InterTradeIreland

Identifying Circular Economy Business Opportunities on the Island of Ireland

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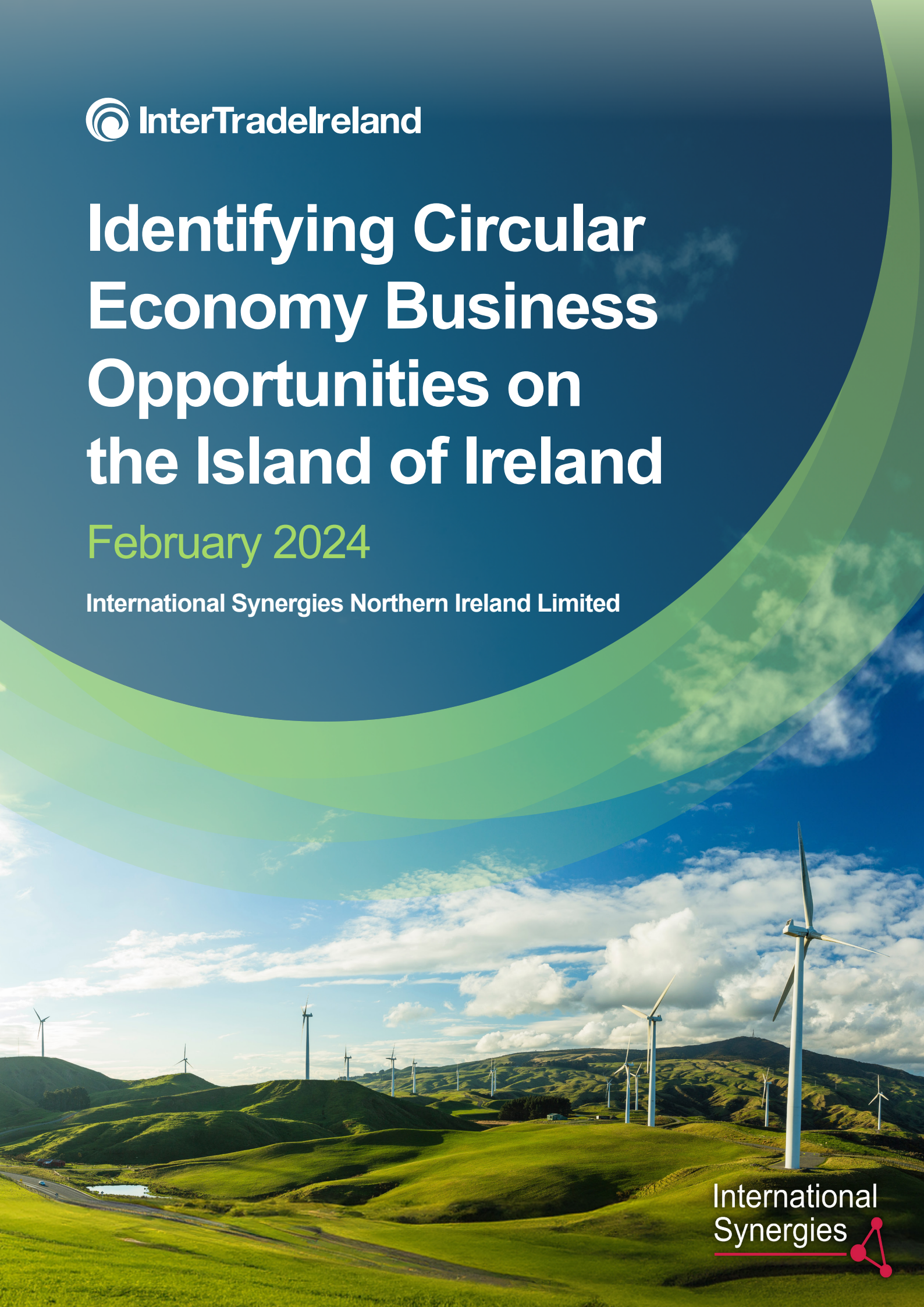
International Synergies Northern Ireland Limited



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Acronyms

AD	Anaerobic Digestion
BITC	Business in the Community
CE	Circular Economy
CDW	Construction & Demolition Waste
DAERA	Department for the Environment, Agriculture and Rural Affairs
DECC	Department of the Environment, Climate and Communications
DETE	Department of Enterprise, Trade and Employment
DFE	Department for the Economy
DRS	Deposit Return Scheme
EC	European Commission
ELV	End of Life Vehicles
EOW	End of Waste
EPA	Environmental Protection Agency
EPR	Extended Producer Responsibility
ERDF	European Regional Development Fund
EU	European Union
GHG	Greenhouse gas
GPP	Green Public Procurement
IBA	Incinerator Bottom Ash
IE	Ireland (Republic of Ireland)
IS	Industrial Symbiosis
ISL	International Synergies Limited
LF	Landfill
NI	Northern Ireland
NIEA	Northern Ireland Environment Agency
NZ	Net Zero
OECD	Organisation for Economic Co-operation and Development
R&D	Research & Development
RAG	Red-Amber-Green
RE	Resource Efficiency
RMS	Resource Matching Service
SME	Small and Medium Enterprises
TFW	Transfrontier Shipment of Waste
WAPCE	Waste Action Plan for a Circular Economy
WEEE	Waste Electronics and Electrical Equipment

Executive Summary

This report explains the development of the circular economy on the island of Ireland, and the business opportunities it presents. An all-island understanding of the circular economy provides a framework to drive the implementation of specific policies and practices that minimise the consumption of raw materials in the production and use of goods, products, and materials, fostering the transition from a linear take-make-dispose economic model to a more circular economy.

How the term circular economy is used on the island of Ireland is shaped by policy from the Irish Government and Northern Ireland Executive. Key themes in circular economy policy, strategy reports, and legislation on both sides of the border are resource efficiency and waste, consistent with the desired change from a linear model of the economy to a circular one that closes resource loops.

A holistic approach to climate change and circular economy agendas is critical for meeting net-zero targets, as circular economy has the potential to reduce up to 50% of UK carbon emissions.[1] The interconnection between Scope 3 carbon emissions, resource efficiency, and circularity is often overlooked as a means to reduce carbon emissions.

Stakeholder consultation confirms a robust policy structure for circular economy in both the Republic of Ireland (IE) and Northern Ireland (NI). Stakeholders also recognise the value of a unifying approach to the multiple existing strategies. A comprehensive all-island delivery plan, integrating policies from these disparate strategies, would improve small and medium enterprise (SME) understanding of how their circular economy-related action will contribute to the achievement of circular economy targets, particularly at the national level.

Key sectors for the circular economy include construction, bioeconomy, advanced manufacturing, and tourism and hospitality. The chemicals and pharmaceuticals sector is also included for its economic importance and its synergistic potential with the priority sectors. Specific, replicable, and scalable circular economy business opportunities for priority sectors are identified in this report, primarily around reusing what is currently waste. The mismatch of policies and regulatory requirements are identified as barriers.

SMEs face a particular set of challenges in pursuing circular economy opportunities. Internally, SMEs are under time pressure to fulfil daily operational activities, have limited budget to invest, and limited resources available to them in terms of infrastructure, personnel, or skills to act on new opportunities. Surveys identify the cost of environmental actions and supply chain issues as top challenges for SMEs to realise resource efficiency (RE). With support, SMEs have realised cross-border resource reuse opportunities. Surveys indicate minimising waste, saving energy, and recycling by reusing materials or waste within the company are the most common actions undertaken by SMEs in IE and NI.

The responsibility for circular economy policy cuts across, and varies between, different agencies, organisations, and departments in the two jurisdictions This means that in some instances it is difficult to be specific about how some of the broad recommendations and actions in this report should be delivered. In such instances, outline recommendations are given that would require stakeholder agreement between the relevant bodies to determine whether and how these could best be taken forward. Recommended actions for InterTradeIreland, policymakers and business, especially SMEs, to leverage the full potential of these opportunities to support the uptake of circular economy approaches listed below focus on function over form to identify potential partners for implementation.

Recommendation 1: There is a need to raise awareness across audiences (government, industry and its representation, education and training bodies) of the concept of circular economy in jargon-free terms, and use case studies and examples to communicate the business benefits possible through its implementation.

Rationale: *Awareness and comprehension of circular economy are important motivators for stakeholders to act on circular economy opportunities. Interviews underscore the importance of effectively communicating the proven business benefits of circular economy to SMEs: Cost savings supporting profitability, improved competitiveness, reduced supply chain risk, additional sales and new markets, and improved innovation.*

[1] World Business Council for Sustainable Development, 2018, Circular Policy Action Brief

- Government departments and trade associations can inform SMEs of the relevant legislation and government strategies, and the implications thereof for circular economy-related practices, especially cross-border. Simplify messaging by avoiding jargon to ensure accessibility for SMEs. Resource efficiency and cost reduction are well received and well understood, whereas circular economy and sustainability are as yet not.

- InterTradeIreland can foster awareness among policy makers and businesses of the connection between Net Zero, Climate Change and Resource Efficiency. Host a webinar/seminar inviting experts such as CREDS. Disseminate via trade, sector associations, business networks, and chambers of commerce and industry.

- Government departments and trade associations can draw on success stories and best practice that SMEs can relate to and, in some cases, easily adopt or seek their own innovative circular economy solutions. Source case studies from existing programmes and networks involved in supporting circular economy activity in each jurisdiction.

- Existing network membership organisations (e.g, trade associations and chambers of commerce) can align communications to facilitate knowledge exchange, collaborative initiatives, and unified advocacy for regulatory adaptations, enhancing both environmental and economic sustainability.

Recommendation 2: There is a need for governments and training providers to collaborate to empower SMEs through skills development and training, building familiarity with circular economy opportunities, policy and regulatory requirements.

Rationale: *Stakeholders emphasised the need to address industry-specific challenges for SMEs. Each industry sector brings unique hurdles and opportunities in the adoption and implementation of circular economy principles, be it in managing waste, exploiting renewable resources, or innovating more sustainable processes.*

- Educational and professional institutions can incorporate circular economy concepts in vocational and educational training, such as that being developed by the European Commission's ERASMUS+ SPIRE-SAIS project. Government training support programmes can facilitate educational initiatives to build circular economy skills, drawing on existing vocational and educational circular economy tools.

- Trade sector associations can address sector-specific concerns, such as regulation and standards, specific supply risks and opportunities, technology and innovation through sector-specific strategies and communications.

- Government bodies responsible for strategies at the educational, post-graduate and vocational levels can liaise with vocational and educational trainers and regulators to design training that demystifies the regulatory landscape, including End Of Waste (EOW) and Transfrontier Shipment of Waste (TFW) requirements. Trade, sector and other membership organisations representing the target sectors can liaise to roll out training to target industry sectors.

Recommendation 3: There is a need to encourage implementation by providing free support to business. Consideration should be given to use of a resource matching platform for data transparency and how to boost investment in innovation and infrastructure.

