SBCI, 2023; SEAI, 2025a). In December 2025, the first successful projects under the €20 million Shared Island Sustainability Capital Grant Scheme were announced, expected to leverage over €63.5 million in private sector investment across demonstration-stage projects at Technology Readiness Levels (TRLs) 7–9, including Aurivo (dairy heat decarbonisation), Ecocem (low-carbon cement) and Gannon Eco (acid waste recovery), illustrating the strong demand for blended capital at the commercial demonstration stage that standard market terms do not provide (Enterprise Ireland, 2025a). Separately, the Ireland Strategic Investment Fund (ISIF) has committed €30 million to the Irish Minerals Fund LP, targeting minority investments in environmental, social and governance-responsible metals and mining projects in Ireland with a primary focus on zinc and other

critical minerals, representing an emerging domestic supply-side response to Ireland's CRM dependencies (Pollock, 2024).

Irish organisations have performed above target in Horizon Europe, securing €1.02 billion to date (2.09% of total allocations against a 1.6% national target), but participation in the EU Innovation Fund has been limited to two projects: the Aughinish Alumina Limited Steam Electrification Boiler project in Limerick (€4.24 million; 2021 small-scale call) and the Saoirse Wave Energy demonstration project off the coast of Clare (2022 mid-sized pilot call) (DFHERIS, 2025a). Figure 3.4 illustrates the distribution of Innovation Fund projects across EU Member States, showing that France, Spain, Germany, Sweden, Italy and Belgium account for the substantial majority of the over €7.1 billion awarded across 120 ongoing projects to date (CINEA, 2025b).

The Innovation Fund's selection criteria, covering GHG emission avoidance effectiveness, degree of innovation, project maturity, scalability and cost efficiency, require well-developed, investment-ready projects at near-commercial scale. A significant gap remains at the commercial demonstration stage (TRLs 7–9), where projects require large-scale capital, infrastructure integration and operational validation under conditions of high technological and market uncertainty that exceed private investor appetite alone. Closing this gap requires blended public–private financing mechanisms, including grants, guarantees, co-investment structures and contracts for difference, to advance projects to commercial maturity and

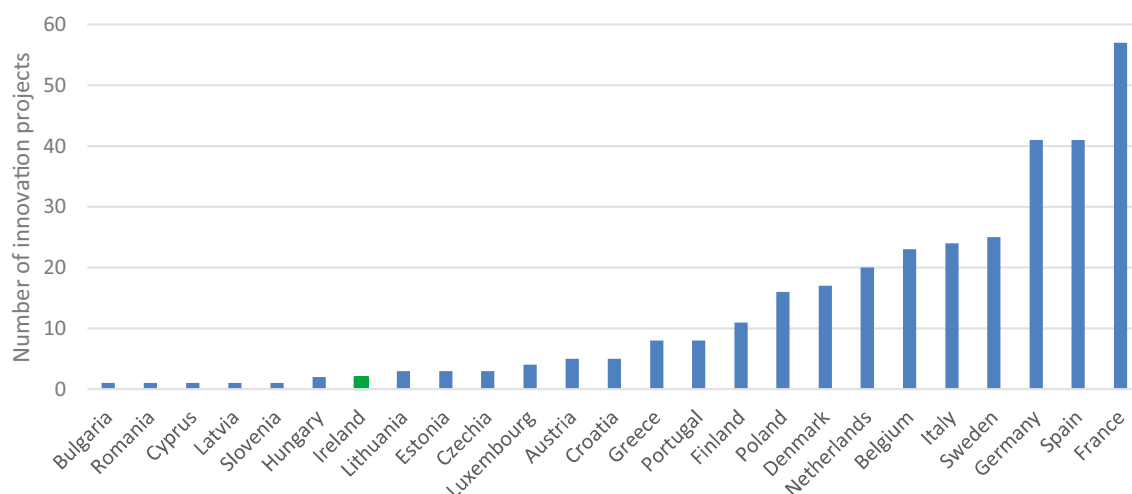


Figure 3.4. Distribution of Innovation Fund projects across EU Member States. Source: Authors' calculations based on European Commission (2026a) data.

crowd in private capital (European Commission, 2025a,c). Demand-side policy compounds the supply-side financing picture: public procurement guidance introduced in September 2024 requiring a minimum 30% clinker substitution in concrete used in government projects has created a guaranteed market for lower-carbon cement, with Irish cement sector GHG emissions falling 15.6% in 2024, in part attributable to this policy, an interaction between procurement rules and investment behaviour directly consistent with the CID’s approach to lead markets and financing (Cembureau, 2024; RPS Group, 2024; EPA, 2025a). A table summarising major financing instruments is included in Appendix 1 (see Table A1.1). Further details on the EU-level legislative pipeline, the Irish national financing landscape and Innovation Fund participation are provided in Appendix 3.

3.4 Circularity and Access to Materials

The CID identifies circularity as “the key to maximising the EU’s limited resources, reducing dependencies and enhancing resilience”, with the stated ambition being to make the EU “the world leader on circular economy by 2030” (European Commission, 2025a). The circularity and access to materials pillar addresses three interconnected dimensions: increasing the supply and uptake of secondary raw materials, securing access to CRMs and reducing strategic dependencies on external suppliers, operationalised through regulatory reform, trade policy, resource diplomacy and innovation support across the full materials value chain (European Commission, 2025a). The Draghi report on EU competitiveness provides the analytical foundation by identifying a market failure in

which secondary raw materials remain more expensive than primary materials because the environmental externalities of virgin material production are not fully internalised. It proposes addressing this distortion by extending the EU ETS to incineration and landfilling and introducing minimum requirements for recycled content, proposals now reflected in the CID’s forthcoming Circular Economy Act (Draghi, 2024; Grabbe, 2024).

For Ireland, this pillar carries urgency. The Irish CMUR stood at only 2.0% in 2024, among the lowest in the EU and far below the EU average of 12.2%, with the Netherlands leading at 32.7%, followed by Belgium (22.7%) and Italy (21.6%) (Eurostat, 2026d) (Figure 3.5). The Organisation for Economic Co-operation and Development’s 2022 assessment noted that, with a CMUR of just around 2% in 2020 (relative to an EU average of 12.8%), Ireland had significant scope for progress, and that municipal waste recycling rates had “stagnated at around 40%” (OECD, 2022). Murtaza *et al.* (2025) conducted the first-ever criticality assessment for Ireland, identifying 20 materials with high criticality status affecting Irish manufacturing, including rare earth elements for electronics and medical devices, lithium and cobalt for batteries, and platinum group metals for catalysts and hydrogen technologies, with import reliance approaching 100% for many of these materials. Their assessment also ranked materials by the sum of economic importance and supply risk values, from least to most critical, identifying lead as the least critical material and sulfur as the most critical. Ireland’s Whole of Government Circular Economy Strategy 2026–2028, launched on 23 February 2026 with a statutory basis under the Circular Economy and Miscellaneous Provisions Act 2022, sets the core

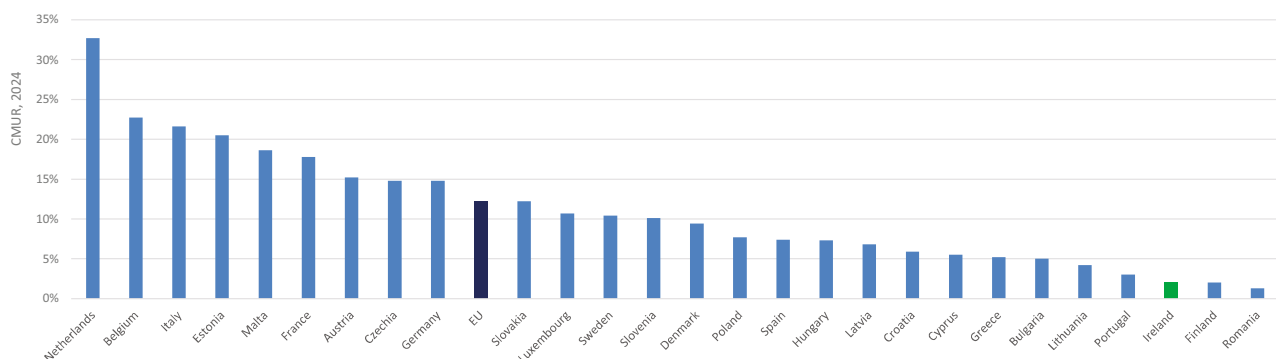


Figure 3.5. CMUR (2024) across EU Member States. Source: Authors’ calculations based on Eurostat (2026d) data.

objective of raising Ireland's CMUR by at least 2 percentage points annually, with a target of reaching 12% by 2030, a level that would bring Ireland to parity with the current EU average within 4 years (DCEE, 2026a).

The CRMA (Regulation (EU) 2024/1252), in force since May 2024, establishes binding 2030 benchmarks: at least 10% of EU annual consumption should be from EU extraction, 40% should be from EU-based processing and 25% should be from recycling, and no more than 65% of any strategic raw material should originate from a single third country (European Commission, 2025e). In March 2025, the European Commission designated a first list of 47 strategic projects across 13 Member States covering 14 of the 17 strategic materials, and a further 13 third-country projects in June 2025 to diversify supply (European Commission, 2025e,f). No Irish projects feature on either list, reflecting the country's early-stage position in domestic CRM project development. The act also mandates the National Exploration Programme; Ireland's programme, under the DCEE's responsibility, remains behind schedule, with the national geological assessment having been delayed.

In parallel, the European Commission launched a call for evidence in August 2025 for a new Circular Economy Act, planned for adoption in the second half of 2026 (European Commission, 2025f). Between 2010 and 2023, the EU's CMUR rose by only 1.1 percentage points, from 10.7% to 11.8%, indicating that existing instruments have been insufficient to generate systemic change. The act sets the target of a CMUR of 24% by 2030, reducing primary material use and GHG emissions by approximately 25%, through two pillars: reforming electronic waste (e-waste) regulation (with e-waste generation growing at 2% annually but with only ~40% being recycled) and fostering the single market for waste and secondary raw materials through reformed end-of-waste criteria, simplified extended producer responsibility schemes and mandatory public procurement criteria for circular goods (Baldé *et al.*, 2024; European Commission, 2025f). Trans-Regional Circularity Hubs are to be established by the end of 2026, alongside an EU Critical Raw Material Centre for demand aggregation and supply matchmaking, and DCEE has engaged with the framework through the European Commission's public consultation process (European Commission, 2025b).

The European Commission's 2025–2030 working plan for the Ecodesign for Sustainable Products Regulation, adopted in April 2025, identifies steel and aluminium as priority product groups for ecodesign requirements, with harmonised EU product sustainability standards expected to reduce the risk of divergent national standards and improve competitive conditions between producers using primary and secondary materials (European Commission, 2025g). DETE is developing a national Ecodesign for Sustainable Products Regulation implementation plan for 2026, covering compliance, industry engagement and integration with enterprise support programmes (DETE, 2025b). The European Commission also updated the List of Waste (Commission Delegated Decision (EU) 2025/934) in March 2025 to facilitate the recovery and reuse of batteries and associated CRMs, and made customs surveillance data on scrap imports and exports of aluminium, copper and steel publicly accessible to improve market transparency, forming part of a wider framework that could lead to targeted trade measures to safeguard secondary raw material availability within the EU (European Commission, 2025g).

Global supply chain concentration for critical minerals compounds Ireland's structural position. China accounts for between 35% and 70% of processing activity for nickel, copper, lithium and cobalt; however, export restrictions from China grew by a factor of nine between 2009 and 2020, and International Energy Agency projections indicate that demand for critical minerals will grow by a factor of four to six by 2040 (IEA, 2023; Draghi, 2024). Using threshold-based analysis (Method I), Murtaza *et al.* (2025) identified 20 raw materials as being critical for Ireland, including cobalt, tungsten, silver, tellurium, tin, platinum, manganese and tantalum, with the economic importance threshold adjusted from the European Commission's standard of 2.8 to 0.4, reflecting Ireland's smaller scale and greater vulnerability to supply disruptions. A fundamental data deficit compounds these risks: Ireland lacks a publicly accessible national database on raw material reserves, resource stocks, product streams and material flows, and Murtaza *et al.* (2025) recommend that the CSO lead the establishment of a national CRM database, incorporating CRM data, CMUR tracking and material flow analysis. Ireland's sole significant active mining operation, the Boliden Tara zinc and lead mine near Navan, County Meath, exemplifies both the potential

contribution of domestic mineral assets to the CRMA's extraction benchmark and the vulnerability of such operations to volatile commodity prices and high energy costs; a detailed account is provided in Appendix 4.

Three structural barriers constrain Ireland's ability to realise the pillar's ambitions. First, fragmented end-of-waste criteria across Member States impede cross-border trade in recycled materials (Draghi, 2024; European Commission, 2025f). While the EPA has made progress through national decisions, including the National End-of-Waste Decision (EoW-N001/2023) for recycled aggregates and the National By-Product Criteria for Greenfield Soil and Stone (BP-N002/2024), the absence of harmonised EU-wide standards creates uncertainty for Irish recyclers seeking to access the single market, a barrier that the forthcoming Circular Economy Act is intended to address (EPA, 2023, 2024). Second, the data deficit identified by Murtaza *et al.* (2025) means that policymakers and industry cannot accurately assess supply chain vulnerabilities, target interventions or monitor progress against the CRMA and national targets, making the establishment of the recommended national CRM database a prerequisite for evidence-based policy development. Third, private capital mobilisation for circular economy activities remains limited: the Circular Economy Innovation Grant Scheme awarded €650,000 to 14 projects in its fourth round (DCEE, 2026b), and the pathway from innovation grant to commercially scaled operation requires patient capital, risk-sharing instruments and demand certainty, which current national mechanisms do not fully provide. EU-level instruments, including the Innovation Fund, InvestEU and the proposed Industrial Decarbonisation Bank, offer financing pathways, but Ireland's low Innovation Fund capture rate to date limits near-term benefits, and state aid support from consultancy to R&D and capital investment will be required to develop the level of project maturity needed to access competitive EU funds (European Commission, 2025a,c).

Closing the CMUR gap from the current 2.0% to the target 12% by 2030 will require a step change across all major waste streams, particularly construction and demolition waste, packaging and e-waste. Completing the national geological assessment under the CRMA by 2027 is a prerequisite for any strategic project designation. Developing higher-value recycling and materials recovery capacity, particularly for CRMs

in e-waste and end-of-life batteries, aligns with the CRMA's 25% recycling benchmark and Ireland's need to reduce import dependencies. Leveraging the construction sector as a pilot for circular economy integration, through existing public procurement guidance on embodied carbon, end-of-waste criteria for recycled aggregates and enterprise support for life cycle assessments and environmental product declaration development, provides a scalable model for other sectors. Positioning Irish research and enterprise for participation in EU instruments, including the Innovation Fund, the European Battery Raw Materials Fund and the Important Project of Common European Interest on Circular Advanced Materials, will require pipeline development, capability building and coordinated state support. The forthcoming Circular Economy Act (expected in the second half of 2026) will establish new obligations and opportunities that Irish policymakers and industry should anticipate in current planning cycles, and the Whole of Government Circular Economy Strategy 2026–2028 provides the domestic framework for delivering on these ambitions (DCEE, 2026a). Further details on circularity opportunities across construction and demolition waste, e-waste, battery materials and enterprise awareness are provided in Appendix 4.

3.5 Global Markets and International Partnerships

The CID positions global market access as integral to industrial decarbonisation, recognising that “the EU cannot realise its clean industrialisation objectives without partnerships on the global stage” (European Commission, 2025a). The global markets and international partnerships pillar addresses three interdependent areas: Clean Trade and Investment Partnerships (CTIPs) for diversifying supply chains and securing CRMs; the CBAM for preventing carbon leakage and incentivising global decarbonisation; and sharpened trade defence instruments for protecting European industry from state-subsidised overcapacity. The Draghi report provides a strategic rationale, noting that the global market for clean energy technology is set to exceed US\$2 trillion by 2035 and that EU exports of low-carbon technologies have risen by 65% since 2017, but that China's 79% growth rate over the same period and US industrial policy through the Inflation Reduction Act have intensified competitive pressures (Draghi, 2024).

For Ireland, this pillar carries consequences. As shown in Figure 3.6, exports are highly concentrated; two-thirds of all export value is concentrated in six country partners and five industries. Goods exports reached a record €224 billion in 2024, with the EU (€88.4 billion) and the USA (€73.5 billion) as the two dominant markets, and medical and pharmaceutical products accounting for 45% of total goods exports (CSO, 2024a). In 2025, goods exports to the USA surged by 52% to nearly €112 billion, with pharmaceuticals and pharmaceutical products accounting for a considerable share of this increase, partly reflecting front-loading ahead of potential US tariffs (CSO, 2026c). As illustrated in Figure 3.7, this sectoral concentration in US-bound exports has been a persistent structural feature across the past decade.

The first CTIP was signed with South Africa on 20 November 2025 at the G20 Johannesburg Summit; it covers five priority supply chains: renewable energy, low-carbon and net-zero technologies, electricity transmission and energy grids, clean fuels, and raw materials and climate technologies (European Commission, 2025h). South Africa hosts 91% of the world's platinum metal reserves, alongside substantial green hydrogen potential, resources that are directly relevant to Irish industrial needs, given the extensive use of platinum group metals in catalytic processes and medical device manufacturing. The European Commission further announced a Trans-Mediterranean Energy and Clean-Tech Cooperation

Initiative under the Pact for the Mediterranean in Q4 2025, and CTIPs are intended to complement existing free trade agreements by focusing specifically on clean value chains, CRM supply diversification and market access for EU clean technology exporters. Ireland's dependency on the 20 materials classified as having high criticality status by Murtaza *et al.* (2025) makes active participation in CTIP-facilitated diversification directly relevant, and the Government's Market Diversification and Resilience Action Plan (August 2025) details over 100 actions aimed at broadening Ireland's international trade engagement (DETE, 2025c).