Rationale: *Supporting SMEs with expertise, data transparency, investment and infrastructure helps overcome challenges to circular economy integration.*

Expertise: Facilitation is paramount to identifying and advancing cross-sector circular economy opportunities, and supporting the development of non-traditional supply chains cross-sector.

- Relevant government departments should consider establishing a cross-border collaboration between programmes supporting industry waste avoidance (such as NI's Resource Matching Service) to realise additional impact through cross-border resource reuse opportunities, foster eco-innovation and a long-term culture of reuse.

- Relevant government departments could incentivise cross-border synergy realisation and strategic alignment between business support activities through impact metrics for existing and future support programmes.

- Relevant government departments could build a critical mass of support through existing support platforms in NI and IE, including the NI Resource Network, Federation of Small Businesses, Invest NI Resource Matching Service (RMS), Small Firms Association, Business in the Community NI and IE, Chambers of Commerce, CIRCULÉIRE and the Re-discovery Centre. InterTradeIreland and its partners could convene representatives of these programmes to enhance interdepartmental and inter-jurisdictional collaboration, align objectives, share data where appropriate and focus on impact.

Data transparency: Improving visibility of available resources, be they materials, logistics, expertise or manufacturing capacity, is necessary to drive circular business opportunities.

- Governments supporting circular economy programmes should consider adding an all-island resource matching platform (such as that used by the INI RMS, SYNERGie®) to their offer, increasing the visibility of resources and technologies to businesses, and hosting supporting information such as industry sector and resource specific case studies

- Regulators in both jurisdictions can align data reporting requirements to produce a holistic view of material and waste movements across the entire island, informing implementation and strategy.

- Secondary raw materials lack visibility compared to their primary equivalents, including industry sources and technical suitability. Regulators can align waste reporting with listing on a resource matching platform to bring visibility and acceptance to secondary raw materials.

Infastructure: Stakeholders noted a clear imperative to augment recycling and waste management capacities within the national infrastructure of both NI and IE to enable access to high quality secondary resource flows and reduce the export of valuable resources in the form of waste. InterTradeIreland and/or other relevant economic development actors, should consider commissioning a study on all-island infrastructure to identify investment needs and propose best routes to implementation

- Enhanced recycling capabilities unlock economic opportunities by transforming waste into valuable resources. A symbiotic approach between NI and IE, centring on the integration of advanced recycling technologies and development of efficient waste management systems could significantly elevate the collective sustainability agenda by leveraging economies of scale in waste flows to make the infrastructure investment viable.

Recommendation 4: Relevant stakeholders should collaborate to agree how they can foster a consistent integration of the circular economy within SMEs across NI and IE through a robust, collaborative approach and policy alignment that transcends regional boundaries. Consideration could be given to funding a dedicated resource to enable this to happen on an all-island basis

Rationale: *Disparities in policy, legislation, and strategic approaches between IE and NI pose challenges for businesses across the island. These different rules on each side of the border, inconsistent administrative requirements and incentives, and a lack of clear information. The hurdles are particularly daunting for SMEs engaged in cross-border operations.*

- Create a cross-border forum with private and public sector representation to break silos, build relationships, and provide consistency for businesses. Engage across departments and themes (economy/industry, environment, skills and innovation) to build appreciation of the synergistic opportunities for coordinated investment and incentives. Make coordination on circular economy policies, strategies and action plans across departments a priority.

- Relevant government departments in both jurisdictions can develop and align to a single, all-island comprehensive circular economy delivery plan that ensures, to the maximum extent possible, alignment of strategy, metrics, and incentives. Both jurisdictions currently share the European Commission framework, which provides a starting point to assess success along agreed metrics. This work may be informed by the cross-border forum described above.

- End of Waste (EOW) needs revision in both IE and NI to remove both perceived and actual barriers to reuse. Revising the EOW licensing in IE and NI and aligning cross-border would enable more SMEs to designate their surplus resources for reuse and stimulate the secondary materials market across both jurisdictions.

- Secondary materials can be a more expensive option than primary materials. These market forces disincentivize circular economy opportunities for reuse. National policy can help bridge the economic gap between primary materials and their secondary equivalents, using instruments such as the UK's aggregate tax.

Introduction

Evolving environmental pressures in the last half century have created a need to move from a linear take- make-dispose economy to a more efficient, more circular economy. In the 1960s and 1970s, businesses sought to become more efficient, and approaches such as lean manufacturing and six-sigma became commonplace, at least in the manufacturing sector. In the 1990s with the Brundtland Commission the dialogue moved on to a broader sustainability/sustainable development approach that explicitly addressed economic and social pillars alongside environmental pressures; this remains at the forefront of the global discussion today in the form of the United Nations' Sustainable Development Goals. In the last twenty years, a new term has gained prominence, the 'circular economy'. This reflects the need to move away from the linear to the circular, or closed loops, approach to resources, although it is not exclusively a resource strategy. Mainstream awareness of the term 'circular economy' has grown over time, but lags what the concept means in practice for a business. In 2015 the Eurobarometer survey polled small and medium enterprises (SMEs) across Europe about resource efficiency (an element of the circular economy) and the circular economy itself. Then, 90% of respondents reported taking action on resource efficiency but only 10% did so for circular economy, indicating the lack of awareness of the interrelationship between the two.

The goal of this work is to understand how the circular economy is developing on the island of Ireland, and the business opportunities it presents. Understanding of the circular economy is mapped via an analysis of policy documents, and further explored through stakeholder consultation. In parallel, a detailed analysis of priority sectors highlights specific scalable and replicable circular economy opportunities for businesses in the Republic of Ireland (IE) and Northern Ireland (NI). It then recommends actions for IntertradeIreland, other economic development stakeholders, policymakers, and business, especially SMEs, to leverage the full potential of these opportunities and support the uptake of circular economy approaches.

METHODOLOGY

Twenty-one policy and strategy documents were analysed across IE and NI. These are listed in the table below.

Table 1: Scoping Documents

NI	IE
Climate Change Act (Northern Ireland) 2022	Climate Action and Low Carbon Development (Amendment) Act 2021
The Path to Net Zero Energy: NI Energy Strategy	Circular Economy and Miscellaneous Provisions Act 2022
Draft Circular Economy Strategy	Whole of Government Circular Economy Strategy 2022-2023
The Circularity Gap Report Northern Ireland	DETE Industry 4.0
10X Economy	DETE White Paper on Enterprise
Draft Green Growth Strategy	EU Circular Economy Action Plan
Skills for a 10X economy – Skills Strategy for NI	
Draft Environment Strategy	Waste Action Plan for a Circular Economy 2020-2025
Waste Management Strategy (Draft)	The Circular Economy Programme 2021-2027
UK-Wide Circular Economy Package Policy Statement July 2020 (including NI)	National Smart Specialisation Strategy for Innovation 2022-2027
Innovation Strategy 2020-2025	Green Public Procurement Strategy 2012

Five key themes emerged from these documents:

1. **Resource efficiency**
2. **Waste**
3. **Skills**
4. **Innovation**
5. **Climate Change Ambition**

The frequency of the key themes per 1000 words of each document was mapped by document and department. The policy, strategy and legislative scoping analysis highlights synergies and overlaps as well as potential cross-border differences which may present barriers to the development of an all-island approach.

To better understand how an all-island circular economy is emerging from the perspective of policymakers and businesses, key stakeholders were consulted on adoption of circular economy practices. The adoption of circular economy practices among businesses was assessed through a combination of surveys and semi-structured interviews. In addition, attendees of the Invest NI-funded Resource Matching Service workshop (August 2023) were consulted on circular economy opportunities and challenges, and best practice examples.

In Part 2, a high-level exploration of the local industrial base and its associated waste streams identifies opportunities for the innovative reuse, repurposing, recycling, or sharing of a broad spectrum of resources to close resource loops in IE, NI, and the island of Ireland. Industrial sectors as identified through IE and NI strategies were prioritised. These opportunities would lead to resource and energy efficiency, reduced environmental impacts with embedded sustainable consumption and production patterns, and support ambitions for an all-island transition to a circular economy.

Identification of the barriers to an all-island circular economy was based on desk-based research, stakeholder consultation feedback, and direct ISL experience of on-the-ground-delivery of circular economy projects, both on the island of Ireland and beyond. This experience also includes direct sight of the typical barriers encountered in the delivery of European Regional Development Fund (ERDF)-funded SME-focused resource efficiency projects.

From the policy study and stakeholder review, key areas to support cross border activity were identified that could benefit from strengthening or simplifying:

- Collection & Visibility of Data
- End of Waste and Waste Legislation Exempt Activity
- Cross-Border Movement of Waste
- Market Instruments
  (narrowing economic gaps between secondary materials and their primary equivalents)

To address gaps in policy and strategy, or where uptake and understanding of circular economy is low, targeted international best practice examples relating to specific sectors, challenges and cross-border examples are presented throughout.

Finally, recommendations are presented to enable InterTradeIreland and its partners to support the development of an all-island circular economy. The recommendations draw on the policy context and industrial base in both jurisdictions to identify collaborative and commercial circular economy opportunities for businesses across the island.

Part 1: Policy, Strategy And Legislation Landscape

Understanding how the term circular economy is used on the island of Ireland is crucial to properly identify how InterTradeIreland and its partners can support the uptake of circular economy approaches, especially for SMEs. Structuring an all-island framework for the circular economy is complex due in part to the wide range of definitions that exist in industry and literature.

Achieving a net-zero (NZ) economy by 2050 is an all-island objective, legislated for in Ireland's Climate Action and Low Carbon Development (Amendment) Act 2021 and in Northern Ireland's Climate Change Act (Northern Ireland) 2022. Transitioning to a low-carbon economy offers opportunities for businesses to make better use of finite resources, reduce emissions, protect human health and biodiversity, boost economies, and create more high-quality jobs. Both governments identify the circular economy as key to achieving the target of NZ. However each jurisdiction has different legislative, strategic, and policy approaches to meeting this ambitious target.

The Irish government defines circular economy in the "Circular Economy and Miscellaneous Provisions 2022 Act" as "an economic model and the policies and practices which give effect to that model in which -

a. Production and distribution processes in respect of goods, products and materials are designed to minimise the consumption of raw materials associated with the production and use of those goods, products and materials,

b. The delivery of services is designed to reduce consumption of raw materials,

c. Goods, products and materials are kept in use for as long as possible thereby further reducing the consumption of raw materials and impacts harmful to the environment,

d. The maximum economic value is extracted from goods, products and materials by the persons using them, and

e. Goods, products and materials are recovered and regenerated at the end of their useful life.

The NI Executive describes circular economy in its "Draft Circular Economy Strategy" as an economy that "strives to make better use of materials, components and products through a whole-lifecycle and whole-systems approach. This enables reduced resource use and waste prevention, while keeping products and components in use for longer before, eventually, recycling the materials that they are made of."

An all-island circular economy would see a greater uptake of non-linear economic models that work across both jurisdictions, drive the implementation of policies and practices to minimise the consumption of raw materials in the production and use of goods, products, and services, and foster opportunities for both IE and NI businesses.

Both NI and IE recognise the potential of the circular economy but face challenges in actualising it. NI's challenges derive in part from its unique geopolitical position post-Brexit, necessitating the navigation of both UK and EU regulations which so far have not substantively diverged.

Strategies already taken up in IE and NI include labelling on recycled content and recyclability, and bans on single use plastics, driving circular supplies. Other strategies are less advanced, such as the Right to Repair, which is reflected in the European Commission's (EC's) agenda through the "European Green Deal" and the "Circular Economy Action Plan", but have not yet filtered down into Member State legislation in many cases.

POLICY CONTEXT IN NI

Upon the UK's official departure from the European Union in January 2020, the UK government stated its intent to transpose the waste measures contained within the "Circular Economy Action Plan" (2020). Nevertheless, this departure and the subsequent transition period introduced an element of uncertainty for NI businesses awaiting the formalisation of the transposition.

The complex NI political landscape, characterised by ongoing issues within the Northern Ireland Assembly and Executive, introduced a further delay in clarification for business. Disagreements over the Irish/UK sea border have led to political deadlock, preventing new regulation and policy being enacted.

The Department for Agriculture, the Environment, and Rural Affairs (DAERA) developed an "Environment Strategy" for NI; its formal approval and publication await an incoming Executive, as is also the case for the "Draft Circular Economy Strategy" published by the Department for the Economy (DfE) in January 2023. The Chair of the UK Climate Change Committee wrote in a letter to DAERA that NI is already playing catch-up with the rest of the UK and that the targets set out in the "Climate Change Act 2022" will quickly lose credibility if the policy focus fails to stimulate implementation. NI's "Draft Circular Economy Strategy" (2023) set out an overview of potential policy actions on how the circular economy can help to meet these targets but the delays are exacerbated by the lack of Executive sign-off.

Stakeholders identified that the "Draft Strategy for a Circular Economy," "Draft Green Growth Strategy," "Energy Strategy," and bodies such as DfE, DAERA, and the Northern Ireland Environment Agency (NIEA) were essential to develop a region-specific framework for the circular economy. The Resource Matching Service (RMS) and the Efficiency Assistance Grant stand out as strategic initiatives to embed circular economy practices within businesses alongside the "Plastic Reduction Action Plan". The "Climate Action Plan" is a pivotal umbrella strategy, synthesising various environmental domains, including the circular economy. The first draft "NI Climate Action Plan" (2023 – 2027), along with setting carbon budgets, will involve policy development across government departments led by DAERA.

POLICY CONTEXT IN IE

In late 2020, Ireland's first circular economy policy document was published in the "Waste Action Plan for a Circular Economy" (WAPCE), signposting the EC's "Circular Economy Action Plan" as a guiding document.

A "Whole of Government Circular Economy Strategy: 2021-2023" was published to facilitate the transition towards a circular economy; its twenty targets include the establishment of an interdepartmental circular economy working group, and reconfiguring Ireland's National Waste Prevention Programme as The Circular Economy Programme 2021- 2027.

The stakeholder consultation demonstrated that the "European Green Deal," "Waste Action Plan for a Circular Economy," and the "Circular Economy and Miscellaneous Provisions Act" represent a robust policy structure in line with broader EU objectives. The introduction of proactive initiatives like the "RETURN" deposit system and the "Waste Recovery Levy" are noteworthy examples of implemented policies. Stakeholders also referenced the "Food Waste Prevention Roadmap" and the role of the Environmental Protection Agency (EPA), as part of a structured effort to introduce circular economy principles to SMEs.

POLICY ALIGNMENT AND GAPS

Effective collaboration entails bringing together diverse stakeholders and departments to consult on best practice and unify circular practices. Across NI and IE documents, a gap appears in the level of cross- departmental and cross-sectoral collaboration to address circular needs. The documents from the economy-tasked departments (Department of Enterprise, Trade and Employment (DETE) IE and DfE NI) are consistent in emphasising the essential roles of skills development and innovation. Both NI and IE documents acknowledge the symbiotic relationship between these elements and the circular economy, reinforcing their interconnectedness with a notable difference: whereas NI DfE policies and strategies lead with innovation and skills, they also make the explicit connection to waste; IE DETE focuses on innovation and skills, and in some cases do not mention resource efficiency or waste at all. From the environmental perspective, both DECC and DAERA focus on waste and innovation, whereas in NI DAERA adds mention of skills. In general, NI policies across departments are more inclusive of the key themes. This suggests a lack of a consistent framing of the circular economy between jurisdictions and government departments, indicating missed opportunities for collaboration.

IE appears to have a more robust approach in that it has created multi-disciplinary teams and working groups that can consult on varying issues to inform best practice and policy. An extensive list of stakeholder engagement initiatives such as CIRCULÉIRE, the Smart Farming programme, and the Community Resources Network Ireland all help to promote knowledge sharing and best practice. NI has a similar network in the NI Resources Network as well as the Invest NI RMS. However, neither jurisdiction has a clear plan or instrument in place to support the linking of these networks to share best practice on a cross-border basis.

The launch of the "National Waste Management Plan for a Circular Economy" in Q1 2024 will bring more clarity regarding local authority-led circular economy activities & structures and the well-established Local Authority Prevention Network will respond to ensure alignment with the Circular Economy Programme, local authority needs, and circular economy priorities. This mix of public and private sector communication enables a more holistic approach to identifying circular challenges and addressing them in future policy development. In NI, a similar network bridging the public and private sectors was not identified.

Respondents underscored the pivotal role of stakeholder engagement through consultations on subject matters such as waste classification and the circular economy. Clarification on the classification of waste as a by-product or classified for reuse, was identified as imperative – a request that is consistent across EU member states. Policy stakeholders recognize the need for comprehensive data to enable appropriate measurement and management of national level activity. Data streams such as national level material flows of primary and secondary materials, potentially benchmarked using EU circular economy monitoring, Eurostat, and Organisation for Economic Co-operation and Development (OECD) metrics were highlighted as useful data sets to aid circular economy uptake.

Opportunity: Create a cross-border forum with private and public sector representation to break silos cross-border and cross-sector, build relationships necessary to foster collaboration and provide consistency for business. Engage across departments and themes (economy/ industry and environment; resources, waste, skills and innovation) to build appreciation of the synergistic opportunities for coordinated investment and incentives. Make coordination of circular economy policies, strategies and action plans across departments a priority.

Disparities in policy, legislation, and strategic approaches between IE and NI pose challenges for SMEs across the island. These challenges include navigating different rules on each side of the border, inconsistent administrative requirements and incentives, and a lack of clear information. The hurdles are particularly daunting for SMEs engaged in cross-border operation.

Stakeholders call for a coherent approach. A comprehensive delivery plan, integrating policies from the various connected strategies, would help SMEs understand how their circular economy-related action will contribute to the achievement of circular economy targets and the economic benefits.

Currently both NI and IE are aligned to the European Commission's "Circular Economy Action Plan", providing the opportunity for a consistent approach to the circular economy. Coordination at this formative stage between the departments responsible for the respective circular economy delivery plans - DfE and DECC (with input from key stakeholders such as DAERA and the EPA) - could maintain an alignment as policies and plans are put into place.

In NI this would mean that strategies such as the "Draft Circular Economy Strategy", "Draft Green Growth Strategy", "Energy Strategy" and "10X Economy Strategy", should fit within broader frameworks such as the "Climate Action Plan", thereby aligning circular economy targets with net zero objectives and providing a roadmap for delivery. This sentiment is echoed by stakeholders in IE, who also point to the findings of joint research endeavours between institutions like Dublin City University and Business in the Community (BITC) Ireland. This underscores the importance of aligning business strategies with governmental carbon budget targets so SMEs can become active players in combating climate change. An integrated approach in policy development would also ensure areas like the circular economy and Bio-Economy align with overarching frameworks, promoting a congruent development pathway across multiple sectors.

Policies that incentivise businesses to adopt circular economy practices can redress the absence of compelling market forces or mandates for circular economy adoption. Practical suggestions include fiscal measures such as altering the tax environment to encourage sustainability-centric activities, thereby more effectively engaging SMEs. Stakeholders call for policies that are clear, straightforward, and especially pertinent to businesses; tools such as the Small and Micro Business Impact Test (SAMBIT) would tailor policies more effectively towards SMEs, and balance environmental imperatives with business practicalities. All policies could be examined through a circular economy 'lens'. For those policies targeted at the circular economy, a useful framework that could be employed is from the World Business Council for Sustainable Development. This Action Brief mapped global circular economy policies to the industry sectors affected and the circular economy business models that were employed or influenced (e.g., circular supplies and product life extension).

Opportunity: Relevant government departments in both jurisdictions can develop and align to a single, all-island comprehensive circular economy delivery plan that ensures to the extent possible alignment of strategy, metrics and incentives. Both jurisdictions currently share the European Commission framework, which provides a starting point for a single framework to assess success along agreed metrics. This work may be informed by the cross-border forum described above.

NORTHERN IRELAND	REPUBLIC OF IRELAND
	SEPTEMBER 2020 **Waste Action Plan for a Circular Economy 20-25** was published
	JULY 2021 **Climate Action and Low Carbon Development Act** 2021 was published
	DECEMBER 2021 **Whole of Government Circular Economy Strategy** was published Ireland's National Waste Prevention Programme was reconfigured into a natonal **Circular Economy Programme** which is officially published in December 2021.
MARCH 2022 Northern Ireland's first overarching **Environment Strategy** is published - in draft form. Needs formal approval by the executive.	
	JULY 2022 **Circular Economy and Miscellaneous Provisions Act or the 'Circular Economy Act'** was published, cementing the Circular Economy into Irish legislation.
JUNE 2022 Climate Change Act (Northern Ireland 2022) officially came into force.	
JANUARY 2023 A Draft Circular Economy Strategy was published for consultation.	
	DECEMBER 2023 A new Whole of Government Circular Economy Strategy is due for publication as an evolving document, expected to be updated every 18 months to 2 years This new iteration is expected to include targets and actions to support those targets, to build on the overall policy vision and approach set out in the 2021 publication.
AUGUST 2023 The DFE publishes its findings from a public consultation exercise on its draft Circular Economy Strategy.	
	UNDER DEVELOPMENT
UNDER DEVELOPMENT Environment Strategy waiting for formal executive sign off Final Circular Economy Strategy and new Waste Strategy under development Deposit Return Scheme for drinks containers rollout expected for October 2025	A new **National Waste Management Plan** is currently being drafted - it will be a National Waste Management Plan for a Circular Economy Deposit Return Scheme 'Re-Turn' expected for February 2024 for plastic bottles.