CBAM entered its definitive phase on 1 January 2026, with importers of cement, iron and steel, aluminium, fertilisers, electricity and hydrogen now required to purchase CBAM certificates priced in line with EU ETS allowances (European Commission, 2025i). In Ireland, the EPA administers CBAM authorisation, with importers exceeding the 50-tonne annual threshold being required to register as authorised declarants. The Omnibus I simplification adopted in February 2025 introduced this 50-tonne threshold, exempting approximately 90% of importers while retaining 99% of embedded emissions within scope (European Commission, 2025i). A formal legislative proposal published in December 2025 would extend CBAM from 1 January 2028 to 180 downstream products with high steel or aluminium content (unofficial indications from Irish departmental sources suggest that this could eventually be extended to as many as 600 downstream products), the overwhelming majority being intermediate industrial goods (Delivorias, 2026). Future revisions may extend CBAM further to chemicals, polymers, indirect emissions and transport emissions. A more consequential dynamic for Ireland concerns the potential extension of CBAM to chemicals: given that chemicals and pharmaceutical products account for the majority of Irish exports, any CBAM-type mechanism applying to chemical value chains would carry substantial implications for importers of chemical precursors and for the competitiveness of Irish-manufactured exports in markets without comparable carbon pricing.

The CID also commits to sharpening trade defence instruments to protect EU industry from unfair competition driven by state-subsidised overcapacity (European Commission, 2025a). The European Commission tightened the steel safeguard in

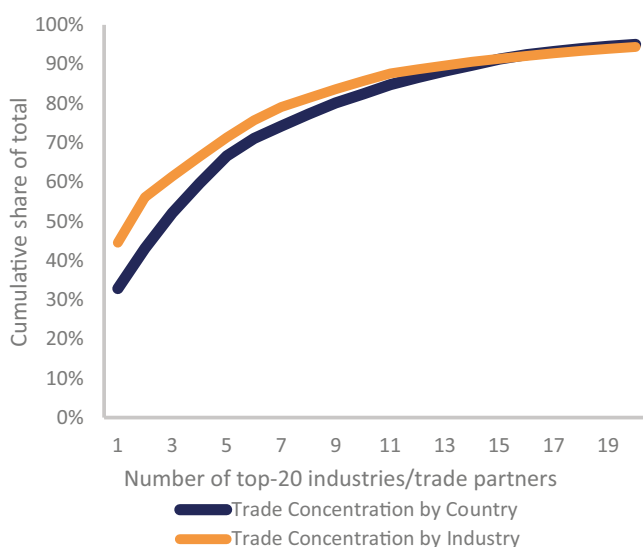


Figure 3.6. Concentration of Irish trade by top-20 export partners and industries. Source: Authors' calculations based on CSO (2026c) data.

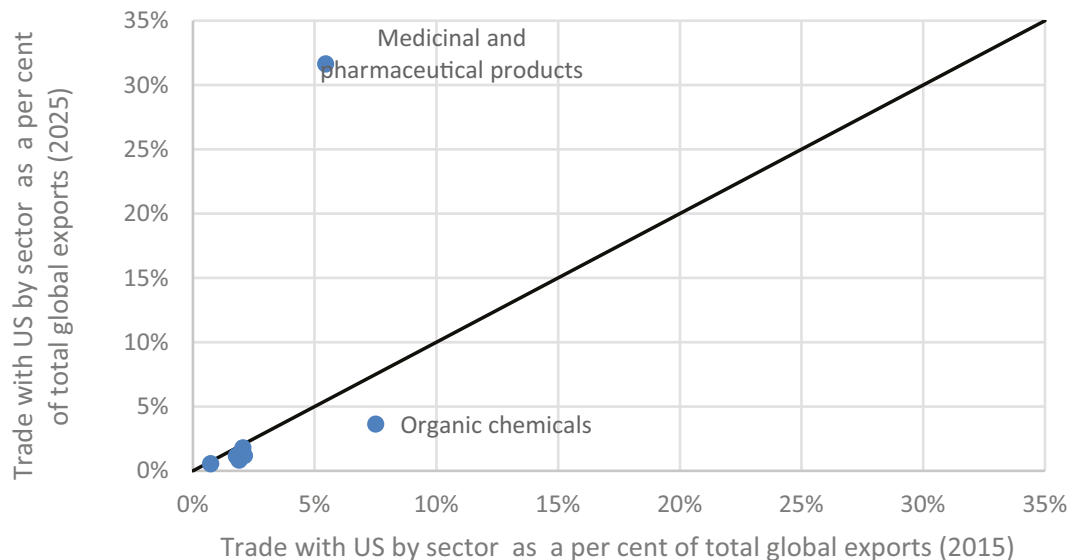


Figure 3.7. Concentration of exports to the USA across the top-five exporting sectors (2015–2025). The top-five exporting sectors to the USA are medicinal and pharmaceutical products; organic chemicals; professional, scientific and controlling apparatus; miscellaneous manufactured articles; and other transport equipment. For scaling, only sectors with material changes in exports have been labelled. Source: Authors’ calculations based on CSO (2026c) data.

April 2025 and committed to proposing a long-term steel protection measure ahead of the current safeguard’s expiry in June 2026; special monitoring tasks were active in 15 investigations in 2024, with 12 concerning Chinese imports (European Commission, 2025j). Ireland’s Screening of Third Country Transactions Act 2023, which entered into force on 6 January 2025, established the country’s first formal foreign investment screening mechanism, requiring mandatory notification for investors from outside the EU, the European Economic Area and Switzerland (i.e. “third country” investors) in designated sensitive sectors, including energy, critical infrastructure, health, defence and technology, with the renewable energy sector explicitly being within scope (European Commission, 2025a). The EU–US trade agreement, finalised in mid-2025, established a 15% ceiling on tariffs for EU-originating pharmaceuticals, though President Trump’s subsequent announcement of 100% tariffs on branded pharmaceuticals not manufactured in the USA introduced renewed uncertainty (Directorate-General for Trade and Economic Security, 2025). Given that pharmaceutical and medical exports constituted over half of all Irish goods exports in 2025, the tariff environment materially affects Ireland’s industrial base, and the Government Trade Forum and Market Diversification

and Resilience Action Plan represent the institutional responses to these risks.

The global markets pillar creates five cross-cutting considerations for Irish policymakers. First, active engagement with CTIP investment mobilisation and regulatory cooperation frameworks is needed to secure access to strategic materials, given Ireland’s near-100% reliance on imports for many CRMs. Second, with CBAM’s definitive phase being operational and a downstream extension from 2028 being in place, importers across construction, manufacturing and agricultural supply chains face growing compliance obligations, and any future extension to organic chemicals and polymers warrants early preparation by Ireland’s dominant export sector. Third, the concentration of Irish exports in the US and EU markets requires sustained diversification efforts; Enterprise Ireland’s strategy has a target of reaching €50 billion in client company exports by 2029, with 97% of surveyed clients planning new market entry (Enterprise Ireland, 2025b). Fourth, Ireland’s new investment screening regime must balance historical openness to FDI with the CID’s emphasis on strategic resilience and conditionality. Fifth, the tightened steel safeguard and proposed long-term protection measures directly affect input costs for the construction and engineering sectors. Further details

on CTIPs, CBAM implementation and trade defence instruments are provided in Appendix 5.

3.6 Skills and the Quality of Jobs Needed for Social Fairness and a Just Transition

The CID's sixth pillar commits to ensuring that "every person, community, and business should benefit from the clean transition", positioning skills development and high-quality employment as prerequisites for both industrial competitiveness and social cohesion (European Commission, 2025a). The pillar addresses a structural tension identified in Draghi's report on EU competitiveness: Europe's clean transition requires the development of a skilled workforce at a pace and scale that existing education and training systems are not currently equipped to deliver, while the displacement effects of decarbonisation risk deepening regional and social inequalities if inadequately managed (Draghi, 2024). The CID structures its response through two workstreams: skills architecture and worker transition support.

The Union of Skills, adopted in Q1 2025, establishes an overarching EU strategy for enhancing skills intelligence, adult and lifelong learning, vocational education and training, higher education and skills recognition, and also a European Skills High-Level Board and Skills Observatory (European Commission, 2025k). The Skills Portability Initiative under development for 2026 aims to facilitate cross-border recognition of qualifications, addressing the fragmentation that currently constrains labour mobility (European Commission, 2026b). The CID's target key performance indicator for this pillar measures the reduction in the number of occupations where at least five Member States report a shortage of workers with green transition skills, from 27 such occupations in 2024. The Quality Jobs Roadmap, published on 4 December 2025, addresses four priority areas – psychosocial risks, responsible algorithmic management, the right to telework and occupational safety in digital workplaces – and was developed with 88 recognised European social partners (European Commission, 2025l). For workers specifically affected by industrial restructuring, the European Commission has proposed amendments to the European Globalisation Adjustment Fund for Displaced Workers and the European Social Fund Plus, to support

workers at risk of job loss due to decarbonisation-linked restructuring, a provision of direct relevance to Ireland's energy-intensive manufacturing sectors. The European Fair Transition Observatory, launched in March 2026, is strengthening the evidence base on fairness aspects of the green transition through standardised indicators, data sharing and an online Fair Transition Monitor tracking related policies, due for publication in autumn 2026; further details on this instrument and the proposed training conditionalities for public funding are provided in Appendix 6.

The demand for green skills in Ireland has intensified markedly. According to the IDA Ireland Labour Market Pulse, green skills demand grew by 22.1% in 2024, approximately double the global average growth rate of 11.6%, and one in eight Irish job postings now requires at least one green skill, one of the highest proportions internationally (IDA Ireland, 2024). The Further Education and Training Authority's (SOLAS's) Quarterly Skills Bulletin found that 75% of employment in Ireland requires some level of green skill, with approximately 400,000 people in green employment during Q4 2024, of whom 280,000 were in non-agricultural roles, with this number growing at a rate of 6.4% annually against a national average of 3.4% (SOLAS, 2025a). However, the demographic profile reveals imbalances: 68% of those in green employment were male and 69% held third-level qualifications, patterns that risk reinforcing existing gender and educational inequalities if not addressed through targeted programme design (SOLAS, 2025a).

In the construction sector, SOLAS and the Department of Further and Higher Education estimate that approximately 23,000 new workers will need to be recruited into managerial, professional and skilled occupations by 2030 to meet retrofitting targets alone, rising to approximately 51,000 when combined with housebuilding and repair requirements (National Skills Council, 2021). A government report on construction and modern methods of construction skills, published in June 2025, projects that Ireland will need between 69,000 and 79,000 new construction workers, depending on the degree of modern methods of construction adoption (DFHERIS, 2025b). Apprenticeship registrations reached 9000 in 2024, with over half in construction, and the Government has set a target of 12,500 per year by 2030 under a new 5-year apprenticeship action plan (2026–2030) (DFHERIS, 2025c).

In 2024, SOLAS published *Green Skills 2030: The 1st National Further Education and Training (FET) Strategy for the Green Transition*, with an implementation plan launched in September 2025 containing 24 strategic actions and 71 sectoral actions across construction, agriculture, transport, energy, hospitality and finance (SOLAS, 2024, 2025b). Skillnet Ireland's enterprise-led networks – the Green Tech Skillnet (promoted by Wind Energy Ireland), the Skillnet Climate Ready Academy and the Lean & Green Skillnet – address sector-specific decarbonisation training needs and collectively mirror the CID's emphasis on strategic sectoral skills reinforcement (Skillnet Ireland, 2021). Enterprise Ireland's Green Transition Fund suite (Climate Action Voucher, GreenStart, GreenPlus and Strategic Consultancy) embeds skills development within capital support, with 30% of Enterprise Ireland clients having developed a sustainability plan by 2024, up from 24% in 2023 (Enterprise Ireland, 2024b). The CID's proposal to assess training and skills conditionalities for public funding represents a direction of travel that would require Irish enterprise agencies to embed workforce development requirements within capital support programmes, a shift from current practice, while the General Block Exemption Regulation review scheduled for Q4 2027 will assess how state aid rules can incentivise industry investment in upskilling and reskilling for a just transition (European Commission, 2025a, 2026c).

Kelly *et al.* (2025) identified the importance of monitoring distributional inequality as the transition progresses, using nationally representative household surveys with demographic disaggregation by region, income level and age group. The agricultural sector, accounting for 38.4% of Irish GHG emissions and facing a 25% reduction target by 2030, presents direct implications for rural employment and farm viability (EPA, 2025b). Ireland's most substantial just transition experience – the Midlands transition, following cessation of commercial peat extraction and closure of peat-fired power stations and supported by €169 million from the Just Transition Fund across 172 projects in skills training, bioeconomy and community development – provides operational lessons for managing workforce transitions in other sectors and regions facing decarbonisation pressures (Eastern and Midland Regional Assembly, 2024a). A detailed account of the Midlands transition is provided in Appendix 6.

The pillar creates six cross-cutting considerations for Irish policymakers. Ireland's green skills demand growth significantly outpaces supply, and the retrofit sector alone requires approximately 23,000 additional workers by 2030 (National Skills Council, 2021). SOLAS's Green Skills 2030 strategy provides the national framework, but the 16 education and training boards (ETBs) will require sustained resourcing and coordination to deliver green skills at the scale and speed required (SOLAS, 2025b). The gender imbalance in green employment (68% male) and its concentration among third-level qualification holders warrants targeted intervention in programme design (SOLAS, 2025a). The CID's direction towards training conditionalities creates a policy expectation that support for Irish enterprises will progressively embed workforce development requirements. Enterprise-led network models – the Green Tech Skillnet, Climate Ready Academy and Lean & Green Skillnet – demonstrate effective sector-specific delivery at a modest scale, and increased co-investment from both industry and the state will be required to match the breadth of the CID's ambition (Skillnet Ireland, 2021). Ireland's historically strong capture of Horizon Europe and Erasmus+ funding provides a foundation for extending performance to CID-specific skills instruments, including the reinforced €90 million Erasmus+ allocation for sectoral skills in CID-relevant industries.

3.7 Clean Energy Technology Deployment and Industrial Competitiveness

The CID treats clean energy deployment as a competitiveness measure as well as a decarbonisation objective. Estimates suggest that newly installed solar and wind capacity delivered approximately €100 billion in electricity cost savings across the EU between 2021 and 2023, underpinning the CID's target of increasing electrification from 21.3% to 32% by 2030 and deploying 100 GW of renewable electricity capacity annually (Draghi, 2024; European Commission, 2025b). The framework supports these objectives through the Affordable Energy Action Plan, European Grids Package and EU Energy Union Task Force, with Ireland's implementation shaped by the Integrated Single Electricity Market and the National Energy Affordability Taskforce (European Commission, 2025b; DCEE, 2026c).

Ireland reached 8 GW of installed renewable electricity capacity in 2026, with renewables supplying almost half of electricity generation and wind contributing 41% (DCEE, 2026c). Deployment has been supported through five Renewable Electricity Support Scheme auctions since September 2020, with a sixth due in 2026, and the Tonn Nua auction has procured 900 MW of offshore capacity for the south coast. Despite this progress, the SEAI's national energy projections indicate that Ireland remains at risk of under-delivering on the 8 GW solar target by between 1.5 and 2.9 GW by 2030, and offshore wind faces more acute delivery risks, with widespread delays potentially hindering Ireland's ability to meet its EU Renewable Energy Directive target (SEAI, 2024a, 2025b). Grid infrastructure remains the binding constraint: EirGrid forecasts a 45% increase in electricity demand between 2023 and 2034, connection timelines for large industrial loads remain at 7–10 years, and renewable curtailment reached 14% (2.1 TWh) in 2024 at a system cost ultimately borne by electricity consumers (SEM Committee, 2024; EirGrid, 2025; SEAI, 2025a). The Government has committed €3.5 billion to upgrading electricity infrastructure including grids, including the Celtic Interconnector and Greenlink, supported by the CID's European Grids Package (DCEE, 2025; European Commission, 2025b).

Ireland recorded the highest non-household electricity prices in the EU, including all non-recoverable taxes and levies, in the second half of 2025 at €25.52 per 100 kWh, compared with an EU average of €18.37 per 100 kWh (Eurostat, 2026e). The Commission for Regulation of Utilities (CRU) approved combined transmission and distribution revenues of approximately €2.72 billion for 2025/26, with network charges remaining high relative to those of European peers and the Producer Price Index for energy rising by 67.7% between January 2024 and January 2025 (CRU, 2025; NCPC, 2025). The CID's measures, European Investment Bank (EIB) PPA counter-guarantees, contracts for difference guidance and network charge harmonisation align with ongoing Irish tariff reform, although their effectiveness depends on the pace of renewable deployment and grid reinforcement (Farrelly and Collins, 2021; European Commission, 2025b).

EirGrid's Delivering a Secure, Sustainable Electricity System (DS3) programme established commercial frameworks for system services, frequency response,

inertia, voltage support and reserve capacity, enabling up to 75% system non-synchronous penetration and creating revenue opportunities for industrial consumers participating in system balancing (European Commission, 2025b). A November 2025 Scheduling and Dispatch Programme second initiative (SDP-02) market reform enabled energy storage power stations to participate fully in the real-time electricity market, and expanding battery storage capacity is reducing curtailment and improving system efficiency (Statkraft, 2026). The development of demand response mechanisms, private wire arrangements and greater EU market integration through expanded interconnection collectively determine how effectively clean energy deployment translates into industrial competitiveness gains; further details on these market and infrastructure arrangements are provided in Appendix 7.

3.8 Large Energy Users: Connection Policy, Strategic Planning and Grid Integration

Data centres accounted for approximately 22% of metered national electricity consumption in 2024, rising from circa 5% in 2015, and EirGrid projects that this share will reach 31% of national electricity requirements by 2034 (CRU, 2025). The CRU's Large Energy User Connection Policy (CRU2025236) requires data centres above 1 MVA to meet at least 80% of annual demand through new Irish renewable electricity within a 6-year glide path from energisation, with system operators retaining discretion to impose flexible demand conditions consistent with the National Energy Demand Strategy target of 20–30% flexible demand by 2030 (CRU, 2025; Mason Hayes & Curran, 2026).

The Government's Large Energy-User Action Plan (LEAP), published in 2025, sets out a plan-led approach to the location of large energy users across data centres, semiconductors, life sciences and chemicals, with strategic green energy parks as the principal vehicle for aligning industrial demand with indigenous renewable generation and grid infrastructure (DCEE and DETE, 2025). LEAP comprises 17 enabling actions on spatial planning, infrastructure coordination and system integration, including reforms to flexible and non-firm connection contracts, hybrid connections and private wires policy.

It explicitly acknowledges that the Price Review 6 grid investment programme to 2030 does not provide additional infrastructure beyond demand already under contract, and that plan-led investments in strategic locations may require the Government to consider new infrastructure funding. Initial market intelligence suggests potential additional medium-term data centre demand of approximately 5.8 GW, underscoring the planning scale required (CRU, 2025).

Future iterations of the Large Energy Users Connection Policy may shift large energy users from mandatory generation provision towards market-based demand response as renewable deployment progresses and flexibility markets mature, changing them from being system constraints to active system assets that reduce curtailment, lower overall system costs and improve the efficiency with which renewable electricity is translated into industrial competitiveness gains (CRU, 2025).

3.9 Clean Technology Manufacturing Capacity

The government target is to have at least 37 GW of offshore renewable energy generation capacity by 2050, supported by *Powering Prosperity: Ireland's Offshore Wind Industrial Strategy* (March 2024), which contains 40 actions targeting supply chain development, research, development and innovation (RD&I), regional development and future demand, with a target of there being 5000 jobs in the offshore wind sector and associated sectors by 2030 (DETE, 2024c). The April 2025 implementation progress report indicates that most actions are complete or in progress (DETE, 2025a). Under the CID's Net-Zero Industry Act framework, offshore wind is designated a strategic net-zero technology, providing a basis for streamlined permitting and state aid for manufacturing capacity that Ireland could mobilise to accelerate domestic supply chain development (European Union, 2024). However, SEAI identifies that delays across offshore wind, onshore wind and solar deployment could significantly undermine both renewable energy targets and the supply chain pipeline on which these ambitions depend (SEAI, 2024a).

Enterprise policy is central to translating clean energy deployment into domestic economic activity. IDA Ireland's 2025–2029 strategy identifies digitalisation, semiconductors, health and sustainability as four

primary growth sectors, while Enterprise Ireland's parallel strategy targets employment growth and enterprise decarbonisation by 2030 (Enterprise Ireland, 2025b; IDA Ireland, 2025). Both agencies are positioned as delivery mechanisms for CID-aligned objectives under CISAF provisions enabling state aid for cleantech manufacturing capacity. However, a structural gap persists between early-stage enterprise support and the deployment-ready project maturity level required for EU competitive instruments: Ireland's participation in the EU Innovation Fund remains limited, reflecting the mismatch between Enterprise Ireland's early- and mid-stage capability instruments and the Innovation Fund's requirement for near-commercial, investment-ready projects (DFHERIS, 2025a). Extending Ireland's strong Horizon Europe performance to Innovation Fund and Industrial Decarbonisation Bank instruments requires dedicated pipeline development connecting national enterprise support with EU deployment criteria. Further discussion of sector-specific competitiveness considerations for pharmaceuticals, chemicals, food processing and construction materials is provided in Appendix 8.

Effective CID implementation requires that regulatory, market and enterprise policy frameworks are coordinated rather than pursued in isolation. The National Competitiveness and Productivity Council has called for "greater consultation between regulators" to expedite infrastructure delivery, as fragmented decision-making across the CRU, the Single Electricity Market Committee (SEMC), DCEE, DETE and enterprise agencies risks producing internally inconsistent outcomes (NCPC, 2025). The CID's proposed IDAA, with its one-stop shop for developers and accelerated permitting provisions, provides a governance model that could inform the coordination of Ireland's energy market reform agenda (European Commission, 2025b).

3.10 Economic Impact and Environmental Assessment

The CID is embedded within an investment imperative of a historically unprecedented scale. The Draghi report on EU competitiveness estimates additional annual investment requirements of €750 billion to €800 billion for the EU's digitalisation, decarbonisation and defence objectives, with the CID identifying a

requirement for approximately €480 billion for the clean transition alone. European Commission and IMF simulations indicate that this investment push is sustainable and capable of generating positive output and productivity effects over time, providing the macroeconomic rationale for co-financing the transition through public instruments (Draghi, 2024; European Commission, 2025b). This investment case is grounded in a widening gap between Ireland's current emissions trajectory and its legal obligations, as examined below.

For the industry sector specifically, the 2018 baseline stood at 7.1 MtCO₂eq, with an emissions reduction target of 35% by 2030 (EPA, 2026b). Under current policy trajectories, the sector is projected to reach just 6.4 MtCO₂eq under the WEM scenario (a 10.1% cut) and 6.3 MtCO₂eq under the WAM scenario (11.8%), both far short of the 35% goal (EPA, 2026b). This is consistent with actual 2025 performance, where industry emissions fell 3.3% year-on-year to 6.0 MtCO₂eq, driven by reduced coal (–25.5%), oil (–6.2%) and gas (–2.7%) usage, but the sector has already exceeded its first carbon budget sectoral ceiling by 9.1% (EPA, 2026a). At the national level, Ireland's total GHG emissions decreased by 2.2% (1.2 MtCO₂eq) to 55.16 MtCO₂eq in 2025, the fourth consecutive annual decline, but the emissions trajectory still falls substantially short of legally binding targets: emissions were 14.5% below 2018 levels in 2025, against a 51% reduction target for 2030, meaning that emissions now need to fall by over 10% annually to close the gap (EPA, 2026a). This national picture, however, conceals sectoral divergence. Ireland provisionally remained within its first carbon budget (2021–2025) at the national level, coming in 1.1 MtCO₂eq under the 295 MtCO₂eq cap, with the energy industries and buildings sectors meeting their sectoral ceilings; but the transport and industry sectors individually exceeding their sectoral ceilings by 8.1% and 9.1%, respectively (EPA, 2026a). Under the EPA's projections, this divergence is set to widen: nearly all sectors, including industry, remain on track to exceed their sectoral ceilings for the second carbon budget (2026–2030) under current policy settings (EPA, 2026b). The CCAC estimates that failure to meet Ireland's 2030 EU targets could expose Ireland to compliance costs of between €8 billion and €26 billion (CCAC, 2025). This shortfall is compounded by structural cost and market barriers specific to the Irish

economy, namely, elevated energy import dependency, persistent cost premiums on low-carbon products and a domestic procurement market too small to generate meaningful lead-market effects on its own.

Ireland's energy import dependency of 78.4% in 2023, significantly above the EU average, contributes to higher energy costs and greater exposure to international price volatility. Survey evidence confirms that low-carbon products continue to face significant cost premiums and that customer willingness to pay remains limited, reinforcing the importance of the CID's demand-side instruments, public procurement mandates, carbon-intensity labelling and non-price criteria (Deloitte, 2025). Ireland's small domestic procurement market limits direct lead market effects nationally, but Irish producers supplying EU-wide markets in construction materials, food ingredients and pharmaceutical intermediates stand to benefit from EU-level sustainability criteria applied consistently across the single market.

Enterprise Ireland has approved combined funding of over €60 million under the Environmental Aid Scheme and Green Transition Fund since 2022, supporting more than 500 companies and an estimated 130,000 tonnes of CO₂ abated (Enterprise Ireland, 2024b). These figures are substantial relative to Ireland's enterprise support baseline but modest relative to the EU-wide €100 billion of funding proposed through the Industrial Decarbonisation Bank. Four structural factors shape Ireland's overall economic and environmental impact balance: the historically limited deployment of state aid instruments for industrial decarbonisation relative to larger Member States, despite the simplified pathways of CISAF; Ireland's strong Horizon Europe performance (€1.02 billion; 2.09% of total awards) but low Innovation Fund capture, the latter being the instrument most directly relevant to the proposed Industrial Decarbonisation Bank; private capital mobilisation constrained by project risk profiles, planning uncertainty and grid connection timelines of 7–10 years; and structural competition between data centre electricity demand (27% of generation in 2025) and manufacturing electrification, which represents a binding constraint on the affordable energy pillar's effectiveness in the Irish context and requires explicit policy resolution. The principal channels of transition costs and long-term benefits are summarised in Table A1.4 in Appendix 1.

4 Conclusions and Policy Recommendations

This report assesses the impacts and opportunities for Ireland of the EU's CID, examining the alignment between EU-level policy objectives and Ireland's industrial structure, competitive positioning and decarbonisation requirements across the CID's six pillars and associated legislative instruments. The analysis draws on EU legislative sources, CSO data, SEAI assessments, EPA-funded research and national policy frameworks to characterise both Ireland's baseline conditions and the mechanisms through which CID instruments interact with the Irish economic and institutional context.

Ireland's industrial base presents a mixed picture of readiness. The concentration of manufacturing value in pharmaceuticals, chemicals, computers and electronics, and food processing alongside substantial ICT services creates sectors with distinct decarbonisation challenges, while also representing a productive base from which CID financing and lead market instruments can be deployed. Indigenous firms, particularly in food processing, construction and other lower-margin sectors, face greater barriers in accessing capital-intensive EU instruments and implementing abatement technologies, reflecting smaller-scale, more limited financial capacity, information barriers and the high level of project maturity required for accessing instruments such as the Innovation Fund. The affordable energy pillar is the pillar most directly constrained by Ireland's energy cost position and grid infrastructure: high electricity prices, lengthy grid connection timelines (averaging 7–10 years for large industrial loads) and growing electricity demand from data centres remain structural factors affecting the pace of industrial electrification. Despite recent progress, the industry sector is not on track to comply with its 2030 sectoral emissions ceiling, having already exceeded its first carbon budget sectoral ceiling by 9.1%. The potential compliance costs of exceeding our 2030 climate targets have been estimated at €8–26 billion, underscoring an urgency for accelerating decarbonisation (CCAC, 2025; EPA, 2026a).

The analysis across the six pillars identifies a set of policy priorities that emerge consistently from the evidence, as outlined below.

On affordable energy and grid infrastructure, the priority is to turn the renewable electricity build-out into a reliable and competitive decarbonisation pathway for manufacturing consumers. This will require the faster delivery of EirGrid and ESB Networks investment programmes, permitting reform for grid infrastructure, better locational grid information, more flexible connection arrangements and electricity tariff structures that reduce the operating cost risk of switching from fossil fuels to electricity. It will also require large new electricity demand, including data centres, to be managed in a way that does not crowd out strategically important industrial electrification (EirGrid, 2025; NCPC, 2025; SEAI, 2025a).

On lead markets, Ireland's limited domestic procurement market constrains direct demand-side effects, and so the greatest opportunity lies in translating national commitments into concrete EU-facing procurement criteria and carbon-intensity labelling, leveraging multinational supply chains and hydrogen demand aggregation to support early industrial adoption (DETE, 2024a; IDA Ireland, 2025).

On financing and EU fund capture, Ireland's participation in the Innovation Fund remains limited to two projects, despite strong Horizon Europe performance. Building the commercial demonstration pipeline at TRLs 7–9 through sequenced state aid, blended finance and technical assistance, and positioning projects for the Innovation Fund and the proposed Industrial Decarbonisation Bank are the highest-leverage financing interventions available within the CISAF (DFHERIS, 2025a; European Commission, 2025c).

On circularity, addressing Ireland's CMUR of 2.0%, against an EU average of 12.2% and the national target of reaching a rate of 12% by 2030, will require step-change action. Completing the national geological assessment, establishing the CSO-led national CRM database recommended by Murtaza *et al.* (2025) and scaling materials recovery capacity, particularly for construction and demolition waste and e-waste, will enable the collection of foundational data and facilitate the infrastructure actions needed to achieve this (DCEE, 2026b; Eurostat, 2026d).

On skills, the growing gap between green skills demand and supply is a consideration, and the gap is particularly acute in retrofit delivery. One in eight Irish job postings now requires a green skill, and it is estimated that the retrofit sector alone will require approximately 22,800 additional workers by 2030. This skills challenge is not only a labour supply issue, but also a constraint on delivering on Ireland's retrofit targets and wider industrial transition, given the need to scale up activity sharply over the remainder of the decade. Resourcing and scaling up the actions set out in SOLAS's green skills implementation plan for 2030 across the 16 ETBs, expanding Nearly Zero-Energy Building and retrofit training capacity, improving awareness among SMEs and workers, and reducing barriers to participation should therefore be treated as time-critical priorities (National Skills Council, 2021; IDA Ireland, 2024; SOLAS, 2025b).

On global markets, the concentration of Irish goods exports in pharmaceuticals and within two primary markets (EU and USA) heightens exposure to CBAM downstream extension, tariff policy shifts and trade defence actions. Early compliance preparedness and active engagement with CTIP-facilitated supply chain diversification are prudent risk-management responses (CSO, 2024a).

Three cross-cutting institutional priorities also emerge from this analysis. First, state aid deployment requires dedicated coordination: despite the simplified pathways of the CISAF, Ireland has historically under-deployed industrial decarbonisation state aid relative to larger Member States, and a coordinated cross-departmental strategy integrating DETE, DCEE, Enterprise Ireland and IDA Ireland is needed to design and deploy CISAF-compatible schemes targeting Ireland's sectoral priorities within EU competition law parameters (European Commission, 2025c).

Second, regulatory coordination is a binding condition for system-wide CID implementation: fragmented decision-making across the CRU, SEMC, DCEE, DETE and enterprise agencies risks producing internally inconsistent outcomes; the CID's proposed IDAA, with its one-stop shop governance model, provides a template (European Commission, 2025b; NCPC, 2025). Third, distributional monitoring must accompany the transition: the EPA's Just Transition Indicator Framework, the gender imbalance in green employment (68% male) and the agricultural sector's 25% emissions reduction requirement by 2030 all point to the need for proactive targeting of transition support to the regions, sectors and demographics most exposed to adjustment costs (EPA, 2025b; Kelly *et al.*, 2025; SOLAS, 2025a).

The costs and benefits of the transition remain uncertain and will depend on energy prices, technology costs, carbon prices, trade policy and multinational investment decisions. The overall outcome for Ireland will be shaped by the interaction between decarbonisation investment requirements, access to EU markets and funding, and the avoidance of future compliance costs. The policy window provided by the CISAF, valid to December 2030, and the legislative instruments progressing through the EU co-legislative process are concentrated and time limited; the strategic priorities identified in this report would be most effectively addressed in the near term, when EU regulatory and financing frameworks are still being operationalised and Ireland retains the capacity to shape its own implementation pathways. Further work should therefore focus on tracking implementation, identifying sector-specific investment pipelines and assessing how emerging EU instruments can be translated into practical delivery for Irish industry.

References

- Argus Media (2023). Boliden to close Tara zinc mine in Ireland: update. Available online: <https://www.argusmedia.com/en/news-and-insights/latest-market-news/2459241-boliden-to-close-tara-zinc-mine-in-ireland-update> (accessed 14 January 2026).
- Baldé, C. P., Kuehr, R., Bel, G., Deubzer, O., Forti, V., Gray, V., Herreras, L. and Stegmann, P. (2024). *The Global E-waste Monitor 2024*. United Nations Institute for Training and Research and International Telecommunication Union, Bonn/Geneva.
- Bord na Móna (2021). Bord na Móna delivering over 1400 climate solutions jobs in Midlands. Available online: <https://www.bnm.ie/bord-na-mona-delivering-over-1400-climate-solutions-jobs-in-midlands/> (accessed 11 August 2026).
- BVG Associates, Gavin and Doherty Geosolutions, and AFRY (2025). *Offshore Wind Potential in Ireland*. Available online: https://assets.gov.ie/static/documents/Offshore_Wind_Technical_Resource_Assessment.pdf (accessed 8 February 2025).
- CCAC (Climate Change Advisory Council) (2025). *Annual Review 2025: Cross-sectoral Review*. Available online: <https://www.climatecouncil.ie/councilpublications/annualreviewandreport/CCAC-AR2025-Cross-sectoral-final.pdf> (accessed 9 February 2026).
- Cembureau (2024). *Clinker Substitution in the Cement Industry*. Position paper. <https://www.cementeurope.eu/media/02hh1sdv/240305-cembureau-position-faq-on-clinker-substitution.pdf> (accessed 20 January 2026).
- CINEA (European Climate, Infrastructure and Environment Executive Agency) (2024). Five innovative electric vehicle battery cell projects secure €643 million under the Innovation Fund 2024 battery call. News article. Available online: https://cinea.ec.europa.eu/news-events/news/five-innovative-electric-vehicle-battery-cell-projects-secure-eu643-million-under-innovation-fund-2025-11-10_en (accessed 20 January 2026).
- CINEA (European Climate, Infrastructure and Environment Executive Agency) (2025a). Advancing Europe's clean industrial transformation. News article. Available online: https://cinea.ec.europa.eu/news-events/news/advancing-europes-clean-industrial-transformation-2025-03-13_en (accessed 19 December 2025).
- CINEA (European Climate, Infrastructure and Environment Executive Agency) (2025b). *2025 Annual Knowledge Sharing Report of the Innovation Fund: De-risking Innovative Low-carbon Technologies*. Publications Office of the European Union, Luxembourg.
- CRU (Commission for Regulation of Utilities) (2025). *Large Energy Users Connection Policy*. Available online: https://cruie-live-96ca64acab2247eca8a850a7e54b-5b34f62.divio-media.com/documents/CRU2025236_Large_Energy_User_connection_policy_decision_paper.pdf (accessed 19 December 2025).
- CSO (Central Statistics Office) (2024a). Irish industrial production by sector 2023. Available online: <https://www.cso.ie/en/releasesandpublications/ep/p-iips/irishindustrialproductionbysector2023/> (accessed 19 December 2025).
- CSO (Central Statistics Office) (2024b). Business energy use 2023. Available online: <https://www.cso.ie/en/releasesandpublications/ep/p-beu/businessenergyuse2023/keyfindings/> (accessed 19 December 2025).
- CSO (Central Statistics Office) (2024c). Output and value added by activity 2023. Available online: <https://www.cso.ie/en/releasesandpublications/ep/p-naova/outputandvalueaddedbyactivity2023/> (accessed August 2026).
- CSO (Central Statistics Office) (2025a). Business energy use 2023 – key findings. Available online <https://www.cso.ie/en/releasesandpublications/ep/p-beu/businessenergyuse2023/> (accessed 11 August 2026).
- CSO (Central Statistics Office) (2025b). Key findings: data centres metered electricity consumption 2025. Available online: <https://www.cso.ie/en/releasesandpublications/ep/p-dcmec/datacentresmeteredelectricityconsumption2025/keyfindings/> (accessed 11 August 2026).
- CSO (Central Statistics Office) (2026a). Prodcom statistics. Available online: <https://data.cso.ie/product/PCOM> (accessed July 2026).
- CSO (Central Statistics Office) (2026b). BEU01 – business energy use in kilotonne of oil equivalent (ktoe). Available online: <https://data.cso.ie/table/BEU01> (accessed July 2026).
- CSO (Central Statistics Office) (2026c). TSA10 – value of merchandise trade. Available online: <https://data.cso.ie/table/TSA10> (accessed July 2026).
- DCEE (Department of Climate, Energy and the Environment) (2020). Bord na Móna bog rehabilitation scheme. Available online: <https://www.gov.ie/en/department-of-climate-energy-and-the-environment/publications/bord-na-mona-bog-rehabilitation-scheme/> (accessed 11 August 2026).