Key Themes

In the review of strategy and policy documents, the following key themes emerged:

1. **Resource efficiency (RE)**
2. **Waste**
3. **Skills**
4. **Innovation**
5. **Climate Change Ambition**

Resource efficiency is the foundational theme. The emphasis on resource efficiency then naturally extends to the recognition of waste as a critical component of the circular economy, minimising waste generation and optimising its management through approaches such as extended producer responsibility (EPR) schemes, end-of-waste, and recycling targets.

While climate change ambition is identified as a driving force in the reviewed documents, primarily in the context of net zero targets and the transition towards a lower carbon economy, there is a notable gap in effectively articulating the alignment between the circular economy and the pursuit of net zero objectives. The NI "Draft circular economy strategy" aims to communicate how the circular economy can contribute towards NI's net zero target, primarily through a reduction in material footprint. A public consultation response report to this strategy noted that better alignment was needed with the "Climate Change Act" and net zero, citing the example of sector-specific material targets, in alignment with the carbon reduction targets proposed in the "Draft Climate Action Plan". A holistic approach to climate change and circular economy agendas is critical to meeting net zero targets, as circular economy has the potential to reduce up to 50% of UK carbon emissions.[2] Few businesses understand how circular economy principles address Scope 3 carbon emissions, with the consequence that Scope 3 and circularity are often overlooked. Greater awareness and understanding are required to help businesses grasp circular economy concepts and how resource efficiency can reduce a high percentage of their direct and indirect CO2 emissions. The few voluntary climate pledges in the business community focus on Scope 1 & 2 emissions (e.g. BITC's Climate Pledge).

Raise awareness across audiences (government, industry and its representation, education and training bodies) of the concept of circular economy in jargon-free terms, and use case studies and examples to communicate the business benefits possible through its implementation

BOX 1: INTERNATIONAL EXAMPLE, CIRCULAR ECONOMY-RELATED POLICIES

International example:
Netherlands Circular Economy by 2050[3]

The Dutch government's policy "A Circular Economy in the Netherlands by 2050" sets the guidelines for the country to reach a fully circular economy by 2050. A series of transition agendas focused on the five sectors responsible for 50% of the country's raw material consumption. In 2019, the agendas were realised in the form of projects and regulations, including the requirement that government buildings be built using as many recycled materials and resources as possible and with zero emissions. The Dutch government also aims to reduce the use of resources by 50% by 2030. Dutch taxes were expanded to cover incineration as well as landfill in 2015, further driving materials to recycling and reuse options.[4]

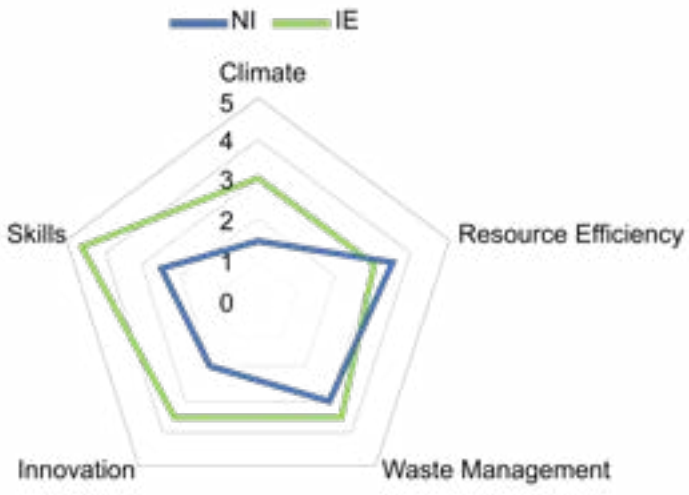


Figure 2 Radar chart showing key theme uptake in circular economy policies, strategies, and legislation across NI and IE.

[2] https://aecom.com/content/wp-content/uploads/2020/08/MI-ROG_white-paper-4_circular-economy_2020.pdf
[3] Hope, B. 2022, How countries are striving to build their circular economy, Sustainability Magazine.
[4] https://www.eea.europa.eu/publications/many-eu-member-states/netherlands

Theme: Resource Efficiency

Resource efficiency (RE) emerged as a common focal point for action plans and investment, underpinning much of the strategic landscape for moving toward a circular economy. Resource efficiency offers competitive benefits to industry, in particular reduced dependence on raw materials with concomitant reductions in costs (raw materials and waste), carbon emissions, and supply risk. The imperative to maximise resource utilisation while minimising waste and environmental impact is pronounced in NI and IE alike. In both jurisdictions, the focus on resource efficiency primarily centres around downstream waste-related strategies; a holistic approach to closing resource loops would also address upstream issues including circular supplies, and supply risk mitigation through alternative sourcing.

POLICY & STRATEGY

NI's score of 4.5 reflects a substantial level of resource efficiency integration within the realm of circular economy policy and strategy. The reviewed documents highlight a 10-year history of prioritising resource efficiency within the national strategy (e.g., the NI "Resource Efficiency Plan" since 2013). While some groundwork has been laid, there is acknowledgment in the "Draft Circular Economy Strategy" that some planned initiatives are yet to be actualised. While resource efficiency is briefly touched upon in innovation and skills strategies in NI, the "Circularity Gap" showcases the potential of resource efficiency to enhance sectors such as manufacturing and the built environment, fostering job creation and promoting the adoption of circular business models.

IE's score of 4 indicates a similar emphasis on resource efficiency although it is integrated into various policies rather than having its own dedicated plan. There is a substantial commitment to resource efficiency, supported by well-funded initiatives. The "National Smart Specialisation Plan" outlines how innovative adoption of digitalisation will drive more resource efficiency and sustainable production, which in turn leads to more circular jobs. The "Circular Economy Programme 2021-2027" outlined by the EPA underscores resource efficiency as a pivotal component of circularity, reflecting a comprehensive approach where all government departments and agencies have integrated resource efficiency into their respective strategies.

IE's whole-of-government strategy identifies sector-specific opportunities for resource efficiency initiatives. The sector-based approach to policy implementation and supporting guidance means that SMEs can easily find the elements pertinent to their own business and that policy messages and actions can be tailored to suit each sector in turn. It also means that sectors can be targeted in priority of impact, aligned to national objectives such as greenhouse gas (GHG) reduction. This approach has been successfully used in the EU member states for the implementation of the Industrial Emissions Directive, where guidance notes have been issued on a sectoral basis targeting those of most significant environmental impact. It is also an approach being implemented by DAERA for the implementation of the "Climate Change Act (Northern Ireland) 2022".

Table 2 Alignment and Gaps between IE and NI - Resource Efficiency policies

POLICY ALIGNMENT
• Both NI and IE have established resource efficiency within their national Circular Economy strategies.
• Both NI and IE have a vibrant NGO, voluntary and community group sector which is leading on showcasing resource efficiency.
POLICY GAPS
• NI has a Resource Efficiency Plan since 2013 whereas IE does not have a dedicated plan.
• NI has a long-established resource efficiency programme through Invest NI's fully funded 'Resource Matching Service', whereas IE investment in the equivalent SMILE ceased in 2018
• IE has stated its intention to set reuse targets in line with EU recommendations, NI has not.

NI is investing in resource efficiency through Invest NI's 'Resource Matching Service', delivered by International Synergies (Northern Ireland) Limited. Through this initiative, businesses share resource data to identify opportunities for reuse, maximising the value of their waste streams. The equivalent IE programme, SMILE, was funded from 2010 to 2018 by the EPA. Historically, the NI RMS and IE SMILE collaborated to achieve cross-border synergies, indicating that an all-island RMS could be effective through growing networks and increased opportunity realisation.

Opportunity: Relevant government departments could establish a cross-border collaboration between programmes supporting industry waste avoidance (such as NI's Resource Matching Service) to realise additional impact through cross-border resource reuse opportunities, foster eco-innovation and a long-term culture of reuse.

Both jurisdictions benefit from the active engagement of NGOs, voluntary organisations, and community groups dedicated to resource efficiency. Examples include the Irish Environmental Network and the Community Reuse Network Ireland (CRNI), which work within the resource-efficiency space, fostering collaboration and innovation. Additionally, organisations like the Rediscovery Centre in IE leverage the talents of artists, designers, and scientists to pioneer sustainability, exemplifying effective resource efficiency through the creative repurposing of materials. In NI, initiatives like the Belfast Tool Library promote resource efficiency by offering a wide range of tools for borrowing, reducing the need for individuals to purchase new ones. FareShare and Foodbank also play vital roles in both jurisdictions by addressing food waste and food poverty through food redistribution, aligning with the circular economy's aim to minimise waste and maximise resource use.

RESOURCE EFFICIENCY THROUGH REUSE AND REPAIR

Key to the circular economy is keeping resources in productive use, including reuse where possible, to retain embodied energy. The European Parliament defined reuse in the Waste Framework Directive 2008/98/EC as an "operation where products or product components that are not waste, are reused with the same use for which they were designed".

The same Directive promotes reuse through the establishment and support of reuse and repair networks run by social enterprises, incentivising remanufacturing, refurbishment and repurposing products.

Both IE and NI have highlighted the reuse and repair sector as a major area for potential growth. In IE, the Rediscovery Centre supports four reuse social enterprises: Rediscover Furniture, Rediscover Fashion, Rediscover Paint, and Rediscover Cycling. These enterprises demonstrate resource efficiency and effective reuse by using unwanted materials for new product development and design. In NI, the Northern Ireland Resource Network aims to grow and support a network of reuse and repair businesses across the region, including the Belfast Tool Library, the Repair Café Belfast, and 4Rs project. Invest NI also funds the RMS, a free service to all businesses that promotes industrial symbiosis, which is a powerful approach to creating a network of diverse companies that can foster eco-innovation and a long-term culture of reuse.

Despite a flourishing network of social enterprises supporting reuse, both NI and IE have yet to adopt policy solutions for promoting reuse and repair. The Interreg-funded Policy Learning Platform on Environment and Resource Efficiency[5] identified the following key principles to inform the design of local reuse targets:

- Adopt environmental and social public procurement criteria that prioritise reuse. Voluntary tools like Circular Procurement help guide sustainable public spending.
- Establish reuse and prevention targets. These include determining the volume of materials prepared for reuse. IE has noted its intention to introduce a binding reuse target in its "Whole of Government circular economy Strategy 22-23", while NI has not yet planned for such a measure.
- Invest and create quality collection points: Reusable products and materials should be collected separately from recyclable and residual waste. Staff need to be trained in order to identify reusable materials and products.
- Create a local reuse culture: Awareness-raising and education of citizens and businesses about the importance of reuse is crucial.

[5] https://www.interregeurope.eu/sites/default/files/2022-12/Policy%20brief%20on%20reuse%20and%20repair%20in%20a%20circular%20and%20social%20economy.pdf.