- DCEE (Department of Climate, Energy and the Environment) (2024). *Report of the Task Force on Just Transition*. Government of Ireland, Dublin.
- DCEE (Department of Climate, Energy and the Environment) (2025). Minister O'Brien welcomes historic €18.9 billion investment in energy infrastructure. Press release. Available online: <https://www.gov.ie/en/department-of-climate-energy-and-the-environment/press-releases/minister-obrien-welcomes-historic-189-billion-investment-in-energy-infrastructure/> (accessed 9 February 2026).
- DCEE (Department of Climate, Energy and the Environment) (2026a). *Whole of Government Circular Economy Strategy 2026–2028: Accelerating Action*. Government of Ireland, Dublin.
- DCEE (Department of Climate, Energy and the Environment) (2026b). Minister Dillon announces Circular Economy Innovation Grant Scheme recipients. Press release. Available online: <https://www.gov.ie/en/department-of-climate-energy-and-the-environment/press-releases/minister-dillon-announces-circular-economy-innovation-grant-scheme-recipients/> (accessed 30 March 2026).
- DCEE (Department of Climate, Energy and the Environment) (2026c). Ireland reaches 8GW of onshore renewable electricity generation – securing our future with homegrown renewables. Press release. Available online: <https://www.gov.ie/en/department-of-climate-energy-and-the-environment/press-releases/ireland-reaches-8gw-of-onshore-renewable-electricity-generation-securing-our-future-with-homegrown-renewables/> (accessed 30 March 2026).
- DCEE (Department of Climate, Energy and the Environment) and DETE (Department of Enterprise, Tourism and Employment) (2025). *LEAP: Large Energy-User Action Plan*. Government of Ireland, Dublin.
- Delivorias, A. (2026). CBAM extension to downstream products. Briefing, EU Legislation in Progress, PE 789.314. European Parliamentary Research Service, European Parliament, Brussels. Available online: [https://www.europarl.europa.eu/thinktank/en/academic/EPRS_BRI\(2026\)789314](https://www.europarl.europa.eu/thinktank/en/academic/EPRS_BRI(2026)789314) (accessed 10 September 2026).
- Deloitte (2025). Closing the European competitiveness gap. Available online: <https://www.deloitte.com/uk/en/Industries/energy/perspectives/closing-the-european-competitiveness-gap.html> (accessed 22 January 2026).
- DETE (Department of Enterprise, Tourism and Employment) (2019). *Ireland's Industry 4.0 Strategy 2020–2025*. Government of Ireland, Dublin.
- DETE (Department of Enterprise, Tourism and Employment) (2024a). *Statement of Strategy 2024–2025*. Government of Ireland, Dublin.
- DETE (Department of Enterprise, Tourism and Employment) (2024b). Government approves public procurement guidance to promote the reduction of embodied carbon in construction. Press release. Available online: <https://www.gov.ie/en/department-of-enterprise-tourism-and-employment/press-releases/government-approves-public-procurement-guidance-to-promote-the-reduction-of-embodied-carbon-in-construction/> (accessed 11 December 2025).
- DETE (Department of Enterprise, Tourism and Employment) (2024c). *Powering Prosperity: Ireland's Offshore Wind Industrial Strategy*. Government of Ireland, Dublin.
- DETE (Department of Enterprise, Tourism and Employment) (2024d). Minister Burke announces €300 million to drive the decarbonisation of manufacturing sectors. Press release. Available online: <https://enterprise.gov.ie/en/news-and-events/department-news/2024/june/20240623.html> (accessed 22 January 2026).
- DETE (Department of Enterprise, Tourism and Employment) (2025a). *Powering Prosperity – Ireland's Offshore Wind Industrial Strategy Implementation Progress Report*. Government of Ireland, Dublin.
- DETE (Department of Enterprise, Tourism and Employment) (2025b). Ecodesign for Sustainable Products Regulation. Available online: <https://enterprise.gov.ie/en/what-we-do/the-business-environment/ecodesign-for-sustainable-products/> (accessed 28 January 2026).
- DETE (Department of Enterprise, Tourism and Employment) (2025c). *Government Action Plan on Market Diversification*. Government of Ireland, Dublin.
- DETE (Department of Enterprise, Tourism and Employment) (2025d). *SME Sustainability Research: Wave 2*. Government of Ireland, Dublin.
- DETE (Department of Enterprise, Tourism and Employment) (2025e). Minister Burke welcomes findings that four in five businesses rank sustainability as an important day-to-day issue. Available online: <https://enterprise.gov.ie/en/news-and-events/department-news/2025/june/20250614.html> (accessed 20 January 2026).
- DETE (Department of Enterprise, Trade and Employment) (2025f). White Paper on Enterprise Implementation Plan: Update Report H2 2024. Available online: <https://enterprise.gov.ie/en/publications/white-paper-on-enterprise-implementation-plan-update-report-h2-2024.html> (accessed 11 September 2026).

- DFHERIS (Department of Further and Higher Education, Research, Innovation and Science) (2025a). Ireland reaches €1 billion milestone in Horizon Europe funding. Press release. Available online: <https://www.gov.ie/en/department-of-further-and-higher-education-research-innovation-and-science/press-releases/ireland-reaches-1-billion-milestone-in-horizon-europe-funding/> (accessed 4 December 2025).
- DFHERIS (Department of Further and Higher Education, Research, Innovation and Science) (2025b). *Modern Methods of Construction (MMC) Action Plan*. Government of Ireland, Dublin.
- DFHERIS (Department of Further and Higher Education, Research, Innovation and Science) (2025c). *Public Consultation on the Action Plan on Apprenticeship 2026–2030*. Government of Ireland, Dublin.
- Directorate-General for Trade and Economic Security (2025). Joint statement on a United States–European Union framework on an agreement on reciprocal, fair and balanced trade. Available online: https://policy.trade.ec.europa.eu/news/joint-statement-united-states-european-union-framework-agreement-reciprocal-fair-and-balanced-trade-2025-08-21_en (accessed 11 August 2026).
- Draghi, M. (2024). The Future of European Competitiveness: Part A – A competitiveness strategy for Europe. Publications Office of the European Union, Luxembourg.
- Eastern and Midland Regional Assembly (2024a). *Programme Summary: EU Just Transition Fund*. Available online: https://www.emra.ie/wp-content/uploads/2024/03/eujtf_brochure_final_online.pdf (accessed 30 October 2025).
- Eastern and Midland Regional Assembly (2024b). *EU Just Transition Fund 2021–2027: Programme Summary*. Available online: https://www.emra.ie/wp-content/uploads/2024/10/eujtf_brochure_august_2024.pdf (accessed 11 August 2026).
- EIB (European Investment Bank) (2024). *Financing and Commercialisation of Cleantech Innovation*. EIB, Luxembourg.
- EIB (European Investment Bank) (2025). EIB Group and European Commission simplify application of state aid rules to support Europe's clean industry and hold roundtable with business leaders. Press release. Available online: <https://www.eib.org/en/press/news/eib-group-and-european-commission-simplify-application-of-state-aid-rules-to-support-europe-s-clean-industry-and-hold-roundtable-with-business-leaders> (accessed 30 March 2026).
- EIB (European Investment Bank) (2026). Commission and EIB Group increase financial support for the EU economy and speed up key transformative investments under InvestEU. Available online: <https://www.eib.org/en/press/all/2026-201-commission-and-eib-group-increase-financial-support-for-the-eu-economy-and-speed-up-key-transformative-investments-under-investeu> (accessed 11 August 2026).
- EirGrid (2025). New EirGrid analysis examines the balance between electricity demand and supply in Ireland over 10 years. EirGrid news. Available online: <https://www.eirgrid.ie/news/new-eirgrid-analysis-examines-balance-between-electricity-demand-and-supply-ireland-over-10-0> (accessed 15 January 2026).
- Enterprise Ireland (2024a). *Annual Report & Accounts 2023*. Enterprise Ireland, Dublin.
- Enterprise Ireland (2024b). *Sustainability Report 2024*. Available online: <https://www.enterprise-ireland.com/resource/blob/176666/1929a35ea016a7f8f6461b69d06168bf/sustainability-report-2024-pdf--data.pdf> (accessed 31 August 2026).
- Enterprise Ireland (2025a). Shared Island Enterprise Scheme. Available online: <https://www.enterprise-ireland.com/en/shared-island> (accessed 10 July 2026).
- Enterprise Ireland (2025b). *Delivering for Ireland, Leading Globally: Strategy 2025–2029*. Enterprise Ireland, Dublin.
- Enterprise Ireland (n.d.). Research, Development & Innovation Fund. Available online: <https://www.enterprise-ireland.com/en/supports/research-development-innovation-fund> (accessed 2 November 2025).
- EPA (Environmental Protection Agency) (2023). *National End-of-Waste Decision EoW-N001/2023 of 12th September 2023 Establishing Criteria Determining When Recycled Aggregate Ceases to be Waste Under Regulation 28 of the European Union (Waste Directive) Regulations 2011–2020*. Available online: <https://www.epa.ie/publications/licensing--permitting/waste/Final-Decision---National-End-of-Waste-Criteria-N001-2023.pdf> (accessed 11 March 2026).
- EPA (Environmental Protection Agency) (2024). National By-Product Criteria for Greenfield Soil and Stone (Reference Number BP-N002/2024) of the 2nd of July 2024, Establishing Detailed Criteria on the Application of the Conditions of Regulation 27(1)(a)–(d) When Making the Decision that Greenfield Soil and Stone Can Be Regarded as a By-Product Under Regulation 27 of the European Union (Waste Directive) Regulations 2011–2020. Available online: <https://www.epa.ie/publications/licensing--permitting/waste/National-By-Product-greenfield-stone--Criteria-Ref.-No.-BP-N002.2024.pdf> (accessed 11 March 2026).

- EPA (Environmental Protection Agency) (2025a). *Ireland's Provisional Greenhouse Gas Emissions 1990–2024*. EPA, Johnstown Castle, Ireland.
- EPA (Environmental Protection Agency) (2025b). *Ireland's Greenhouse Gas Emissions Projections 2024–2055*. EPA, Johnstown Castle, Ireland.
- EPA (Environmental Protection Agency) (2026a). Ireland's greenhouse gas emissions decrease by 2.2% in 2025. News release. Available online: <https://www.epa.ie/news-releases/news-releases-2026/irelands-greenhouse-gas-emissions-decrease-by-22-in-2025-.php> (accessed 7 July 2026).
- EPA (Environmental Protection Agency) (2026b). *Ireland's Greenhouse Gas Emissions Projections 2025–2030*. EPA, Johnstown Castle, Ireland.
- European Commission (2025a). Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: The Clean Industrial Deal – a joint roadmap for competitiveness and decarbonisation. COM(2025) 85 final, 26.2.2025, Brussels.
- European Commission (2025b). Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Action plan for affordable energy. COM(2025) 79 final, 26.2.2025, Brussels.
- European Commission (2025c). Communication from the Commission – Framework for State Aid Measures to Support the Clean Industrial Deal (Clean Industrial Deal State Aid Framework). OJ C, C/2025/3602, 4.7.2025.
- European Commission (2025d). Call for Evidence for an Impact Assessment: Industrial Decarbonisation Accelerator Act – speeding up decarbonisation. Available online: [https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=intcom:Ares\(2025\)3563868](https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=intcom:Ares(2025)3563868) (accessed 31 August 2026).
- European Commission (2025e). Commission Decision (EU) 2025/840: Recognising certain critical raw material projects as Strategic Projects under Regulation (EU) 2024/1252 of the European Parliament and of the Council. OJ L, C/2025/1904, 30.4.2025.
- European Commission (2025f). Commission launches consultation and call for evidence for upcoming Circular Economy Act. News article. Available online: https://environment.ec.europa.eu/news/commission-launches-consultation-upcoming-circular-economy-act-2025-08-01_en (accessed 30 March 2026).
- European Commission (2025g). Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Delivering the Clean Industrial Deal I. COM(2025) 378 final, 2.7.2025, Brussels.
- European Commission (2025h). Ahead of G20 Summit, EU and South Africa advance cooperation on clean trade and investment. Available online: https://ec.europa.eu/commission/presscorner/detail/sk/ip_25_2755 (accessed 21 January 2026).
- European Commission (2025i). Proposal for a regulation of the European Parliament and of the Council amending Regulation (EU) 2023/956 as regards simplifying and strengthening the carbon border adjustment mechanism. COM(2025) 87 final, 26.2.2025, Brussels.
- European Commission (2025j). Report from the Commission to the European Parliament and the Council: 43rd annual report from the Commission to the European Parliament and the Council on the EU's anti-dumping, anti-subsidy and safeguard activities and the use of trade defence instruments by third countries targeting the EU in 2024. COM(2025) 428 final, 28.7.2025, Brussels.
- European Commission (2025k). Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: The Union of Skills. COM(2025) 90 final, 5.3.2025, Brussels.
- European Commission (2025l). Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Quality Jobs Roadmap. COM(2025) 944 final, 4.12.2025, Brussels.
- European Commission (2026a). Innovation Fund – portfolio of signed projects. Available online: https://dashboard.tech.ec.europa.eu/qs_digit_dashboard_mt/public/sense/app/6e4815c8-1f4c-4664-b9ca-8454f77d758d/sheet/bac47ac8-b5c7-4cd1-87ad-9f8d6d238eae/state/analysis (accessed July 2026).
- European Commission (2026b). EU facilitates skills portability for over 185,000 professionals. News article. Available online: https://employment-social-affairs.ec.europa.eu/news/eu-facilitates-skills-portability-over-185-000-professionals-2026-02-20_en (accessed 30 March 2026).
- European Commission (2026c). Commission invites comments on draft new State Aid General Block Exemption Regulation. Press release. Available online: https://ec.europa.eu/commission/presscorner/detail/en/ip_26_453 (accessed 30 March 2026).