The creation of a social enterprise for reuse directory that covers organisations on both sides of the border, structured in a way that supports businesses to find an enterprise that wants a specific resource (such as textiles, wood or plastic) detailing their specific resource requirements and quantities would assist in supporting greater symbiosis between social enterprises and business. This initiative could be supported on a cross-departmental, cross-border basis and provided as an enhancement to existing social enterprise signposting platforms provided by Northern Ireland Resources Network and Community Resources Network Ireland.

The introduction of an effective 'right to repair' for consumers was announced in various EC strategy documents, including the Circular Economy Action Plan and the European Green Deal, where consumers have a right to have their faulty products repaired free of charge during the legal guarantee period of two years. A Eurobarometer survey suggests that EU citizens believe manufacturers should be required to make it easier to repair digital devices and 77% would prefer to repair their devices than replace them.

The main barrier to repair is that repair is still expensive for low quality goods, which encourages consumers to opt for early replacement and leads to increased resource use and waste. Local authorities can help to facilitate repair by lowering the cost of repair activities. One successful case study was conducted in Austria[6] where a 'repair bonus' that began as a voucher in the city of Graz was replicated in Vienna and Salzburg, resulting in savings of 260 tonnes of e-waste while also supporting local repair jobs in the period. Lessons learned such as how to fund and administer it as well as measuring success, could be applied to implementing a similar scheme in a local authority area such as Dublin and Belfast as a test case for stimulating growth in repair activities in both jurisdictions and more widely.

BOX 2 INTERNATIONAL EXAMPLE, CROSS-BORDER COLLABORATION

Cross-border Scandinavian collaboration[7]

A cross-border circular economy project involving 3 Swedish and two Norwegian border regions has found that a successful transition to a circular economy is based on location-specific strategies and characteristics. Local context is a factor in designing tailored campaigns to support the implementation and acceptance of the circular economy in the region. An important consideration is the demographics influencing resource and waste flows, energy and material consumption.

The regions share common policy areas in relation to Greener Europe objectives including bioeconomy, marine environment and blue growth, environmental protection, and renewable energy production. Several local priority policies align with the Smart Europe objectives include supporting entrepreneurship and innovation ecosystems, advanced process industries and digitalization. These interlinked policy priorities present the opportunity to enable synergies across national and regional borders.

[6] Interreg Europe, 'A Policy Brief from the Policy Learning Platform on Environment and Resource Efficiency', Dec 2022. https://www.interregeurope.eu/sites/default/files/2022-12/Policy%20brief%20on%20reuse%20and%20repair%20in%20a%20circular%20and%20social%20economy.pdf
[7] CIRCTER SPINOFF - Cross border Scandinavian.pdf (espon.eu)

Theme: Waste

POLICY & STRATEGY

Waste is a central theme within the circular economy framework in both NI and IE. The OECD reports that despite the existence of various sustainability programmes, initiatives, and policies in IE, ultimately the circular economy is seen as a tool to reduce waste.[8] This viewpoint is reflected in the strong focus on the waste sector in Irish legislation, policy and strategy, and aligned with the move from a linear flow of resources to a more circular economy.

IE's progress towards circular waste management is seen in its national waste policy in the WAPCE, published in 2020. Guided by the EC's two Circular Economy Action Plans (2015 and 2020), this strategy document set the scene for IE's transition toward a circular economy with specific targets and policy actions. These targets include packaging recovery and recycling targets set for 2025 and 2050, as well as specific material recycling targets. The WAPCE also targets 100% of all packaging to be reusable or recyclable by 2030. Commitments include introducing specific packaging format/product targets. As well as the WAPCE, IE has a Whole of Government Circular Economy Strategy 2022-2023, with plans to update the document every two years, intending to support the WAPCE targets with 'unambiguous policy direction and support' from across the Government departments. Furthermore, the development of a National Waste Management Plan for a Circular Economy is underway, with further specific targets planned for reducing waste growth with more emphasis on waste arising from commercial activities.

NI published a draft Circular Economy Strategy in 2023, with the primary target being to halve NI's material footprint to 8 tonnes per person per year by 2050. The documents also list five policy goals, including 'collaborate for systems change', 'design out waste', and introducing funding, incentives and penalties to achieve systems change. The policy goals are accompanied by proposals to help achieve these goals. The public consultation response report subsequently published in August 2023 provided additional perspectives and identification of issues. The policy direction indicated by the NI circular economy strategy is similar to that of IE. NI is also awaiting the publication of a draft Waste Management Strategy, expected in early-mid 2024, which will follow NI's last strategy Delivering Resource Efficiency published in 2013. This document is expected to set out specific waste targets and to formally communicate the role waste will have in NI's transition to a circular economy.

Table 3 Alignment and Gaps between IE and NI - Waste Policies

POLICY ALIGNMENT
• Common push for EOW revision, highlighting the potential in the Construction & Demolition sector in particular
• Common activity on Deposit Return Schemes for Plastic Bottles & Aluminium Cans: IE expected in 2024 and NI in 2025.
• Common focus on reuse and repair sector.
POLICY GAPS
• NI Waste Management Strategy has not yet adopted the language of CE, anticipated in the 2023 revision.
• IE's three waste management regions are preparing a combined National Waste Management Plan for CE with specific targets for reuse, repair, resource consumption & reducing contamination levels. They are also working with businesses to promote the philosophy of seeing 'waste as a resource'.
• IE have had a proactive approach to banning Single Use Plastics (SUP) in line with EU regulations, while NI have held public consultations on related policy options but have yet to take formal action.

[8] The Circular Economy in Ireland. (2022). OECD eBooks. doi:https://doi.org/10.1787/7d25e0bb-en

WASTE PREVENTION

NI's interim waste management policy, *National Waste Prevention Plan: Stopping Waste in Its Tracks* highlights that waste prevention is at the forefront of waste policy in NI. As the interim document was only designed to meet the needs of the EU's Waste Framework Directive, it stops short of a push for new policies surrounding waste prevention. NI's last waste management strategy, *Delivering Resource Efficiency* published in 2013 was concluded with a closure report in 2022, reporting that 82% of the targets were met. The new NI waste management strategy is due for publication in draft form in early-mid 2024 and is set to publish new targets for preventing waste.

IE has listed numerous mechanisms, both financial and non-financial, to promote waste prevention. These include: a Waste Recovery Levy, a Deposit Return Scheme, mandatory separation and incentivised charging regimes for commercial waste and the potential introduction of fees for determining EOW and By-Product status.

SINGLE USE PLASTICS

IE has made significant strides in aligning with the EC's Single Use Plastics (SUP) Directive by implementing bans on various disposable items Its proactive approach demonstrates a commitment to reducing the environmental impact of SUPs. Moreover, ambitious plans have been announced for bans on additional products, increasing the onus on producers to take responsibility for the entire lifecycle of their goods within the WAPCE. In NI, progress regarding the SUP Directive remains somewhat unclear: the Northern Ireland Protocol specified that NI must transpose certain articles of the Directive into local law, but these transpositions have yet to occur. Nevertheless, DAERA have engaged in consultations to advance the ban on certain SUP items.

Table 4 Comparison of Single-Use Plastics Category Status

Single use plastics category	IE Status	NI Status
Plastic Bags	Plastic bag levy: 22 cent per bag for all retailers: first introduced in 2002	Carrier bag levy: 25p for all retailers since April 2022, first introduced in 2013
Disposable Cups	20 cent 'Latte levy' proposed by Government expected in late 2023 to reduce waste	DAERA have held consultations for the reduction of single use beverage cups.
Plastic straws, cotton buds, plates, cutlery, beverage stirrers	Banned in IE under SUP Directive since June 2021.	No SUP legislation currently in place:
Tobacco products containing plastic	Mandatory EPR Scheme for producers since Jan 23.	No plan outlined.
Balloons	EPR Scheme planned for December 2024.	No plan outlined.
Wet Wipes	EPR Scheme planned for December 2024.	DAERA have recently consulted as part of a UK-wide consultation on banning wet wipes containing plastics.
Fishing Gear	EPR Scheme planned for December 2024.	No plan outlined.

EXTENDED PRODUCER RESPONSIBILITY

Extended Producer Responsibility (EPR) schemes impose significant responsibility on producers for post-consumer phase of certain goods. Advocated by the OECD since the 1990s,[9] EPR schemes have been described as a powerful policy instrument in enabling the circular economy in both NI and IE strategy documents. These schemes have two primary functions: to generate revenue for waste management activities and recycling, and to incentivise improved product design.

Table 5 Comparison of EPR Schemes

EPR Schemes	IE Status	NI Status
Packaging	Packaging & Packaging Waste Directive sets target that all packaging on Irish market is reusable by 2030. EPR Scheme operated by Repak and mandatory since Jan 2023 for 'major producers'.	Packaging EPR Scheme deferred in NI until 2024.
WEEE	Managed by Waste Electronics and Electrical Equipment (WEEE) Ireland and ERP Ireland.	In place since 2006, DAERA looking to reform alongside DEFRA and other devolved administration, to emphasise eco-design, product labelling and increasing household collections. This reform consultation was opened December 2023 to March 2024.
Batteries	Managed by WEEE Ireland and ERP Ireland.	Producer responsibility regulations in force since 2010. A consultation on reforming UK Batteries legislation is expected to be published in 2024.
End of life Vehicles (ELVs)	Operated by End of Life Vehicles Environmental Services (ELVES)	Current producer responsibility scheme for ELV in place since 2003, with DAERA working with UK to move towards EPR model.
Tyres	The Tyre Regulations adopted in 2017 enabled a mandatory EPR scheme for tyres, managed by Circol ELT.	No EPR Scheme in place.
Farm Plastics	Farm Plastics Regulations require producers to participate in approved EPR scheme or become involved in recovery of farm plastics waste through offering a deposit or refund scheme with customers.	No EPR Scheme in place.

[9] OECD, 2001, Extended Producer Responsibility, A Guidance Manual for Governments.

EXTENDED PRODUCER RESPONSIBILITY

In NI there are four statutory producer responsibility schemes: packaging, batteries, electrical goods and vehicles, with the packaging EPR scheme due for implementation in 2024. DAERA have confirmed that work has also commenced to explore an EPR solution for textiles. IE has six EPR schemes: the four mentioned above, tyres, and farm plastics. These actions, driven by recycling targets, have been instrumental in improving the overall circularity of the goods. The EC's Single Use Plastics (SUP) Directive has been a key catalyst in driving IE to implement EPR schemes which emphasise the crucial role that producers play in managing the end-of-life disposal of their products. Moreover, in alignment with the Directive's objectives, IE's WAPCE outlines plans to not only strengthen existing EPR schemes but also broaden their scope, holding producers accountable for an even wider range of products.