- European Union (2023). Regulation (EU) 2023/1542 of the European Parliament and of the Council of 12 July 2023 concerning batteries and waste batteries, amending Directive 2008/98/EC and Regulation (EU) 2019/1020 and repealing Directive 2006/66/EC. OJ L 191, 28.7.2023.
- European Union (2024). Regulation (EU) 2024/1735 of the European Parliament and of the Council of 13 June 2024 on establishing a framework of measures for strengthening Europe's net-zero technology manufacturing ecosystem and amending Regulation (EU) 2018/172. OJ L, 2024/1735, 28.6.2024.
- Eurostat (2026a). Rate of electrification. Available online: https://doi.org/10.2908/NRG_IND_RE (accessed 31 March 2026).
- Eurostat (2026b). Electricity price statistics. Available online: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Electricity_price_statistics (accessed 31 March 2026).
- Eurostat (2026c). Labour cost levels by NACE Rev. 2 activity. Available online: https://doi.org/10.2908/LC_LCI_LEV (accessed 31 March 2026).
- Eurostat (2026d). Circular material use rate. Available online: https://doi.org/10.2908/SDG_12_41 (accessed 31 March 2026).
- Eurostat (2026e). Non-household electricity prices in 2nd half of 2025: -3.5%. Available online: <https://ec.europa.eu/eurostat/web/products-eurostat-news/w/ddn-20260508-2> (accessed 11 August 2026).
- Expert Group on Future Skills Needs (2021). *Skills for Zero Carbon*. Available online: <https://www.skillsireland.ie/media/2eng44zf/5119-dete-egfsn-skills-for-zero-carbon-web.pdf> (accessed 27 February 2026).
- Farrelly, G. and Collins, O. (2021). Corporate PPAs in Ireland: current trends. Available online: <https://www.matheson.com/insights/corporate-ppas-in-ireland-current-trends-2/> (accessed 10 July 2026).
- Grabbe, H. (2024). A circular single market for sustainable competitiveness. Available online: <https://www.bruegel.org/first-glance/circular-single-market-sustainable-competitiveness> (accessed 25 February 2026).
- IDA Ireland (2024). Labour Market Pulse: Edition 11. Available online: <https://www.idaireland.com/latest-news/publications/labour-market-pulse-edition-11> (accessed 20 February 2026).
- IDA Ireland (2025). Adapt intelligently: a strategy for sustainable growth and innovation 2025–29. Available online: <https://www.idaireland.com/ida-ireland-strategy-2025-2029> (accessed 18 February 2026).
- IEA (International Energy Agency) (2023). *Critical Minerals Market Review 2023*. IEA, Paris.
- IFAC (Irish Fiscal Advisory Council) and CCAC (Climate Change Advisory Council) (2025). *A Colossal Missed Opportunity: Ireland's Climate Action and the Potential Costs of Missing Targets*. IFAC and CCAC, Dublin.
- InnoEnergy (2024). EIT InnoEnergy and Demeter launch €500 million European battery raw materials fund. Press release. Available online: <https://innoenergy.com/news-resources/eit-innoenergy-and-demeter-launch-e500m-european-battery-raw-materials-fund/> (accessed 14 January 2026).
- International Mining (2024). Boliden inks deal to reopen Tara in major boost for Irish mining. News article. Available online: <https://im-mining.com/2024/05/09/boliden-inks-deal-to-reopen-tara-in-major-boost-for-irish-mining/> (accessed 14 January 2026).
- IPHA (Irish Pharmaceutical Healthcare Association) (2025). IPHA statement on EU–US trade agreement. News article. Available online: <https://www.ipha.ie/ipha-statement-on-eu-us-trade-agreement/> (accessed 28 January 2026).
- Ireland Live (2025). Raw material review “years behind schedule” because of geologist shortage. Available online: <https://www.ireland-live.ie/national/raw-material-review-years-behind-schedule-because-of-geologist-shortage-6790410> (accessed 28 January 2026).
- Just Transition Commission of Ireland (2025). *Introductory Report of the Just Transition Commission of Ireland 2025*. Just Transition Commission of Ireland, Dublin.
- Kelly, J. A., Deegan, C., Collins, A., Milimu, A., Kelleher, L. and Farrugia, Y. (2025). *Just Transition Indicator Framework for Ireland*. Environmental Protection Agency, Johnstown Castle, Ireland.
- Lagarde, C. (2024). Follow the money: channelling savings into investment and innovation in Europe. 34th European Banking Congress, Frankfurt, Germany, 22 November.
- Mason Hayes & Curran (2026). *New Large Energy User/ Data Centre Grid Connection Policy: CRU Sets New Criteria for Data Centre Connections*. Available online: <https://www.mhc.ie/uploads/documents/MHC-LEU-Policy-White-Paper-1.pdf> (accessed 11 August 2026).
- McCarthy, J., McCarthy, C., Sigüenza, C. P., Suto, G., Gibson, C., Downey, C. and Boland, A. (2024). *A Critical Analysis of Ireland's Circular Material Use Rate (CAIR)*. Environmental Protection Agency, Johnstown Castle, Ireland.
- McInerney, C., O'Connor, E., Power, B., Deane, P. and McDermott, T. (2019a). *EU ETS and Competitiveness of Irish Industry*. Environmental Protection Agency, Johnstown Castle, Ireland.

- McInerney, C., Hickey, C., Deane, P., Curtin, J. and Ó Gallachóir, B. (2019b). *Fossil Fuel Lock-in in Ireland: How Much Value Is at Risk?* Environmental Protection Agency, Johnstown Castle, Ireland.
- Murtaza, A., Mahnoor, M., Inam, A., Shah, A. A., Obeidi, M. A. and Ul Ahad, I. (2025). *Critical Raw Materials for Ireland for a Resource-Efficient Circular Economy (CIRCLE)*. Environmental Protection Agency, Johnstown Castle, Ireland.
- National Skills Council (2021). *Skills for Zero Carbon: The Demand for Renewable Energy, Residential Retrofit and Electric Vehicle Deployment Skills to 2030*. Available online: <https://enterprise.gov.ie/en/publications/publication-files/skills-for-zero-carbon.pdf> (accessed 9 July 2026).
- NCPC (National Competitiveness and Productivity Council) (2025). *Ireland's Competitiveness Challenge 2025*. NCPC, Dublin.
- NTMA (National Treasury Management Agency) (2025). *Annual Report & Financial Statements*. Available online: <https://www.ntma.ie/annualreport-2025/documents/NTMA-AR25-Eng-Secure.pdf> (accessed 3 September 2026).
- OECD (Organisation for Economic Co-operation and Development) (2022). *The Circular Economy in Ireland*. OECD Publishing, Paris.
- Pollock, S. (2024). ISIF to pump €30m into Irish mining fund as EU bids to move away from Chinese market dominance. Irish Independent. Available online: <https://www.independent.ie/business/irish-business/isif-to-pump-30m-into-irish-mining-fund-as-eu-bids-to-move-away-from-chinese-market-dominance/a/129557314.html> (accessed 11 August 2026).
- RPS Group (2024). *Reducing Embodied Carbon in Cement and Concrete Through Public Procurement in Ireland*. RPS Group, Dublin.
- SBCI (Strategic Banking Corporation of Ireland) (2023). Ministers announce first lender to the market for Growth and Sustainability Loan Scheme. Available online: <https://www.sbc.gov.ie/news/minister-coveney-mcgrath-and-mcconalogue-announce-first-lender-to-the-market-for-500-million-growth-and-sustainability-loan-scheme> (accessed 11 August 2026).
- SBCI (Strategic Banking Corporation of Ireland) (2024). SBCI and BVP launch €50m green transition finance product. Available online: <https://www.sbc.gov.ie/news/sbc-and-bvp-launch-50m-green-transition-finance-product> (accessed 11 August 2026).
- SEAI (Sustainable Energy Authority of Ireland) (2024a). *National Energy Projections 2024*. SEAI, Dublin.
- SEAI (Sustainable Energy Authority of Ireland) (2024b). *Offshore Renewable Energy Technology Roadmap*. SEAI, Dublin.
- SEAI (Sustainable Energy Authority of Ireland) (2025a). *Ireland's Sustainable Energy Supply Chain Opportunities*. SEAI, Dublin.
- SEAI (Sustainable Energy Authority of Ireland) (2025b). *National Energy Projections 2025*. SEAI, Dublin.
- SEM Committee (2024). *Imperfections Charges October 2024–September 2025 and Reforecast Report 2022–September 2023*. Available online: https://www.semcommittee.com/files/semcommittee/2024-09/SEM-24-064_Imperfections%20Charges%20Decision%20Paper.pdf (accessed 17 March 2026).
- Skillnet Ireland (2021). Skillnet Ireland and Ministers Harris and Ryan launch “Climate Ready” programme to prepare Irish businesses for climate change. Available online: <https://www.skillnetireland.ie/news/skillnet-ireland-ministers-harris-ryan-launch-climate-ready> (accessed 11 August 2026).
- SOLAS (Further Education and Training Authority) (2024). *Green Skills 2030: The 1st National Further Education and Training (FET) Strategy for the Green Transition*. SOLAS, Dublin.
- SOLAS (Further Education and Training Authority) (2025a). *Spring Skills Bulletin 2025: Is Ireland Truly Green? Measuring Green Jobs and Skills in the Irish Labour Market*. SOLAS, Dublin.
- SOLAS (Further Education and Training Authority) (2025b). *Green Skills 2030: Implementation Plan*. SOLAS, Dublin.
- Statkraft (2026). Statkraft officially opens Ireland's first 4-hour duration battery energy storage system at Cushaling, Co. Offaly. News article. Available online: <https://www.statkraft.ie/news/2026/statkraft-officially-opens-irelands-first-4-hour-duration-battery-energy-storage-system-at-cushaling-co.-offaly> (accessed 17 March 2026).
- Uisce Éireann (2024). New survey finds increased commitment to water conservation among Irish SMEs. News article. Available online: <https://www.water.ie/news/new-survey-finds-increased-commitment-water-conservation-among-irish-smes> (accessed 17 March 2026).
- WEEE Ireland (2024). Record volume of electrical goods recycled in 2023. Available online: <https://www.weeeireland.ie/2024/06/17/record-volume-of-electrical-goods-recycled-in-2023/> (accessed 11 March 2026).
- WEEE Ireland (2025). 250 million electrical items recycled as WEEE Ireland celebrates 20 years of impact. Available online: <https://www.weeeireland.ie/2025/04/15/250-million-electrical-items-recycled-as-weee-ireland-celebrates-20-years-of-impact/> (accessed 25 March 2026).

Appendix 1 Summary Tables

Table A1.1. Summary of major financing instruments

Instrument	Administration	Scale	Status
Environmental Aid Scheme	Enterprise Ireland/IDA Ireland	€300 million (2023–2026)	Active; €60 million+ approved by mid-2025
Green Transition Fund	Enterprise Ireland	500+ companies supported (combined with Environmental Aid Scheme, since 2022)	Active; National Recovery and Resilience Plan funded
SEAI EXEED	SEAI	Up to €3 million per project	Active; expanded to EU ETS sectors
SBCI Growth and Sustainability Loan Scheme	SBCI/DETE	Up to €500 million	Active; minimum 30% green allocation
Shared Island Sustainability Capital Grant	Enterprise Ireland /Invest Northern Ireland	€20 million (€10 million per jurisdiction)	First six projects announced December 2025
EU Innovation Fund	DCEE (National Contact Point)	~€40 billion EU-wide to 2030	Low Irish participation to date
CID Industrial Decarbonisation Bank	European Commission (forthcoming)	€100 billion target	Pilot (€1 billion auction) launched 2025
CID InvestEU Amendment	European Commission/EIB	Additional ~€55 billion (minimum), with ~€70 billion projected total impact following June 2026 EIB agreement	Adopted (Omnibus II Regulation, December 2025); further €22 billion financing agreement signed June 2026

Table A1.2. Summary of coordinated regulatory initiatives and CID alignment

Reform stream	Lead authority	Timeline	CID alignment
Network tariff methodology review	CRU	Ongoing	CID network charge harmonisation recommendation
Large Energy Users Connection Policy	CRU	Effective December 2025	CID flexibility and demand-side response guidance
Private Wires Bill	DCEE/CRU	General scheme 2025; drafting 2026	CID corporate PPA and direct industrial energy access
Dynamic electricity pricing	CRU/suppliers	Mandatory by June 2026	CID retail flexibility remuneration guidance
Battery Energy Storage Systems market integration (SDP-02)	Single Electricity Market Operator/EirGrid	Implemented November 2025	CID energy system integration and flexibility
Celtic Interconnector/Strategic Markets Programme	SEMC/EirGrid	Commercial go-live Q1 2028	CID European Grids Package; EU market integration
National Energy Affordability Action Plan	National Energy Affordability Taskforce/DCEE	2026	CID Affordable Energy Action Plan; taxation recommendation
CISAF	DETE/DCEE	Valid to December 2030	CID industrial decarbonisation and electrification support

Table A1.3. The status of Ireland's progress on key environmental targets

Indicator	Current position	Target	Status
Total GHG emissions (2025)	~55.16 Mt CO ₂ eq including LULUCF; 14.5% reduction from 2018	51% reduction from 2018 levels by 2030	Significant gap; ~36.5 percentage points short of 2030 target; emissions must fall over 10% annually through 2030 to close it
Industry emissions (2025)	~6.0 Mt CO ₂ eq	35% reduction by 2030 vs 2018 baseline of 7.1 Mt CO ₂ eq	Off track, first carbon budget sectoral ceiling exceeded by 9.1%; 2030 projections of 6.3 (under WAM) and 6.4 Mt CO ₂ eq (under WEM) fall well short of target
EU ETS emissions (cumulative since 2005)	–50%	Continued reductions under reformed ETS	On track within EU ETS scope
Effort Sharing Regulation emissions (2024)	11% below 2005	42% below 2005 levels by 2030	~31 percentage points short
First carbon budget (2021–2025)	~293.9 Mt CO ₂ eq (provisional)	295 Mt CO ₂ eq ceiling	Under by ~1.1 Mt CO ₂ eq
CMUR	2%	12% nationally by 2030; 24% EU-wide (CID)	10 percentage points below national target

Table A1.4. Summary of transition costs and long-term benefits

Dimension	Transition costs	Longer-term benefits
Energy	Capital expenditure on electrification and grid connection; PPAs	Reduced fossil fuel price exposure; lower marginal cost of renewable electricity
Industrial production	Higher production costs for low-carbon variants; capital expenditure on abatement technology	Access to EU lead markets; export competitiveness in carbon-constrained markets
Employment	Displacement in carbon-intensive roles; reskilling costs	Net job creation in renewable energy, energy efficiency and circular economy sectors
Fiscal	State aid co-financing; public procurement sustainability premium	EU ETS and Innovation Fund revenues; reduced EU non-compliance costs
Environment	Short-term adjustment inefficiencies	Emissions reductions aligned with sectoral ceilings; improved resource efficiency
Competitiveness	Green premium exceeding current customer willingness to pay	First-mover advantage in standards-driven EU markets; FDI attraction for clean manufacturing

Appendix 2 Spatial Distribution of Employment in Ireland's Pharmaceutical and Food and Beverage Industries

While pharmaceutical operations tend to be concentrated in clustered regions, the economic impacts of the food and beverage industries in Ireland are more spatially diverse, with large meat manufacturing sectors being located primarily in Meath and Louth, fruit and vegetable manufacturing in Cork

and Wexford, and dairy manufacturing in Wexford and County Cork. Moreover, food and beverage distribution and logistics operations are centred in Dublin, grain manufacturing in Kildare and Cork, and beverage manufacturing in Dublin and Donegal (Figures A2.1 and A2.2).

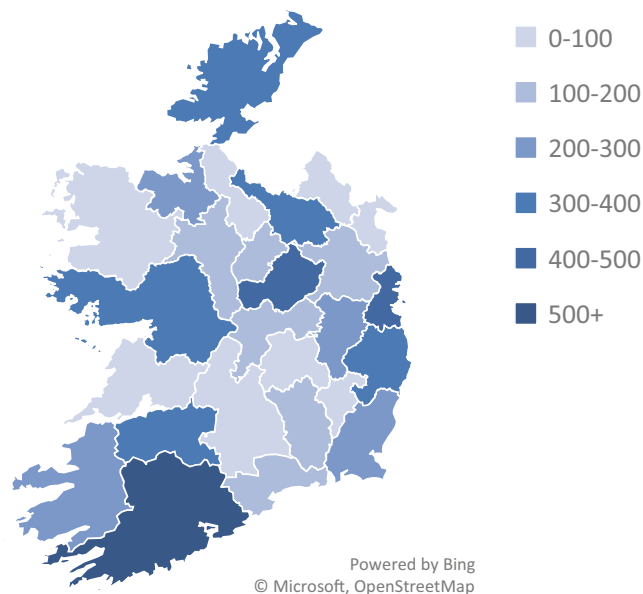


Figure A2.1. Employment in pharmaceuticals, medicinal chemicals and botanical products manufacturing by county (2022). Source: Authors' calculations based on CSO (2026) data (CSO, 3 March 2026, personal communication).

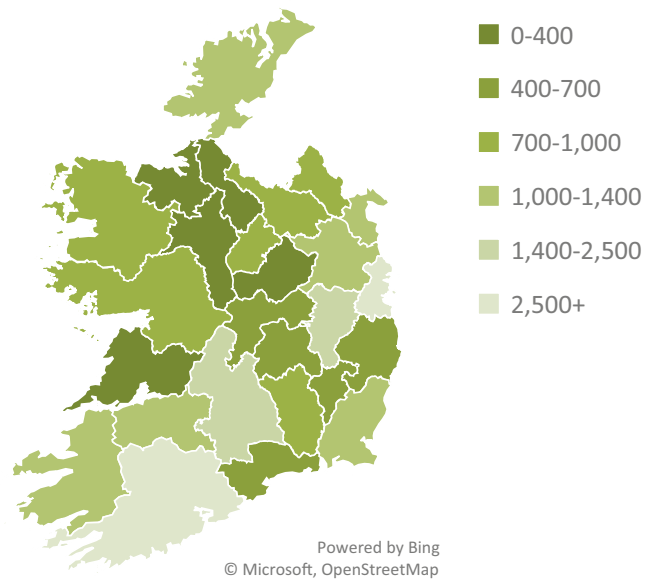


Figure A2.2. Employment in food and beverage manufacturing by county (2022). Source: Authors' calculations based on CSO (2026) data (CSO, 3 March 2026, personal communication).

Appendix 3 Supplementary Material for Section 3.3: Financing through Public and Private Investment

A3.1 EU-level Instruments and the Legislative Pipeline

At the European level, the CID seeks to mobilise large-scale investment through a set of financial instruments designed to lower financing costs, de-risk early deployment and leverage private capital across Member States. The Innovation Fund, funded from EU ETS revenues, is the primary EU grant instrument for large-scale demonstration and first-of-a-kind industrial decarbonisation projects. In 2025, the European Commission committed €6 billion across clean technology, battery manufacturing, the Hydrogen Bank and industrial decarbonisation (CINEA, 2025a). The proposed Industrial Decarbonisation Bank, targeting €100 billion for investment in decarbonisation projects, will draw on Innovation Fund resources, additional EU ETS revenues and the revised InvestEU programme, and represents the CID's most ambitious financing innovation. Ahead of the full reform, a €1 billion pilot auction was launched in 2025 to decarbonise industrial process heat through electrification and renewable heat (European Commission, 2025e). InvestEU has mobilised over €400 billion in public and private capital across key priority sectors to date. Following the adoption of the Omnibus II Regulation in December 2025, the programme's EU guarantee has been increased, unlocking at least €55 billion in additional public and private investment through mechanisms, including reinvestment of returns from past operations, streamlined reporting and simplified access for Member States channelling resources into InvestEU. A subsequent agreement between the European Commission and the EIB Group has since added a further €22 billion in strategic financing, with the EIB Group projecting a total financial impact of approximately €70 billion by the end of the current Multiannual Financial Framework, exceeding the Omnibus II package's original €55 billion minimum target (EIB, 2026). The EIB has also introduced targeted guarantee products, including a €500 million counter-guarantee facility for corporate PPAs prioritising SMEs and energy-intensive industries,

and a €1.5 billion package supporting grid component manufacturing (EIB, 2025). The CISAF, adopted in June 2025 and valid until December 2030, simplifies and accelerates Member State approval for industrial decarbonisation and clean technology aid, providing a 5-year planning horizon and greater investment predictability for firms; more than €85 billion in aid was approved under the preceding Temporary Crisis and Transition Framework, indicating the scale at which simplified state aid rules can increase utilisation (European Commission, 2025c).