Both IE and NI have planned to implement deposit return schemes (DRS) to enhance recycling and reduce waste. In IE, the 'Re-Turn' scheme will be introduced in February 2024 for plastic bottles between 150ml and 3 litres. In January 2023, DEFRA published their response to a 2021 consultation on a DRS system for NI, England, and Wales that has an expected rollout in October 2025. The size of containers that would fall within the scope include 50ml-3litres and materials such as polyethylene terephthalate (PET) bottles, and aluminium cans; Wales is the only nation to include glass bottles. Waste management is a devolved policy area and thus the responsibility of deciding the scope of a DRS falls on the individual nation. IE's planned DRS for 2024 has an identical material scope but slightly differs from NI's container size requirements, with IE's starting at 150ml and NI's beginning at 50ml. Research and experience internationally identify co-ordination as imperative for a successful return rate and to reduce counts of cross-border fraud. The Scottish Deposit Return Scheme implementation has been delayed to ensure alignment with other schemes in the UK. Stakeholders expressed that companies require certainty to mitigate investment risks, and recent policy changes in DRS implementation criteria have made investors more cautious. There is also concern about a lack of clarity regarding who will engage directly with SMEs to support behaviour change on DRS. It was felt a greater balance of policy towards the education of consumers to drive business change would have a bigger effect than a levy. Furthermore, it was expressed that while plastic take-back schemes are seen to be promising, there are practical challenges in their implementation and some exemptions may be desirable (e.g., for compostable or recyclable cups).

BOX 3 INTERNATIONAL CASE STUDY, DEPOSIT RETURN SCHEME

Case studies from across Europe support a considerable advantage through cross-border DRS collaboration. The German-Danish border situation highlights the potential for fraud when differing deposit rates incentivise consumers to buy cheaper beverages across borders and then discard containers without a DRS in their home country. In contrast, the cooperative systems in the Baltic states of Latvia, Estonia, and Lithuania showcase the benefits of improved return rates and more sustainable practices throughout the region due to systems that allow for the return of containers across borders.

The border between NI and IE is highly porous. The lessons from the German-Danish border case study showcase how important it is to align DRS schemes in IE and NI to prevent fraudulent exploitation and reduce cross-border fly-tipping. Cross-border collaboration between bodies such as NIEA and the EPA could see benefits such as increased recycling rates of the drinks containers, as is showcased in the Baltic states. Activity of this nature supports the shared desire from IE and NI to make progress on their Net- Zero ambitions through increased recycling and supports positive behaviour change in both jurisdictions.

Opportunity: Establish a cross-border forum for NIEA/DAERA and the EPA/DECC to co-ordinate their approach to DRS. Align deposit rates and DRS container coverage (materials, sizes) to drive greater participation, and limit conflicting incentives.

WASTE RECOVERY, END-OF-WASTE

End of Waste (EOW), the process whereby material that is recovered or recycled from waste ceases to be classified as waste, is highlighted as needing revision in both IE and NI. NI has had an Aggregates Levy on virgin materials such as rock, gravel and sand that are

extracted for sale in the UK since 2002 to encourage the use of recycled aggregates. IE currently does not have a similar levy but has suggested in the WAPCE that it will consider introducing a levy on virgin aggregates in construction projects to incentivise using recycled aggregates.

In IE, the WAPCE advocates streamlining EOW application and related decision-making processes due to concerns around the general lack of clarity of the current EOW system, and the time to final decisions on applications. Other targets mentioned in relation to EOW include obtaining EOW status for various priority waste streams, notably in the C&D sector. In early 2023 the EPA developed a new National Decision on EOW for the production of recycled aggregates resulting from construction waste. The decision was finalised in late 2023,[10] resulting in many companies registering as producers of EOW recycled aggregates.

BOX 4 IRELAND CASE STUDY, END OF WASTE

Ireland's Construction Soil and Stones
The EPA has encouraged companies involved in construction to think about the waste arisings from their planned project and how it could be used in their own and others' activities. If they can evidence that an end use has been planned into their operations, then soils and stones can be exempt from the Waste Framework Directive which removes cost and time associated with obtaining licenses to store and work with these materials.[11] This pre-planning element to demonstrate that there is 'no intent' to discard has also been successfully used in the UK in the implementation of construction site waste management plans (which although no longer a mandatory concern are still used by many tier 1 construction companies) and the CL:AIRE materials management plan guidance.[12]

The Circularity Gap Report highlights the need to reimagine and redesign how NI uses and extracts resources, in particular construction. Resource recovery and availability of raw materials plays a key role in the draft Housing Supply Strategy NI and the NI Executive's "Energy Strategy" for NI, advocating higher standards for new housing and retrofitting existing buildings to reduce overall carbon emissions.

BOX 5 INTERNATIONAL BEST PRACTICE: END OF WASTE

Emilia-Romagna[13] is the first Italian region to have legislated circularity as the centre point of its waste policy with the aim of reducing waste production and to recover as much as possible for recycling. A Permanent Coordination Body for By-Products was set up that involves trade associations and other stakeholders to identify by-products, with the specific purpose of facilitating the identification of by-products from businesses.

The Italian legislation specifies that any substance or object satisfying the following conditions qualifies as a by-product (and not waste):

- The substance or object originates from a process of production, of which it forms an integral part, and whose primary purpose is not the production of this substance or object;
- It is certain that the substance or object will be used in the during the same or a subsequent trial production or use, by the manufacturer or third party;
- The substance or object can be used directly without any further treatment other than normal industrial practice;
- Final use is legal, i.e., the substance or the object satisfies, for the specific use, all relevant product and protection requirements, health and the environment and will not lead to overall negative impacts on environmental or human health.
- While the qualifications of the Emilia Romagna law do not differ substantially from EU or UK law, the process itself is straightforward for the businesses applying: a short application yields a brief by-product data sheet for industry reference.

[10] EPA, 2023, National End-of-Waste Decision EoW-N001/2023
[11] Guidance on soil and stone products v3, EPA, June 2019 https://www.epa.ie/publications/licensing-- permitting/waste/Guidance_on_Soil_and_Stone_By_Product.pdf
[12] https://www.em-solutions.co.uk/insights/what-is-a-claire-materials-management-plan-and-can-it-work-for- me/
[13] https://www.ermesservizi.it/sottoprodotti/, http://ambiente.regione.emilia-romagna.it/it/rifiuti/temi/economia-circolare/sottoprodotti

Stakeholders confirm that EOW licensing is viewed as restrictive and call for a more flexible approach to the classification of waste, by-products, or reusable items. This is a challenge for companies on both sides of the border and for ongoing cross-border trading of secondary material resources which contribute to achieving all-island economies of scale with resource flows. Stakeholder sentiment in both IE and NI indicated that EOW processes are prohibitively long and bureaucratic to effectively classify materials for reuse. The Emilia-Romagna case study is an exemplar from the EU that could be used as a template for DAERA/NIEA and DECC/EPA for EOW licencing in IE and NI.

Opportunity: End of Waste (EOW) is highlighted as needing revision in both IE and NI to remove perceived and actual barriers to its reuse. Revise the EOW licensing in IE and NI to improve flexibility and responsiveness, aligning processes between jurisdictions to the extent possible. This would enable SMEs to more fully embrace the opportunity to designate their surplus resources for reuse and stimulate the secondary materials market across both jurisdictions.

RECYCLING

Ireland's Circular Material Use Rate is 2% compared to an EU average of 12.8%.[14] IE has the 3rd highest municipal landfill (LF) tax in Europe (2023) at €75 (plus gate fees);[15] the IE tax goes directly into the Circular Economy Fund to improve waste management and recovery performance. From 1 April 2023, the UK LF tax standard rate was raised to £102.10 per tonne,[16] with the lower rate for inert materials of £3.25 per tonne and no recovery levy; the UK tax goes into the overall HMRC tax fund.

IE has introduced a waste recovery levy of €10 per tonne on the recovery of residual municipal waste and a LF levy of €85 per tonne on waste disposal to incentivise recycling and reduce the amount of material going to LF. This levy is payable by the entity that carries out the waste recovery activity, or where the waste holder is to be shipped for recovery. No such plans exist for a levy in NI. However, with a new draft Waste Management Strategy due for publication in early-mid 2024 by DAERA, specific LF reduction targets are expected. These targets could result in a proposal for a similar waste recovery levy.

IE has identified the opportunity to retain material value through enhanced use of recycled materials in its Circular Economy Programme. Through the WAPCE, IE has set a target to reach 30% recycled content by 2025 in line with the UK's plastics packaging pact. The action plan also proposes the introduction of a virgin plastic levy to support the use of recycled materials in packaging.

Stakeholder consultation identified specific NI concerns about the need for government policy to support recycling hubs and investment. IE stakeholders, while also concerned about infrastructure, lean more towards the need for resource-matching services and cross-border cooperation. Cross-border movements need to be facilitated through an alignment of waste classification and regulation to ensure a consistency of approach that is required to avoid creating further barriers to using waste as a resource. InterTradeIreland could play role in convening stakeholders on either side of the border to ensure that regulatory and policy alignment is addressed by departments on a cross-border basis.

From the ISL experience of delivery of the circular economy on the ground with business in both jurisdictions, priority areas to consider include:

- The definition of waste and classification
- End of waste
- Waste exemptions

Avoiding classifying industrial arisings as waste will have a positive effect on the drive for circularity through the reduction of cost, risk and associated bureaucracy. The importance of this activity is already recognised in the findings and recommendations of the circular economy strategies of both NI and IE.

[14] https://ec.europa.eu/eurostat/web/products-eurostat-news/-/ddn-20211125-1
[15] https://www.eea.europa.eu/data-and-maps/figures/overview-of-landfill-taxes-on
[16] https://www.gov.uk/government/publications/landfill-tax-rates-for-2023-to-2024/landfill-tax-increase- in-rates

POLICY & STRATEGY

The interplay between skills and the shift toward a circular economy is evident in the strategic and policy foci of both NI and IE. However, the varying levels of policy integration for businesses highlight gaps between the two jurisdictions in topics such as workforce upskilling programmes, circular job creation, and knowledge sharing to facilitate the exchange of best practice related to circular economy skills development.

For NI, the score of 2.5 reflects a limited level of circular economy integration on skills and workforce development. While the reviewed documents emphasise the pressing need for circular skills to align with the evolving demands of a circular economy, there is a lack of planned actions, budgetary allocations, and well-defined implementation strategies due to the lack of ministerial approval required to move from draft status to adoption and implementation. NI's "Skills for a 10x economy" strategy has no clear integration with the draft "Circular Economy Strategy" with only a brief mention of the potential for green jobs in the NI economy.

The IE score of 4 underscores a greater degree of circular economy integration within the Skills & Workforce domain. This is exemplified by an array of national skills and training initiatives such as those being led by Skillnet Ireland, whose Statement of Strategy 2020 to 2025 includes the aim to "Support the talent demands for building a low-carbon and sustainable economy through our enterprise-driven climate action upskilling initiative." The allocation of a dedicated budget to bolster circular skills development signifies a tangible commitment to translating intention into impactful outcomes including engagement sessions, education, jobs fairs and increased employment opportunities particularly in the renewable energy sector as highlighted in the Just Transition Plan 2022.

Table 6 Alignment and Gaps between IE and NI - Skills & workforce development policies

POLICY ALIGNMENT
• NI and IE have both prioritised building circular skills in their national skills strategies.
• IE and NI strategies identify common barriers to participation in education and training programs (such as apprehensions about returning to education and demanding work schedules).
• NI and IE have both identified key enabling sectors such as design, repair and refurbishment to be supported in the effort to increase circular skills.
POLICY GAPS
• The presence of an efficient green public procurement (GPP) system that fosters circular skills has been recognised in the IE strategies, yet NI lacks a GPP policy to articulate how this can be achieved.
• IE is currently working on a comprehensive skills gap analysis like the NI Circularity Gap Report, making it challenging to address specific skills shortages within the various sectors highlighted.

Areas such as business support, policy levers to stimulate demand for circular skills, and education & awareness programmes were prevalent in the policy documents of both NI and IE. Both NI and IE acknowledge underlying skills deficits, particularly in areas like retrofitting, renewable energy, and circular economy practices. IE and NI can create specialised training that aligns with their decarbonisation and circular economy goals, with the potential for collaboration in this area.

The alignment of the circular economy concept with national initiatives such as the Just Transition endeavour and Skillnet Ireland's skills and training programmes is evident. Skillnet Ireland, as outlined in its Statement of Strategy 2020 to 2025, is committed to bolstering the workforce's capabilities to meet the demands of a sustainable and low-carbon economy. This dedication extends to fostering talent through enterprise- driven climate action upskilling initiatives. Both jurisdictions also highlight the need for educating the workforce, whether through formal education or workplace training.

Theme: Skills & Workforce Development

Collaborating on best practices, curriculum design, and innovative teaching methods can enhance the effectiveness of educational initiatives. Investment in IE's SOLAS Green Skills Training Programme provides accredited training employees on topics supporting circular economy.

The gap between NI and IE in addressing skills initiatives lies with the ability to provide public funding for initiatives that break barriers commonly associated with circular skills, such as resistance to change, lack of awareness and cost and time investment challenges. NI's Circularity Gap Report highlights procurement as a powerful tool to support demand for skills for the circular economy. Factoring social and environmental value into public procurement contracts that place additional value on the use of secondary materials or seek to repair existing equipment provides impetus for businesses to develop the knowledge and skills needed to deliver such contracts.

SME KNOWLEDGE & SKILLS DEFICIT

SMEs often lack awareness and understanding of the circular economy and the language around it, which can be laden with jargon and acronyms, or where to begin to take action. Consultees confirmed this sentiment and noted that in highly regulated sectors, such as the food industry, it can be challenging to navigate the adoption of new secondary materials due to strict regulations. Furthermore, when introducing products or packaging that are innovative or contain recycled content, there can be supply risks and buyers may require extensive checks and certifications to gain confidence in these new products, delaying time to market. Overcoming these challenges may involve not only streamlining regulations and creating the necessary infrastructure to support supply but also providing support to SMEs in navigating complex regulatory environments, developing the skills necessary to manage product innovation and market access using secondary materials.

Skills and workforce development is a central theme to the all-island circular economy in both policy and practice. Both jurisdictions recognise a lack of understanding about circular economy, but NI has more emphasis on the need to increase budget for behavioural change programmes and skills development.

BOX 6 INTERNATIONAL CASE STUDY: VOCATIONAL AND EDUCATIONAL TRAINING

ERASMUS+ SPIRE SAIS Skills for Planet[17]

SPIRE-SAIS is an ERASMUS+ funded projects bringing together stakeholders from across the Sustainable Process Industry through Resource and Energy Efficiency (SPIRE) community, including industry sector associations, education and training providers, research and technology organisations, research institutions, regional institutions, companies, and others, to enable and accelerate the uptake of industrial symbiosis and energy efficiency by developing a comprehensive cross-sectorial blueprint for skills.

The SPIRE-SAIS alliance is addressing possible skills shortages in energy-intensive industries while providing EU citizens with the necessary skill sets for future job profiles. The project will update the curricula and qualifications with knowledge and skills that required to support essential cross- sectoral collaboration and industrial symbiosis activities.

[17] https://www.aspire2050.eu/sais

BOX 7 INTERNATIONAL CASE STUDY: KNOWLEDGE EXCHANGE

Case study: Introducing innovation and energy efficiency in Eastern Poland's industry 2016-17.

Energy efficiency and sustainable resources management are critical factors for a competitive industry in Europe. Polish SMEs struggle to incorporate good practices and sustainable energy management solutions. Apart from European Commission targets, energy efficiency is an important topic for many SMEs. This project addressed SMEs in the Podlaskie and Lubelskie regions of eastern Poland. The project proposed strengthening Norwegian-Polish cooperation and knowledge exchange (know-how and technologies); increasing the energy efficiency and resource management of SMEs; developing sustainable solutions in energy efficiency for participating SMEs; sharing bilateral knowledge and experience to support companies; promoting best practices in energy efficiency both in Poland and in Norway.

Project activities included: an information campaign and recruitment of participants of the project; cooperation with regional chambers of commerce, dedicated mailing, social and branch media, newsletter; the implementation of 2 pilot innovative projects in Lubelskie and Podlaskie Voivodeship – using audits, reports, workshops; study visits, conferences and a web-based platform; education (physical and virtual); and seminars.

Opportunity: Educational and professional institutions can increase focus on circular economy skills development in vocational and educational training, such as that being developed by the EC's ERASMUS+ SPIRE SAIS project. These initiatives could be considered by local and national authorities in NI and IE to address circular economy-related skills deficits, stimulating innovation and productivity.

Government training support programmes can facilitate educational initiatives to build circular economy skills, drawing on existing vocational and educational circular economy tools.

Trade sector associations can address sector-specific concerns, such as regulation and standards, specific supply risks, technology and innovation through sector-specific strategies and communications.

Theme: Innovation

POLICY & STRATEGY

Innovation is a driving force behind transformative change, albeit with nuanced variations between NI and IE. Circular business models, Green Public Procurement (GPP) and Green Enterprise Policies are common areas of focus which could provide opportunities for SME collaboration across the island to learn from each other and break down sectoral boundaries.

For NI, the score of 2 signifies a basic level of circular economy integration within innovation. Notably, the documents touch upon the potential of challenge funds, yet gaps exist in funding and a comprehensive action plan to support their realisation. Two Small Business Research Initiative competitions launched in 2023 suggest that NI is going in the right direction by solving sustainability challenges through the stimulation of business innovation. The assessment highlights the existence of innovation awareness, but also emphasises the need for more substantive steps to bring innovative ideas to fruition.

The IE score of 3.5 reflects a more advanced integration of innovation within the circular economy landscape, exemplified by the National Smart Specialisation Strategy for Innovation 2022-2027 which emphasizes the circular economy as a strategic driver for innovation and outlines a range of R&D projects aimed at fostering the development of circular products and services.

ALIGNMENT AND GAPS BETWEEN IE AND NI - INNOVATION POLICIES

Green Public Procurement (GPP), circular business models, and challenge funds are all important policies in NI and IE. IE published a GPP policy in 2012 and bolstered it with a 2021 action plan and best practice guide, showing a commitment to leveraging public procurement for sustainable practices. In October/ November 2023 a new GPP strategy and Action Plan went for public consultation and is due for publication early 2024. NI, on the other hand, has yet to develop a dedicated GPP plan. In bridging the gap between aligning innovation and circular economy across the policy and strategic landscape, more beneficial outcomes are possible across both NI and IE.

Table 7 Alignment and Gaps between IE and NI - Innovation policies

POLICY ALIGNMENT
• Green Public Procurement (GPP) is highlighted as a key area in both NI and IE to drive innovation and CE.
• Both NI and IE highlight various Circular Business Models that SMEs can be incentivised to adopt.
POLICY GAPS
• IE first published its GPP policy in 2012, and followed with an Action Plan on GPP in 2021; NI has yet to develop a dedicated plan.
• NI has yet to adopt a plan for promoting the adoption of Circular Business Models among SMEs.
• Ireland's National Smart Specialisation Strategy 22-27 realizes the potential for innovation to contribute to an all-island CE through supporting business clusters and networks.

CHALLENGE FUNDS

In IE, the use of challenge-based funding represents an innovative approach that directs research activities towards ambitious societal issues. This solution-focused strategy employs competition, interdisciplinary collaboration, and strict timelines to address challenges related to waste and sustainability.

In NI, challenge funds are highlighted as an avenue to encourage demand for more innovation-active firms. However, outside of the recently published Green Innovation Challenge Fund, which is more geared toward academics, there is limited support for NI businesses to pursue circular economy. A new competition with a budget of £500,000, funded by the Small Business Research Initiative was launched in January 2023 by DAERA and focused on delivering a sustainable solution for livestock slurry. These competitions highlight NI's use of challenge funds and competitions to stimulate innovation.

A potential opportunity arises for the creation of an all-island circular challenge fund, inviting enterprises from both jurisdictions to partake in addressing circular challenges shared across the regions—such as those found within the construction sector or single-use plastics. This collaborative initiative has the potential to unify efforts, draw upon collective expertise, and effect transformative change, driving innovation and sustainability on a broader scale.

GREEN PUBLIC PROCUREMENT

Green Public Procurement is also highlighted as a key focus area for collaboration due to both IE and NI recognising its potential to drive innovation for a circular economy. Green Public Procurement is defined by the EC as "Public procurement for a better environment" and "a process whereby public authorities seek to procure goods, services and works with a reduced environmental impact throughout their life cycle when compared to goods, services and works with the same primary function that would otherwise be procured."[18] The basic principle of GPP relies on having clear environmental criteria for products and services, and is classed as a 'vital' policy lever in IE's WAPCE (p.63) for the prevention of waste and other policy objectives. IE's Climate Action Plan 2019 highlights various steps to accelerate GPP practices including engaging with SMEs on GPP opportunities. It also sets out future GPP action, including reviewing the first GPP action plan, Green Tenders, to consider the mandatory inclusion of green criteria in all public purchasing. However, the OECD report 'Circular Economy in Ireland' recognised the regulatory gap related to the lack of circular criteria in GPP, more details will become available in the new GPP due to be published in early 2024. The Circular Economy Programme in IE also highlights GPP as a key driver of innovation to stimulate critical demand for more sustainable goods and services while simultaneously reducing the environmental impact of delivering those services.

NI's Green Growth Strategy has committed to develop its own GPP strategy. NI's current public procurement strategy, published in 2014, does not include any measures for circular action or GPP. Despite IE's advancements in publishing various policy documents and best practice guides, the EPA published a report in 2023 which found low levels of green criteria being used in public procurement by Government departments, with 24% of contracts awarded in 2021 including green criteria, accounting for 10% of total spend. This suggests that accelerating the decision to include mandatory GPP criteria in all public contracts needs to occur, with the further potential to share best practice outcomes with NI.