A3.2 The Irish National Financing Landscape in Detail

DETE's €300 million Environmental Aid Scheme for 2023–2026 is the centrepiece of Ireland's national financing response for industrial decarbonisation, delivered through Enterprise Ireland and IDA Ireland to support Scope 1 emissions reductions in the dairy, cement and pharmaceuticals sectors (DETE, 2024d). Enterprise Ireland is the primary delivery mechanism for indigenous manufacturing firms: as at the end of 2025, it had approved more than €90 million under this scheme, leading to emissions reductions equivalent to an estimated 245,000 tonnes of CO₂, with supported projects including Techrete's sustainable concrete range, which achieved a 50% reduction in embodied carbon emissions, and Mannok Cement's decarbonisation project (Enterprise Ireland, 2024a,b). The Green Transition Fund, administered by Enterprise Ireland under the National Recovery and Resilience Plan, forms part of a combined Environmental Aid Scheme and Green Transition Fund package that has supported more than 500 companies since 2022, spanning sustainability planning, energy efficiency measures, carbon reduction road mapping and circular economy strategy development, and catalysing action among over 30% of Enterprise Ireland clients, who now have sustainability plans in place (Enterprise Ireland, 2024b). SEAI's EXEED scheme provides grants of up to €3 million per project

for energy-efficient industrial design. The SBCI Growth and Sustainability Loan Scheme offers up to €500 million in long-term lending (typically 7–10 years) to Irish SMEs, with at least 30% being allocated to environmental sustainability projects, supported by the EIB Group, with individual loans ranging from €25,000 to €3 million, including unsecured amounts of up to €500,000 (SBCI, 2023).

The Shared Island Sustainability Capital Grant Scheme, with €20 million in public funding forming part of the €30 million Shared Island Enterprise Scheme developed by InterTradelreland, Invest Northern Ireland and Enterprise Ireland, announced its first successful projects in December 2025, which are expected to leverage over €63.5 million in private sector investment (Enterprise Ireland, 2025a). The three Irish recipients – Aurivo (heat decarbonisation in dairy processing), Ecocem (low-carbon cement using recycled crushed glass co-ground with ground granulated blast-furnace slag) and Gannon Eco (industrial hazardous acid waste recovery and recycling) – are first-of-a-kind demonstration projects, and the strong uptake in this time-limited call signals the significant unmet demand for demonstration-stage capital at TRLs 7–9, capital that is not available from public or commercial finance providers on standard market terms. The ISIF has committed €30 million to the Irish Minerals Fund LP, an Irish limited partnership sponsored by Lionhead Resources, targeting minority investments in environmental, social and governance-responsible metals and mining projects in Ireland, with a primary focus on zinc and other critical minerals with proven deposits and strong community social licences, aligning with ISIF's indigenous businesses and climate investment themes (NTMA, 2025, pp. 270–282).

A3.3 Innovation Fund Participation: Performance Gap and Structural Causes

Ireland's limited Innovation Fund participation – only two Irish projects are represented in the current portfolio of 120 ongoing projects across 24 countries – reflects a structural gap rather than a lack of R&D capacity. Irish organisations have performed well in early-stage research funding: Ireland has secured €1.02 billion of Horizon Europe funding to date (2.09%

of total allocations against a 1.6% national target), and DETE's Disruptive Technologies Innovation Fund (€530 million across 131 projects) and Enterprise Ireland's R&D schemes demonstrate strong early-stage pipeline activity (DFHERIS, 2025a). The structural gap occurs at the commercial demonstration stage (TRLs 7–9), where projects require large-scale capital investment, infrastructure integration and operational validation under conditions of high technological and market uncertainty. The Aughinish Alumina Limited Steam Electrification Boiler project in Limerick (€4.24 million, 2021 small-scale call, supporting fuel switching and demand flexibility at an aluminium refinery) and the Saoirse Wave Energy demonstration project off the coast of Clare (2022 mid-sized pilot call) represent Ireland's two successful Innovation Fund applications to date. In comparison, projects are most frequently located in Spain, France and Germany by number, while Germany, Spain and Sweden are followed by Belgium and Norway, which receive the highest overall funding contributions, together accounting for the substantial majority of the fund's more than €7.1 billion in total committed contributions. This reflects both these countries' larger industrial bases and more developed public co-financing ecosystems, which de-risk projects sufficiently to meet the fund's maturity and scalability criteria (CINEA, 2025b).

Bridging this gap requires a pipeline development approach in which state aid support from consultancy and feasibility grants through to R&D co-funding and capital investment are sequenced to advance projects progressively to the investment-ready maturity level that the Innovation Fund demands. Blended public–private financing mechanisms, including grants, guarantees, co-investment structures and contracts for difference, are the instruments best suited to managing the residual risks that prevent private capital from committing alone at the commercial demonstration stage (European Commission, 2025a,c). The proposed Industrial Decarbonisation Bank's €1 billion pilot auction for industrial process heat and the EIB's expanded guarantee products under CISAIF represent near-term EU-level instruments through which Irish projects could access this co-financing architecture, provided that project maturity levels are sufficient and that sufficient national co-financing is in place.

Appendix 4 Supplementary Material for Section 3.4: Circularity and Access to Materials

A4.1 Boliden Tara Mine

Ireland's sole significant active mining operation is the Tara zinc and lead mine near Navan, County Meath, operated by Swedish metals producer Boliden. Tara is Europe's largest zinc mine, with over 85 million tonnes of ore having been extracted since mining commenced in 1977. The mine was placed into "care and maintenance" in July 2023 due to a confluence of unfavourable zinc prices, high energy costs and operational challenges (Argus Media, 2023). An agreement between Boliden and workers' unions (the Services, Industrial, Professional and Technical Union, Unite the Union and Connect Trade Union), reached in May 2024, enabled the mine's reopening on a restructured basis involving an optimised mining plan with an annual production rate of 1.8 million tonnes, organisational redesign and a reduction in headcount from over 600 to approximately 400 full-time equivalent employees (International Mining, 2024). Production ramp-up commenced in Q4 2024, with normal cash costs projected to decrease to approximately US\$1 per 0.45kg of zinc, down from US\$1.37 in the first half of 2023. The Tara experience illustrates several dynamics relevant to the CID circularity pillar: the vulnerability of European mining operations to volatile commodity prices and energy costs; the employment and community dependencies associated with resource extraction; and the importance of cost competitiveness for sustaining the domestic supply of materials otherwise imported. It also underscores the potential for Ireland to contribute to the CRMA's domestic extraction benchmark, provided that enabling conditions, including stable energy costs, streamlined permitting and geological assessments, are in place (Argus Media, 2023; International Mining, 2024).

A4.2 Construction and Demolition Waste

Construction waste, with over 9 million tonnes being generated annually, represents Ireland's single

largest waste stream and a substantial untapped resource. The EPA's publication of National By-Product Criteria for Greenfield Soil and Stone (BP-N002/2024) in August 2024 provides rules for the safe reuse of excavated clean soil and stone, while the National End-of-Waste Decision (EoW-N001/2023) established criteria for when recycled aggregate from construction and demolition concrete waste ceases to be classified as waste, enabling its use as a substitute for natural aggregates (EPA, 2023, 2024). The Government's public procurement guidance on reducing embodied carbon in construction, effective for projects commencing on or after September 2024, mandates a minimum 30% clinker substitution in cement procurement (RPS Group, 2024). Cembureau, the European Cement Association, cites Ireland's guidance, alongside measures taken in Denmark, France, Germany and the Netherlands, as an exemplar of how Member States are stimulating demand for low-carbon, circular construction products (Cembureau, 2024). EPA data indicate that Irish cement sector GHG emissions fell by 15.6% in 2024, attributed in part to reduced clinker production in response to increased demand for less carbon-intensive construction products (EPA, 2025a). Enterprise Ireland reports a concurrent increase in construction-sector clients seeking Green Transition Fund support for life cycle assessments, environmental product declarations and capital investment in low-carbon construction materials, including Techrete's development of a sustainable concrete range, which achieved a 50% reduction in carbon emissions with Environmental Aid Scheme funding, and Mannok Cement's decarbonisation project (Enterprise Ireland, 2024a,b). Cement production accounts for approximately 5% of Ireland's total national GHG emissions, making construction materials a priority sector for both lead market development and circular economy interventions (DETE, 2024b).

A4.3 E-waste and Critical Raw Material Recovery

Ireland recycled a record 41,730 tonnes of electronic and electrical waste in 2023, with approximately 18.1 million appliances being collected, exceeding EU targets (WEEE Ireland, 2024). Over its 20-year history, WEEE Ireland has facilitated the collection and recycling of more than 609,000 tonnes of electrical waste, investing approximately €25 million annually in indigenous recycling infrastructure, recovering CRMs present in electronics, batteries and lighting equipment. However, current weight-based collection targets for waste from electrical and electronic equipment are increasingly at odds with circular economy principles: WEEE Ireland has noted that targets fail to account for the improved lifespan of modern technology and that “if a mobile phone is repaired or refurbished, it does not count towards Ireland’s official environmental performance, despite keeping raw materials in circulation” (WEEE Ireland, 2025). The forthcoming Circular Economy Act’s first pillar targets e-waste reform, with potential revisions to the Waste Electrical and Electronic Equipment Directive being expected to modernise collection and recycling metrics. The CID’s emphasis on securing the CRM supply through recycling creates a specific opportunity for Ireland to develop higher-value e-waste processing capabilities, particularly for cobalt, lithium and rare earth elements currently exported for further processing after domestic collection.

A4.4 Battery Materials

The clean energy transition is generating unprecedented demand for battery materials. The Draghi report notes that global demand for lithium tripled between 2017 and 2022, while demand for cobalt rose by 70% and nickel by 40% (Draghi, 2024). Following the EU Innovation Fund’s 2024 battery call, €643 million was awarded to five electric vehicle battery cell manufacturing projects across four Member States, covering advanced material production, cell manufacturing, recycling technologies and second-life applications (CINEA, 2024). Ireland does not currently host facilities for battery cell manufacturing or large-scale battery materials processing; however, the country’s growing electric vehicle fleet, expanding energy storage installations and projected decommissioning of early-generation

wind turbines will generate increasing volumes of battery and component waste containing recoverable CRMs. The European Battery Raw Materials Fund, launched in January 2024 with a target capitalisation of €500 million and at least 70% of investments dedicated to EU domestic production from mining, processing, refining and recycling, represents an instrument through which Irish enterprises and research institutions with capabilities in materials science, hydrometallurgy or industrial chemistry could pursue opportunities (InnoEnergy, 2024).

A4.5 National Geological Assessment and Exploration

The CRMA mandates national exploration programmes, recognising that Europe’s mineral potential remains insufficiently characterised. Ireland has known deposits of zinc, lead, gypsum and other minerals, but the comprehensive geological assessment of Irish geology for CRMs mandated under the act remains incomplete. A 2025 progress report indicated that the assessment would not be completed until 2027, with the delay attributed to a shortage of exploration geologists within the state’s geology unit (Ireland Live, 2025). Geological Survey Ireland is responsible for conducting this assessment, the outcome of which will map occurrences of CRMA-designated materials in Ireland, in order to de-risk commercial mineral exploration, an essential precursor to strategic project development under the CRMA. Project promoters in Member States with advanced geological datasets and designated strategic projects are already benefiting from streamlined permitting and facilitated finance under the CRMA framework. Ireland’s later entry into this process reduces the window for project development within the act’s 2030 benchmark horizon.

A4.6 Enterprise Policy and Awareness among SMEs

The DETE-commissioned Amárach research on SME sustainability (Wave 2, November 2025) found that 85% of businesses regard sustainability as important to their business on a day-to-day basis, with waste reduction (49%), energy efficiency (44%) and renewable energy adoption (33%) being the most common actions reported (DETE, 2025d).

The primary barrier to further action was upfront investment costs, cited by 22% of respondents, a figure that has declined from the first (2024) wave, indicating moderating cost perceptions. In the first wave of the research, 83% of businesses ranked sustainability as important, with 63% having addressed waste and 49% having taken steps on energy efficiency, leading the Minister for Enterprise, Tourism and Employment Peter Burke to observe that “not only do a large majority of SMEs think sustainability is important, but many have already taken steps to

become so” (DETE, 2025e). Enterprise Ireland's Green Transition Fund has supported over 550 projects since 2022 through climate action vouchers, GreenStart, GreenPlus and strategic consultancy support, with 30% of Enterprise Ireland clients now having a sustainability plan; however, translating this awareness into the project maturity level required for accessing competitive EU instruments, including the Innovation Fund and the forthcoming Industrial Decarbonisation Bank, remains the next challenge for enterprise policy (Enterprise Ireland, 2024a).

Appendix 5 Supplementary Material for Section 3.5: Global Markets and International Partnerships

A5.1 Clean Trade and Investment Partnerships: Design and Scope

CTIPs represent a new instrument in the EU's external economic toolbox, designed to offer "a faster, more flexible, and more targeted approach" than traditional free trade agreements (European Commission, 2025b). CTIPs combine three elements: mobilisation of investment through Global Gateway financing; rules to ensure a conducive environment for EU businesses operating on equal footing in foreign markets; and regulatory cooperation on clean technology standards, carbon pricing and decarbonisation pathways. The first CTIP, signed with South Africa at the G20 Johannesburg Summit on 20 November 2025, covers renewable energy, low-carbon and net-zero technologies, electricity transmission and energy grids, clean fuels, and raw materials and climate technologies (European Commission, 2025h). The total value of EU–South Africa trade stood at €45 billion in 2024, with the EU representing over 40% of FDI in the country. The first business-to-government dialogue under the CTIP took place in March 2026, with the aim of gathering information on business priorities for implementation. The European Commission announced a Trans-Mediterranean Energy and Clean-Tech Cooperation Initiative under the Pact for the Mediterranean in Q4 2025, and the CTIP model is intended to be progressively replicated with further partners whose resource profiles complement EU industrial transition needs.

Ireland's engagement with the CTIP agenda is supported by its Market Diversification and Resilience Action Plan, launched in August 2025, which details over 100 actions aimed at broadening international trade engagement (DETE, 2025c). Enterprise Ireland's 5-year strategy (2025–2029) sets the targets of achieving €50 billion in client company exports by 2029 and a significant increase in the number of Irish-owned exporters, with 97% of surveyed client companies planning to expand into new international markets (Enterprise Ireland, 2025b). The Eurozone

remains the top target region, followed by the UK and the USA. Ireland's national diversification efforts align with the CID's CTIP agenda, although Irish participation in CTIP-facilitated opportunities will require active engagement with the European Commission's investment mobilisation mechanisms and regulatory cooperation frameworks.

A5.2 Carbon Border Adjustment Mechanism: Implementation Details and Future Scope

CBAM entered its definitive phase on 1 January 2026. Importers of goods in the six initial categories – cement, iron and steel, aluminium, fertilisers, electricity and hydrogen – are required to purchase CBAM certificates corresponding to the embedded emissions of their imports, priced in line with EU ETS allowances. Any carbon price already paid in the country of production may be deducted. In Ireland, the EPA administers CBAM authorisation, with importers exceeding the 50-tonne annual mass threshold being required to register as authorised CBAM declarants before 31 March 2026. The Omnibus I simplification, adopted as part of the CID delivery in February 2025, introduced this 50-tonne threshold, exempting approximately 90% of importers, while ensuring that 99% of embedded emissions remain within scope, and therefore addressing criticism from smaller importers regarding the administrative burden associated with CBAM authorisation (European Commission, 2025i).

In Q3 2025, the European Commission published its comprehensive CBAM review report, followed by a public consultation launched on 1 July 2025 on extension to downstream products. In December 2025, the Commission published a formal legislative proposal to extend the CBAM scope, from 1 January 2028, to 180 additional downstream products with high steel or aluminium content (unofficial indications from Irish departmental sources suggest that this could eventually be extended to as many as 600 downstream products), of which the overwhelming

majority (94%) are intermediate industrial goods, with an average steel and aluminium share of 79% (Delivorias, 2026). Future revisions may extend CBAM further to downstream products in the cement, fertiliser and hydrogen value chains, and potentially to indirect emissions, transport emissions and other sectors, including the chemicals, polymers and refinery products sectors. The proposal also addresses export carbon leakage, a risk that will increase as free EU ETS allowances for CBAM goods are phased out between 2026 and 2034. The European Commission intends to use CBAM-generated revenues to support EU producers at risk of carbon leakage on exported goods. The European Commission delivered on this as planned: alongside proposals to expand CBAM's scope to 180 steel- and aluminium-intensive downstream products from 1 January 2028 and to close anti-circumvention loopholes, it launched a Temporary Decarbonisation Fund to reimburse a portion of EU ETS carbon costs for CBAM-goods producers still facing carbon leakage risk in third-country markets, with support contingent on demonstrated decarbonisation efforts. The fund is financed by Member State contributions equal to 25% of CBAM certificate sale revenues for 2026 and 2027, with the remaining 75% treated as an EU own resource (European Commission, 2025j).

Ireland's direct CBAM exposure is currently concentrated among importers of iron, steel, aluminium, cement and fertilisers. The construction sector is a significant consumer of imported steel and aluminium, and agriculture remains reliant on imported fertilisers. The downstream extension from 2028 would broaden the scope of affected imports and compliance obligations for Irish businesses. A more consequential dynamic concerns potential future extension to chemicals and polymers: given that chemicals and pharmaceutical products constitute the majority of Irish exports, a CBAM-type mechanism applying to chemical value chains would affect both importers of chemical precursors and the competitiveness of Irish-manufactured exports in markets without comparable carbon pricing.

A5.3 Trade Defence Instruments and Foreign Direct Investment Screening

The CID commits to sharpening trade defence instruments, anti-dumping duties, anti-subsidy duties

and safeguard measures to protect EU industry from unfair competition driven by state-subsidised overcapacity (European Commission, 2025a). The European Commission tightened the steel safeguard measure in April 2025, but the promised long-term steel protection measure slipped past its September 2025 target: co-legislators reached political agreement only in April 2026, and the new EU Steel Regulation (Regulation (EU) 2026/1384) entered into force on 25 June 2026, applying from 1 July 2026 just after the original safeguard's legal expiry on 30 June 2026. The new regime cuts tariff-free import quotas to 18.3 million tonnes annually (a 47% reduction on 2024 levels) and raises the out-of-quota duty from 25% to 50%. Special monitoring tasks were active in 15 investigations in 2024, with 12 concerning imports from China being identified (European Commission, 2025j). The Foreign Subsidies Regulation, in force since mid-2023, provides a further layer of protection; the European Commission met its target and adopted guidelines on 9 January 2026 (published 13 January 2026) clarifying key concepts including the assessment of distortions, the balancing test and the call-in mechanism for below-threshold mergers and public procurement. The Foreign Direct Investment Screening Regulation review, which was before co-legislators at the time of drafting, has since progressed further: the European Parliament adopted the agreed text on 19 May 2026, and the Council formally adopted it on 8 June 2026, completing the ordinary legislative procedure; it will apply 18 months after entry into force, once published in the Official Journal.

Ireland's Screening of Third Country Transactions Act 2023, which entered into force on 6 January 2025, established Ireland's first formal foreign investment screening mechanism. The act requires mandatory notification and pre-clearance for transactions involving non-EU/non-European Economic Area investors that exceed €2 million in consideration and relate to designated sensitive sectors, including energy, critical infrastructure, health, defence and technology. The renewable energy sector is explicitly within scope, encompassing wind, solar, battery storage and grid infrastructure assets. This regime aligns Ireland with the CID's emphasis on ensuring that foreign investments "better contribute to the long-term competitiveness of EU industry, its technological edge and economic resilience" (European Commission, 2025a). The CID further proposes that, for projects involving foreign investment

and public financing, Member States could consider conditions on ownership, EU-sourced inputs, local staff recruitment and intellectual property arrangements, starting with sectors such as automotive and renewable manufacturing.

A5.4 Ireland–US Trade Relationship and Tariff Risk

Ireland's trade relationship with the USA represents both its greatest export opportunity and a significant source of vulnerability. The EU–US trade agreement, finalised in mid-2025, established a 15% ceiling on tariffs for EU-originating pharmaceuticals (Directorate-General for Trade and Economic Security, 2025). However, President Trump's subsequent announcement of 100% tariffs on branded

pharmaceuticals not manufactured in the USA introduced renewed uncertainty. Enterprise Ireland's Trade Tariff Response Team has reaffirmed confidence in the EU–US agreement, but the Irish Pharmaceutical Healthcare Association has highlighted that tariff on medicines "would increase costs, disrupt global supply chains, undermine innovation, and ultimately harm patient access" (IPHA, 2025). The Government Trade Forum and the Market Diversification and Resilience Action Plan represent institutional responses to these risks. This trade exposure intersects with the CID in two respects: US tariff and subsidy policies could divert multinational investment away from Irish manufacturing sites, and EU countermeasures, including CBAM extensions or local content conditions, could create additional compliance burdens for Irish-based manufacturers serving US markets.

Appendix 6 Supplementary Material for Section 3.6: Skills and the Quality of Jobs Needed for Social Fairness and a Just Transition

A6.1 EU Skills Architecture: Detailed Instruments

The Union of Skills, adopted in Q1 2025, is accompanied by a European Skills High-Level Board and a Skills Observatory providing forward-looking intelligence on occupational shortages and emerging skill requirements (European Commission, 2025k). The European Commission committed to reviewing EU support models for sectoral skills initiatives, including the academies, Pact for Skills, the European Alliance for Apprenticeships and Centres of Vocational Excellence, to streamline the framework for sectoral skills reinforcement in strategic industries linked to the CID, with reinforced Erasmus+ support of up to €90 million. The Skills Portability Initiative, under development for 2026, aims to facilitate cross-border recognition of qualifications, directly addressing fragmentation that constrains labour mobility across Member States (European Commission, 2026b).

The Quality Jobs Roadmap was prepared in consultation with all 88 recognised European social partners, resulting in 11 joint contributions and 32 unilateral submissions from approximately 200 organisations across all 27 Member States (European Commission, 2025l). Its four priority areas – psychosocial risks and mental health at work, responsible algorithmic management and use of AI, the right to telework, and occupational safety and health rules for digital workplaces – reflect the changing nature of work in both traditional and emerging industrial sectors.

The European Fair Transition Observatory, established in March 2026, aims to strengthen the evidence base on the fairness aspects of the green transition through the development of standardised indicators; collection of best practices on employment and high-quality job creation; workforce reskilling, investment needs and social protection; and aggregation of data across Member States. Participation in this observatory

and the contribution of Irish data through the Just Transition Indicator Framework positions Ireland well to both inform and benefit from EU-level evidence on transition fairness (Kelly *et al.*, 2025). The European Commission is also exploring conditions linking public funding to skills and training outcomes, that is, “training and skills conditionalities for public funding supporting the anticipation and management of change and the industrial transition”, with the ongoing General Block Exemption Regulation review assessing how state aid rules can be updated to incentivise industry investment in the upskilling, reskilling and recruitment of workers for a just transition (European Commission, 2025g, 2026c).

A6.2 National Institutional Responses in Detail

SOLAS’s *Green Skills 2030: Implementation Plan*, launched in September 2025, translates the accompanying green skills strategy’s recommendations into 24 strategic actions and 71 sectoral actions developed through consultation with Education and Training Boards Ireland, the 16 ETBs, government departments and industry partners (SOLAS, 2024, 2025b). Sectoral actions span seven key economic sectors and include the development and delivery of further education and training programmes, the establishment of specialist skills centres and the enhancement of pathways between further and higher education. The plan aligns with the United Nations Sustainable Development Goals and sets out measurable targets developed in collaboration with KPMG.

Skillnet Ireland’s enterprise-led networks address specific aspects of green skills demand. The Green Tech Skillnet, promoted by Wind Energy Ireland, has engaged 1149 trainees over 2050 training days since 2014, representing approximately 25% of those employed in the wind industry in Ireland.

The Skillnet Climate Ready Academy provides leadership and operational sustainability training tailored to the compliance, regulatory and strategic challenges that firms face. The Lean & Green Skillnet delivers programmes including energy management systems with SEAI, sustainable procurement with the National Standards Authority of Ireland, and Lean for Sustainable Business with the University of Limerick (Skillnet Ireland, 2021). The Climate Ready Cluster model, grouping renewable energy, sustainable finance and clean operations networks, mirrors the CID's emphasis on strategic sectoral skills reinforcement.

IDA Ireland's Labour Market Pulse report, produced in collaboration with Microsoft and LinkedIn using University College Cork data, provides granular occupational-level intelligence on green skills demand (IDA Ireland, 2024). Between 2021 and 2024, Ireland's green skills demand growth rate was 11.9% per annum against a global average of 6%. Skills in environmental impact assessment and operational efficiency are among the fastest-growing areas of demand, while needs in sustainable supply chain management, pollution prevention and renewable energy are emerging rapidly across non-traditional green sectors. Green skills are most concentrated in utilities, construction and manufacturing, but demand is spreading to professional services, financial services and technology sectors. IDA Ireland's 2025–2029 strategy targets cleantech manufacturing, advanced manufacturing and sustainable industries as priority FDI categories, each carrying distinct workforce requirements that national skills programmes must anticipate (IDA Ireland, 2025).

A6.3 The Midlands Just Transition: Lessons Learned and Framework

Ireland's most substantial just transition experience to date is that of the Midlands transition following the cessation of commercial peat extraction by Bord na Móna and the closure of peat-fired power stations at Edenderry, Lough Ree and West Offaly, affecting thousands of direct and indirect workers in Counties Offaly, Westmeath, Laois, Roscommon and Longford. The Government established the Just Transition Commission for the Midlands and appointed a Just Transition Commissioner in 2019 to facilitate consultation and develop an action plan for the region.

The Just Transition Fund, with EU co-financing, was operationalised through the Eastern and Midland Regional Assembly as the managing authority.

Cumulatively, €169 million from the Just Transition Fund has been allocated across 172 projects, spanning skills training and retraining for displaced workers, bioeconomy enterprise development, community infrastructure and environmental rehabilitation of former peat extraction sites (Eastern and Midland Regional Assembly, 2024b). Projects include the Bord na Móna ReStore programme, training former peat workers for restoration and rewetting activities on the Bord na Móna estate (DCEE, 2020); the Technological University of the Shannon's clean technology innovation support; and multiple ETB-delivered green construction and energy efficiency training programmes. Bord na Móna itself underwent a strategic transformation, retraining over 1000 employees who had undertaken peat-related activities in renewable energy, land rehabilitation and circular economy operations, representing one of the largest employer-led just transition initiatives in Ireland (Bord na Móna, 2021).

Operational lessons learned from the Midlands experience include the importance of early and sustained social partner engagement, the value of employer-led retraining programmes that leverage existing workforce skills, the need for dedicated transition funding that bridges the gap between redundancy and re-employment, and the significance of regional industrial strategy for attracting alternative investment in affected areas. The Expert Group on Future Skills Needs report *Skills for Zero Carbon* drew on Midlands case evidence in developing its 30 recommendations across the renewable energy, residential retrofitting and electric vehicle sectors (Expert Group on Future Skills Needs, 2021). These lessons learned are directly applicable to other sectors and regions that will face decarbonisation-linked restructuring under the CID, including energy-intensive manufacturing communities in Cork, Limerick and the greater Dublin industrial corridor.

A6.4 The Just Transition Commission of Ireland

Ireland's Just Transition Commission published its first introductory report on 18 June 2025, calling on the Government to "urgently develop a bold, nationwide

strategy that sets out how Ireland's approach to climate action will ensure a fair and inclusive transition to a climate-neutral society" (Just Transition Commission of Ireland, 2025). The European Commission emphasised that the transition will offer "a powerful opportunity, not only to manage the risks of the climate transition but to reimagine and reshape Ireland's economy and society to be more inclusive, resilient, and sustainable". The report builds on the earlier Taskforce on Just Transition, chaired by Kieran Mulvey (the former Just Transition Commissioner for the Midlands), which presented its report to the minister in February 2024 (DCEE, 2024).

The Climate Action and Low Carbon Development (Amendment) Act 2021 provides the statutory framework, requiring relevant ministers to consider the impact of climate policy decisions on a just transition. The four core principles – an integrated, structured, evidence-based approach, equipping people with the right skills, the equitable sharing of costs and maintaining social dialogue – align directly with the objectives of the CID's sixth pillar.

A6.5 Distributional Risk: EPA Just Transition Indicator Framework

The EPA's Just Transition Indicator Framework, developed to support implementation of the just transition provisions of the Climate Action and Low Carbon Development (Amendment) Act 2021, proposes a set of standardised indicators drawn from nationally representative CSO household surveys, with demographic disaggregation by region, income level, age group and other societal variables (Kelly *et al.*, 2025). The framework proposes the development of a community vulnerability index and scenario analysis capacity to enable policymakers "to not only assess the just transition, but also to anticipate the impacts of policies or events on a just transition" (Kelly *et al.*, 2025). This analytical infrastructure would support the statutory requirements under the 2021 act and provide evidence for targeting CID-aligned interventions at the communities most exposed to transition costs. The agricultural sector's exposure is a specific priority: with 38.4% of Irish GHG emissions and a 25% reduction target by 2030, the implications for rural employment, farm viability and food processing supply chains require dedicated monitoring and early intervention frameworks informed by the framework's demographic segmentation capacity (EPA, 2025b).

Appendix 7 Electricity System Flexibility, Storage and Market Design

A7.1 Dynamic Pricing and Industrial Demand Response

As a complement to system-level flexibility markets and storage integration, dynamic pricing provides the demand-side mechanism through which price signals are transmitted to end users and operationalised in consumption decisions. The CRU's dynamic electricity price tariff decision (September 2024) requires Ireland's five main electricity suppliers to offer a standard dynamic price contract, tracking wholesale electricity market prices every half hour. As of 1 June 2026, all five obligated suppliers – Bord Gáis Energy, Electric Ireland, Energia, PrePay Power/Yuno Energy and SSE Airtricity – offer standard dynamic price contracts. Customers are not forced onto dynamic tariffs; flat-rate and time-of-use plans remain available alongside the new dynamic option. For industrial and commercial consumers, dynamic pricing creates a direct financial incentive to align consumption patterns with renewable generation profiles; data centres capable of shifting computational workloads, cold storage facilities that can pre-cool during low-price periods, and manufacturing plants that can schedule energy-intensive processes during periods of high wind output all stand to reduce costs in ways that improve competitive position. This corresponds with the CID's commitment to guidance on “promoting remuneration of flexibility in retail contracts” (European Commission, 2025b). The CID also proposes that Member States lower electricity taxation for energy-intensive industries; the alignment between this recommendation and the National Energy Affordability Taskforce's mandate to identify structural cost reforms creates a policy window for addressing the taxation and levy components of Irish industrial energy bills.

A7.2 Private Wires: Co-investment in Grid Infrastructure

Complementing system-level flexibility, demand-side pricing and cross-border integration, private wire arrangements provide an infrastructure-level mechanism for large energy users to directly access

renewable generation and mitigate network-related cost and congestion constraints. Under current law, ESB Networks is the sole entity permitted to own electricity lines between a generator and a customer. The Private Wires Policy Statement (July 2025) and subsequent General Scheme of the Private Wires Bill (2026) extend private ownership rights in four defined circumstances: private lines from generator to customer; hybrid connections; on-street electric vehicle charging; and expansion of self-supply (DCEE and DETE, 2025). This scheme provides an expanded implementation architecture while retaining CRU regulatory oversight, licensing and ESB step-in rights.

In effect, large energy users, including data centres, pharmaceutical manufacturers and food processing facilities, will be able to source electricity directly from dedicated renewable generation through privately owned infrastructure, reducing congestion on the public network and enabling bespoke energy arrangements that reflect the CID's emphasis on corporate PPAs and direct industrial access to clean energy. Developers of hybrid projects combining generation, storage and demand on a single site gain a regulatory pathway, aligning with the green energy park model. Key implementation details, tariffs and fees, technical standards and ESB step-in rights remain to be clarified during legislative drafting in 2026.

A7.3 EU Market Integration and the Celtic Interconnector

Extending the role of flexibility and price signal optimisation beyond the domestic system, EU market integration provides the cross-border mechanism through which Ireland can balance supply and demand more efficiently and access lower-cost electricity. The Celtic Interconnector (700MW) is the first direct electricity link between Ireland and continental Europe, transforming Ireland from a market connected only to Great Britain, via the East–West Interconnector and the Greenlink, to one with direct access to the EU internal energy market. Full market coupling enables

Irish consumers to access lower-cost continental generation during periods of domestic scarcity, while enabling Irish renewable generators to export surplus production when domestic prices are low, improving the economics of renewable investment. The CID's

European Grids Package, which simplifies Trans-European Networks for Energy planning and includes the EIB's €1.5 billion counter-guarantee package for grid component manufacturers, provides a supporting EU-level framework (European Commission, 2025b).

Appendix 8 Hard-to-abate Industries and Competitive Exposure

Enterprise strategies and supply-side capacity developments often translate into heterogeneous competitiveness outcomes across sectors, reflecting differences in energy intensity, decarbonisation pathways and exposure to international competition. Pharmaceuticals and chemicals, for example, which account for over 54% of manufacturing net selling value (CSO, 2024), are classified as low-to-medium emitters under the EU ETS framework, yet remain on the carbon leakage list, reflecting their trade exposure and the residual challenge of decarbonising high-temperature process heat for which full electrification is not yet technically or commercially viable. The CID directly addresses these sectors through the forthcoming Chemicals Industry Package, which is intended to recognise chemicals as an “industry of industries” and propose targeted initiatives to enhance competitiveness and support production and innovation in Europe, with hydrogen identified as a primary decarbonisation strategy for hard-to-abate heating processes (European Commission, 2025a).

Across Ireland’s other top-producing sectors, electrification and decarbonisation pathways vary greatly. Within food processing, Ireland’s second-largest manufacturing sector, near-term pathways, including the electrification of lower-temperature processes and anaerobic digestion for renewable heat, provide more diverse carbon reduction potentials. Within the construction and materials sectors, cement production presents a distinct policy interaction point. Irish cement manufacturing firms are classified as high emitters, remaining on the carbon leakage list and retaining 100% free allocation during Phase III of the EU ETS. Public procurement guidance mandating a minimum 30% clinker substitution for projects commencing from September 2024 has been recognised by Cembureau as a lead market instrument; precisely the type of demand-side policy the CID’s IDAA seeks to scale up through non-price procurement criteria and a voluntary carbon-intensity label for cement under the Construction Products

Regulation (European Commission, 2025a). In 2024, total emissions (combustion and process) from the cement sector decreased by 15.2% and amounted to 2.48MtCO₂eq, or 4.6% of national total emissions, with cement sector emissions now 46.8% higher than in 2011 during the economic recession (EPA, 2025a). While the EPA attributes this decline primarily to reduced clinker production, the Government’s public procurement guidance on embodied carbon, which came into effect in 2024, is a plausible contributing factor, given its direct targeting of demand for lower-carbon cement and concrete in construction (DETE, 2024b; RPS Group, 2024).

Decarbonisation potential, energy system performance and the energy market landscape can all affect competitiveness outcomes. For multinational-dominated sectors, investment decisions are made with explicit reference to alternative locations globally, weighing decarbonisation compliance costs, energy pricing and state aid availability across competing jurisdictions (McInerney *et al.*, 2019b). McInerney *et al.* (2019b) identified energy costs and carbon price uncertainty as the primary barriers to long-term decarbonisation investment by Irish-based firms, findings that remain structurally relevant under the CID’s Phase IV EU ETS trajectory. Ireland’s competitiveness, in this regard, depends partially on a combination of mutually reinforcing enabling conditions, including access to competitively priced renewable electricity, efficient and predictable grid connections, and a clear and enabling regulatory framework. The delivery of competitively priced renewable electricity, underpinned by the 8-GW onshore milestone and the Government’s €3.5 billion grid investment commitment, alongside efficient grid connections through the CRU’s Large Energy User Connection Policy and greater regulatory certainty through the forthcoming private wires framework, aim to promote such enabling conditions (CRU, 2025; DCEE and DETE, 2025; DCEE, 2026c).

Appendix 9 Supplementary Material for Sections 3.7–3.10: Clean Energy, Large Energy Users, Clean Technology and Economic Impact

A9.1 Renewable Deployment: Renewable Electricity Support Scheme Auctions and the Offshore Wind Pipeline

Five onshore Renewable Electricity Support Scheme auctions have been held since September 2020, with a sixth due in 2026. Offshore wind is progressing in parallel, with five projects in development on the east coast and the Tonn Nua auction (2025) procuring 900 MW for development off the south coast. Three further south coast sites are being brought to market, alongside the development of a National Designated Maritime Area Plan to ensure strategic, sustainable management of future offshore projects (DCEE, 2026c). The Offshore Wind Technical Resource Assessment identified substantial additional offshore wind potential beyond existing deployment targets (BVG Associates, Gavin and Doherty Geosolutions, and AFRY, 2025). Under the CID's Net-Zero Industry Act framework, offshore wind is designated a strategic net-zero technology, providing a basis for streamlined permitting and state aid for manufacturing capacity; *Powering Prosperity: Ireland's Offshore Wind Industrial Strategy*, published in March 2024, contains 40 actions targeting supply chain development, RD&I, regional development and future demand, with a target of 5000 jobs in the offshore wind sector by 2030 (DETE, 2024c; European Union, 2024).

A9.2 System Services, Storage and Flexibility Markets

EirGrid's DS3 programme established a commercial framework for system services, creating remuneration mechanisms for frequency response, inertia, voltage support and reserve capacity. The framework has enabled the Irish grid to accommodate up to 75% system non-synchronous penetration while creating opportunities for a broader range of actors, including industrial consumers, to participate in

system balancing. A significant market reform was implemented in November 2025 through the SDP-02 update, enabling energy storage power stations to participate fully in the real-time electricity market. Ireland's storage sector continues to expand, with ESB's battery portfolio and Statkraft's Cushaling Battery Energy Storage System combining storage with renewable generation to reduce curtailment and improve system efficiency (Statkraft, 2026). The further development of demand response mechanisms, private wire arrangements and expanded interconnection with EU electricity markets will collectively determine how effectively clean energy deployment translates into industrial competitiveness gains.

A9.3 Large Energy User Connection Policy: Technical Details

The CRU's Large Energy User Connection Policy (CRU2025236) establishes a tiered regulatory framework for data centre connections above 1 MVA, with obligations varying by maximum import capacity category. All qualifying facilities must meet at least 80% of annual demand through new renewable electricity generated in Ireland via corporate PPAs or direct development, within a 6-year glide path from energisation (CRU, 2025; Mason Hayes & Curran, 2026). Demand flexibility is not mandated as a blanket connection requirement; however, system operators retain discretion to impose flexible demand conditions on a case-by-case basis, consistent with the National Energy Demand Strategy target of 20–30% of electricity demand being flexible by 2030. The policy also recognises technical challenges associated with large energy users, including fault ride-through behaviour, which EirGrid is addressing through Grid Code reforms. The CRU acknowledges that future iterations of the policy may review generation adequacy requirements as renewable deployment progresses, and that further development of flexibility

products and markets could, over time, reduce the emphasis on mandatory generation provision in favour of market-based demand response mechanisms.

A9.4 Large Energy User Action Plan: Enabling Actions and Green Energy Parks

LEAP comprises 17 enabling actions focused on spatial planning, infrastructure coordination and system integration for large energy users (DCEE and DETE, 2025). The plan explicitly acknowledges that the Price Review 6 grid investment programme up to 2030 does not provide additional infrastructure beyond demand already under contract, and that plan-led investments in strategic locations may require the Government to consider new infrastructure funding to ensure both investment attractiveness and fairness for all energy customers. Reforms relating to flexible and non-firm connection contracts, hybrid connections and implementation of the private wires policy are included. Initial market intelligence gathered by system operators suggests potential medium-term additional demand capacity in the order of 5.8 GW for the data centre sector alone, underscoring the scale of infrastructure planning that LEAP is designed to address.

A9.5 Enterprise Agency Alignment: Sector-specific Considerations

IDA Ireland's 2025 results reported continued growth in investment, sustainability projects and RD&I activity, with the 2025–2029 strategy identifying digitalisation and AI, semiconductors, health and sustainability as the four primary growth sectors (IDA Ireland, 2025). Ambitious targets cover investment, regional development, sustainability and employment.

Enterprise Ireland's parallel strategy targets employment growth and enterprise decarbonisation by 2030, with the Green Transition Fund suite having supported more than 620 companies since 2022, and 30% of Enterprise Ireland clients having developed a sustainability plan by 2024 (Enterprise Ireland, 2024b, 2025b). The translation of strategy commitments into operational clean technology output depends on enabling conditions, affordable energy, grid access, planning system efficiency and state aid deployment, which remain works in progress. Sector-specific competitiveness considerations for pharmaceuticals, chemicals, food processing and construction materials are discussed in Appendix 8.

A9.6 Macroeconomic Investment Context: EU-level Estimates

At the EU level, the Draghi report on EU competitiveness estimates that decarbonising the four largest energy-intensive industries, chemicals, basic metals, non-metallic minerals and paper, will require approximately €500 billion over 2025–2040, while hard-to-abate transport sectors are estimated to require approximately €100 billion in annual investment from 2031 to 2050 (Draghi, 2024). Macroeconomic simulations conducted jointly by the European Commission and the IMF Research Department indicate that the investment push is sustainable and capable of generating positive output and productivity effects, projecting a 6% increase in EU output within 15 years, with only temporary inflationary pressure. Survey evidence confirms that European industry is already responding: 82% of industrial respondents increased energy transition investment over the past 2 years, and 80% expect further increases over the coming 2 years (Deloitte, 2025).

Abbreviations

CBAM	Carbon Border Adjustment Mechanism
CCAC	Climate Change Advisory Council
CID	Clean Industrial Deal
CISAF	Clean Industrial Deal State Aid Framework
CMUR	Circular material use rate
CRM	Critical raw material
CRMA	Critical Raw Materials Act
CRU	Commission for Regulation of Utilities
CSO	Central Statistics Office
CTIP	Clean Trade and Investment Partnership
DCEE	Department of Climate, Energy and the Environment
DETE	Department of Enterprise, Tourism and Employment
DS3	Delivering a Secure, Sustainable Electricity System
EIB	European Investment Bank
ETB	Education and training board
ETS	Emissions Trading System
EU	European Union
E-waste	Electronic waste
EXEED	Excellence in Energy Efficiency Design
FDI	Foreign direct investment
GHG	Greenhouse gas
ICT	Information and communications technology
IDAA	Industrial Decarbonisation Accelerator Act
IMF	International Monetary Fund
ISIF	Ireland Strategic Investment Fund
LEAP	Large Energy-User Action Plan
PPA	Power purchase agreement
R&D	Research and development
RD&I	Research, development and innovation
SBCI	Strategic Banking Corporation of Ireland
SEAI	Sustainable Energy Authority of Ireland
SEMC	Single Electricity Market Committee
SMEs	Small and medium-sized enterprises
SOLAS	Further Education and Training Authority
TRL	Technology Readiness Level
WAM	With additional measures
WEM	With existing measures

An Ghníomhaireacht Um Chaomhnú Comhshaoil

Tá an GCC freagrach as an gcomhshaol a chosaint agus a fheabhsú, mar shócmhainn luachmhar do mhuintir na hÉireann. Táimid tiomanta do dhaoine agus don chomhshaol a chosaint ar thionchar díobhálach na radaíochta agus an truailithe.

Is féidir obair na Gníomhaireachta a roinnt ina trí phríomhréimse:

Rialáil: Rialáil agus córais chomhlíonta comhshaoil éifeachtacha a chur i bhfeidhm, chun dea-thorthaí comhshaoil a bhaint amach agus díriú orthu siúd nach mbíonn ag cloí leo.

Eolas: Sonraí, eolas agus measúnú ardchaighdeán, spriocdhírthe agus tráthúil a chur ar fáil i leith an chomhshaoil chun bonn eolais a chur faoin gcinnteoireacht.

Abhcóideacht: Ag obair le daoine eile ar son timpeallachta glaine, táirgiúla agus dea-chosanta agus ar son cleachtas inbhuanaithe i dtaobh an chomhshaoil.

I measc ár gcuid freagrachtaí tá:

Ceadúnú

- > Gníomhaíochtaí tionscail, dramhaíola agus stórála peitрил ar scála mór;
- > Sceitheadh fuíolluisce uirbigh;
- > Úsáid shrianta agus scaoileadh rialaithe Orgánach Géinmhodhnaithe;
- > Foinsí radaíochta ianúcháin;
- > Astaíochtaí gás ceaptha teasa ó thionscal agus ón eitlíocht trí Scéim an AE um Thrádáil Astaíochtaí.

Forfheidhmiú Náisiúnta i leith Cúrsaí Comhshaoil

- > Iniúchadh agus cigireacht ar shaoráidí a bhfuil ceadúnas acu ón GCC;
- > Cur i bhfeidhm an dea-chleachtais a stiúradh i ngníomhaíochtaí agus i saoráidí rialáilte;
- > Maoirseacht a dhéanamh ar fhreagrachtaí an údaráis áitiúil as cosaint an chomhshaoil;
- > Caighdeán an uisce óil phoiblí a rialáil agus údaruithe um sceitheadh fuíolluisce uirbigh a fhorfheidhmiú
- > Caighdeán an uisce óil phoiblí agus phríobháidigh a mheasúnú agus tuairisciú air;
- > Comhordú a dhéanamh ar líonra d'eagraíochtaí seirbhíse poiblí chun tacú le gníomhú i gcoinne coireachta comhshaoil;
- > An dlí a chur orthu siúd a bhriseann dlí an chomhshaoil agus a dhéanann dochar don chomhshaol.

Bainistíocht Dramhaíola agus Ceimiceáin sa Chomhshaol

- > Rialacháin dramhaíola a chur i bhfeidhm agus a fhorfheidhmiú lena n-áirítear saincheisteanna forfheidhmithe náisiúnta;
- > Staitisticí dramhaíola náisiúnta a ullmhú agus a fhoilsiú chomh maith leis an bPlean Náisiúnta um Bainistíocht Dramhaíola Guaisí;
- > An Clár Náisiúnta um Chosc Dramhaíola a fhorbairt agus a chur i bhfeidhm;
- > Reachtaíocht ar rialú ceimiceán sa timpeallacht a chur i bhfeidhm agus tuairisciú ar an reachtaíocht sin.

Bainistíocht Uisce

- > Plé le struchtúir náisiúnta agus réigiúnacha rialachais agus oibriúcháin chun an Chreat-treoir Uisce a chur i bhfeidhm;
- > Monatóireacht, measúnú agus tuairisciú a dhéanamh ar chaighdeán aibhneacha, lochanna, uiscí idirchreasa agus cósta, uiscí snámha agus screamhuisce chomh maith le tomhas ar leibhéil uisce agus sreabhadh abhann.

Eolaíocht Aeráide & Athrú Aeráide

- > Fardail agus réamh-mheastacháin a fhoilsiú um astaíochtaí gás ceaptha teasa na hÉireann;
- > Rúnaíocht a chur ar fáil don Chomhairle Chomhairleach ar Athrú Aeráide agus tacaíocht a thabhairt don Idirphlé Náisiúnta ar Gníomhú ar son na hAeráide;

- > Tacú le gníomhaíochtaí forbartha Náisiúnta, AE agus NA um Eolaíocht agus Beartas Aeráide.

Monatóireacht & Measúnú ar an gComhshaol

- > Córais náisiúnta um monatóireacht an chomhshaoil a cheapadh agus a chur i bhfeidhm: teicneolaíocht, bainistíocht sonraí, anailís agus réamhaisnéisiú;
- > Tuairiscí ar Staid Thimpeallacht na hÉireann agus ar Tháscairí a chur ar fáil;
- > Monatóireacht a dhéanamh ar chaighdeán an aeir agus Treoir an AE i leith Aeir Ghlain don Eoraip a chur i bhfeidhm chomh maith leis an gCoinbhinsiún ar Aerthruailliú Fadraoin Trasteorann, agus an Treoir i leith na Teorann Náisiúnta Astaíochtaí;
- > Maoirseacht a dhéanamh ar chur i bhfeidhm na Treorach i leith Torainn Timpeallachta;
- > Measúnú a dhéanamh ar thionchar pleananna agus clár beartaithe ar chomhshaol na hÉireann.

Taighde agus Forbairt Comhshaoil

- > Comhordú a dhéanamh ar ghníomhaíochtaí taighde comhshaoil agus iad a mhaoiniú chun brú a aithint, bonn eolais a chur faoin mbeartas agus réitigh a chur ar fáil;
- > Comhoibriú le gníomhaíocht náisiúnta agus AE um thaighde comhshaoil.

Cosaint Raideolaíoch

- > Monatóireacht a dhéanamh ar leibhéil radaíochta agus nochtadh an phobail do radaíocht ianúcháin agus do réimsí leictreamaighnéadacha a mheas;
- > Cabhrú le pleananna náisiúnta a fhorbairt le haghaidh éigeandálaí ag eascairt as tasmí núicléacha;
- > Monatóireacht a dhéanamh ar fhorbairtí thar lear a bhaineann le saoráidí núicléacha agus leis an tsábháilteacht raideolaíochta;
- > Sainseirbhísí um chosaint ar an radaíocht a sholáthar, nó maoirsiú a dhéanamh ar sholáthar na seirbhísí sin.

Treoir, Ardú Feasachta agus Faisnéis Inrochtana

- > Tuairisciú, comhairle agus treoir neamhspleách, fianaise-bhunaithe a chur ar fáil don Rialtas, don tionscal agus don phobal ar ábhair maidir le cosaint comhshaoil agus raideolaíoch;
- > An nasc idir sláinte agus folláine, an geilleagar agus timpeallacht ghlan a chur chun cinn;
- > Feasacht comhshaoil a chur chun cinn lena n-áirítear tacú le hiompraíocht um éifeachtúlacht acmhainní agus aistriú aeráide;
- > Tástáil radóin a chur chun cinn i dtithe agus in ionaid oibre agus feabhsúchán a mholadh áit is gá.

Comhpháirtíocht agus Líonrú

- > Oibriú le gníomhaireachtaí idirnáisiúnta agus náisiúnta, údaráis réigiúnacha agus áitiúla, eagraíochtaí neamhrialtais, comhlachtaí ionadaíocha agus ranna rialtais chun cosaint comhshaoil agus raideolaíoch a chur ar fáil, chomh maith le taighde, comhordú agus cinnteoireacht bunaithe ar an eolaíocht.

Bainistíocht agus struchtúr na Gníomhaireachta um Chaomhnú Comhshaoil

Tá an GCC á bainistiú ag Bord lánaimseartha, ar a bhfuil Ard-Stiúrthóir agus cúigear Stiúrthóir. Déantar an obair ar fud cúig cinn d'Oifigí:

1. An Oifig um Inbhuanaitheacht i leith Cúrsaí Comhshaoil
2. An Oifig Forfheidhmithe i leith Cúrsaí Comhshaoil
3. An Oifig um Fhianaise agus Measúnú
4. An Oifig um Chosaint ar Radaíocht agus Monatóireacht Comhshaoil
5. An Oifig Cumarsáide agus Seirbhísí Corparáideacha

Tugann coistí comhairleacha cabhair don Ghníomhaireacht agus tagann siad le chéile go rialta le plé a dhéanamh ar ábhair imní agus le comhairle a chur ar an mBord.

Evidence Synthesis Report 14

Impacts and Opportunities of the Clean Industrial Deal in Ireland

Authors:

J. Andrew Kelly, J. Peter Clinch and
Vishwajeet Pundkar

EPA Research: McCumiskey House,
Richiew, Clonskeagh, Dublin 14.

Phone: 01 268 0100

Twitter: @EPAResearchNews

Email: research@epa.ie

EPA Research Webpages

www.epa.ie/our-services/research/

www.epa.ie



Rialtas na hÉireann
Government of Ireland