CIRCULAR BUSINESS MODELS

Circular business models allow SMEs to do business in a manner that focuses on reducing waste and maximising resource use, replacing the traditional linear approach. Both NI and IE strategy and policy documents highlight the importance and potential of circular business models in achieving a circular economy. The Draft Circular Economy Strategy in NI lists five different circular business models with the most potential for SMEs in NI. These are the same five highlighted by an OECD report as having the most potential in IE: models on resource recovery, circular supply, product life extension, sharing, and product service. In the "Whole of Government Strategy", IE has identified this as an area for further development with the plan for national policy to identify the potential for and promotion of investment in these models within the IE economy. CIRCULÉIRE is also a funded mechanism in IE that supports the scaling of circular business models across its members. The circular economy gains that have been evidenced working within existing business models should be considered in terms of the priority that is placed upon recommending SMEs to adopt a circular economy business model.

[18] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52008DC0400

Theme: Climate Change Ambition

POLICY & STRATEGY

Addressing carbon emissions has remained a consistent focal point within the policy agendas of both NI and IE. Yet, upon analysing the strategic and legislative frameworks of these two jurisdictions, a noticeable disparity emerges in the extent to which the circular economy is accorded a central role in attaining climate change targets.

In NI, the score of 2 reflects the relatively lower integration of the climate change ambition within the circular economy context. The reviewed documents indicate that while there is recognition of the imperative to reduce carbon emissions, the circular economy's explicit role in achieving climate targets is less pronounced. If the Draft NI Strategy for Circular Economy were adopted and linked to a published climate action plan, this would improve the score. In addition, NI lacks robust circular economy legislation that could provide a structured framework for aligning climate action with circular principles as is being showcased in IE.

IE's score of 4 is attributed to its robust legislative and policy framework that tightly couples the circular economy with climate change ambition. This is evident in the comprehensive Circular Economy and Miscellaneous Provisions Act 2022 and Waste Action Plan for a Circular Economy which underscores the interdependence of circular practices and carbon reduction. IE's Environmental Protection Agency's Circular Economy Programme has been instrumental in fostering circular business practices, lending weight to the circular economy's role in addressing climate challenges. The additional 0.5 points stem from the pragmatic implementation of associated strategies, reflecting a tangible commitment to translating policy into action.

Table 8 Alignment and Gaps between IE and NI - Climate Change ambition Policies

POLICY ALIGNMENT
• Establishing transparent data on material flows emerges as a critical aspect of transitioning the CE to mainstream climate policymaking in both NI and IE, which could help shift the perspective of the CE from a solely waste topic to a holistic climate action catalyst.
POLICY GAPS
• Both NI and IE are below the EU average circular material use rate (11%), with IE at 2% and NI at 7.9%.
• IE has generally integrated CE principles and policies more holistically into their overall climate-related agenda via strategy documents.

SCOPE 3 CARBON EMISSIONS

Improving circularity within industry has the potential to deliver significant Scope 3 carbon emission reduction as required for the policy objective of Net Zero Emissions in IE and NI. Scope 3 emissions are those carbon emissions associated with a company's raw material use, supply chain activity, and waste production. Unlike Scope 1 and 2 emissions, which are directly related to a company's energy production and consumption and can be directly managed, Scope 3 emissions represent an area where a company often cannot exert direct influence and therefore presents a greater challenge to quantify and manage. Studies show that most industrial sectors have 60-80% of their carbon footprint within Scope 3 emissions, which necessitates prioritising carbon emissions reduction associated with waste and raw materials through improving circular practices. Although current GHG reporting regimes drive Scope 1 and 2 management, the Figure below shows that, except for recognised

energy-intensive industry (such as iron and steel, transport logistics, cement and power generators), most sector carbon emissions sit in Scope 3.[19] New European Sustainability Reporting Standards will have a greater focus on Scope 3.[20] These frameworks are expected to streamline the varied reporting requirements across different regions, enabling consistency and comparability. It is anticipated that these new international standards will be a legal requirement across the UK due to requirements set by the Task Force on Climate Related Financial Disclosure, and in IE due to its status as an EU member state. The requirement for large and soon medium companies to engage with their supply chains on Scope 3 means that this will rapidly become a reporting requirement for SMEs. Companies will need to provide evidenced, independently audited, digitised reports on their action and credible plans to reduce associated GHG emissions and achieve NZ.

SCOPE 1, 2, AND 3 EMISSIONS BY SECTOR

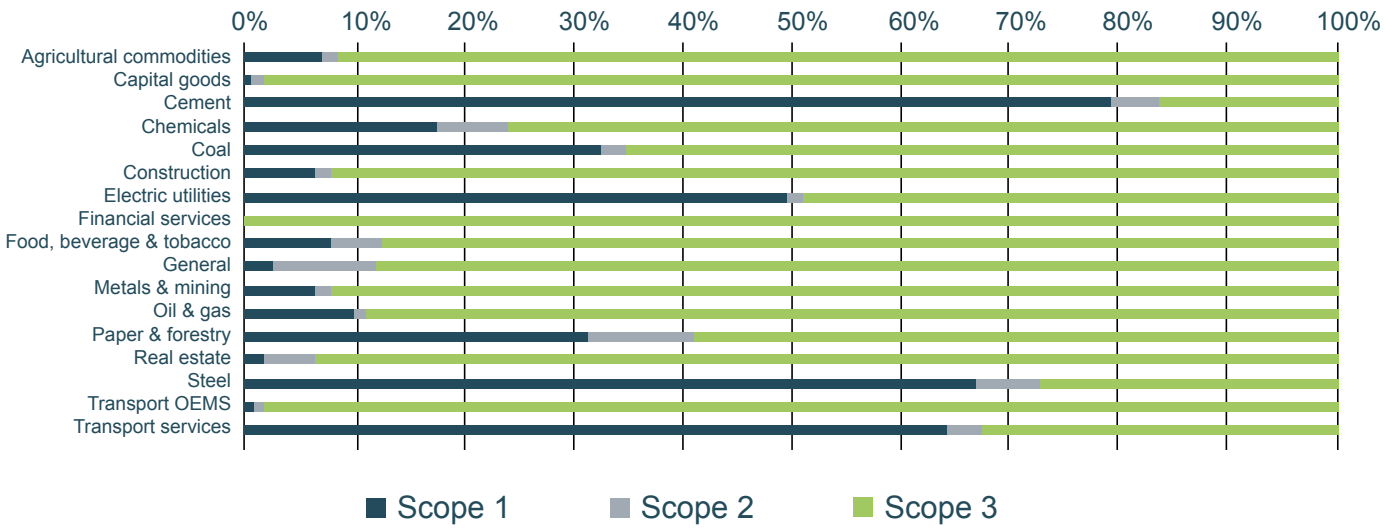


Figure 3 Scope 1, 2 and 3 Emissions by Sector

[19] CPD Technical Note Scope 3 Relevance by Sector
[20] https://www.edie.net/more-than-50000-companies-to-be-impacted-by-new-eu-sustainability-reporting-rules/

Generally, Scope 3 carbon emissions are associated with the materials and services required to manufacture the goods (upstream) or the carbon emissions associated with the use of the final product, including end of life (downstream). Being more circular and resource efficient, either through lower carbon intensive inputs to process, or at end of life keeping the materials associated with product in beneficial use in the economy, will create positive impacts on the bottom line as well as for the environment.

Table 9 Net Zero Reduction Targets for NI and IE

IE: Climate Action & Low Carbon Development Act 2021	NI: Climate Change Act (Northern Ireland) 2022
42% reduction in emissions by 2030 relative to 2018 levels.	48% reduction in net emissions by 2030
Net Zero by 2050	Net Zero by 2050
Industry & Enterprise 29-41% reduction by 2030	June 2024 interim targets to be issued, including sector-specific action plans.
Agriculture 22-30% reduction by 2030	

From the perspective of the key stakeholders, both NI and IE are deeply committed to advancing the circular economy with a desire to use an integrated approach to ensure that sustainability and environmental objectives are met in tandem with business goals. While IE leans towards aligning with broader EU objectives, NI focuses on region-specific nuances, particularly supporting SMEs through longstanding programmes such as the Invest NI RMS and other resource efficiency-related services.

From both stakeholder feedback and the analysis of NI and IE policy, the link between NZ and decarbonization activity and the promotion of circular economy as a tool to deliver Scope 3 emission reduction has not been clearly made in the minds of policy makers and industry alike. Research conducted by the Centre for Research into Energy Demand Solutions at Oxford University (CREDS[21]) in 2018 concluded that compared to ecodesign (49 MTe CO_2e per annum reduction potential) resource efficiency measures had the capability to deliver 199 MTe CO_2e per annum. There are many circular economy models available but for this reason, and the relative simplicity of the approach, the focus has been on circular economy opportunities grounded in closing loops on material flows (rather than fundamental shifts in business models) as a first step that is accessible for many SMEs to take on the road to becoming more circular.

Opportunity: Build awareness among policy makers and businesses of the connection between Net Zero, Climate Change and Resource Efficiency. Host a webinar/seminar inviting experts such as CREDS. Disseminate via trade, sector associations, business networks, and chambers of commerce and industry.

[21] https://www.creds.ac.uk/wp-content/uploads/CREDS-Resource-efficiency-scenarios-UK-technical-report.pdf

Part 2: Business Opportunities In Priority Sectors

The potential economic value the circular economy can deliver has been widely studied. CIRCULÉIRE has reported that in IE alone, a modest 5% material improvement in resource productivity across the economy would deliver over €2.3bn annually.[22] In NI, Eunomia has identified £474M of additional GVA that could be delivered to the national economy by adopting circular economy activity in priority sectors.[23]

The analysis of both national growth strategies and resource flows across industries identifies the following sectors as key to the circular economy on the island of Ireland:

- Construction
- Bioeconomy
- Advanced Manufacturing
- Chemical & Pharmaceuticals
- Tourism & hospitality

The table below sets out a **RED, AMBER, GREEN** (RAG) rating for each priority sector against a set of key criteria.

Table 10 Sector Impact Rating

SECTOR	CE & INDUSTRIAL SYMBIOSIS POTENTIAL	CARBON INTENSITY (NET ZERO)	ECONOMIC IMPORTANCE	CLUSTER OPPS	CROSS BORDER COLLABORATION
Construction	HIGH	HIGH	HIGH	HIGH	HIGH
Bioeconomy	HIGH	HIGH	HIGH	HIGH	HIGH
Advanced Mnaufacturing	MEDIUM	MEDIUM	HIGH	HIGH	HIGH
Chemical & Pharma	HIGH	HIGH	HIGH	HIGH	MEDIUM / LOW
Tourism & Hospitality	LOW	MEDIUM	HIGH	MEDIUM	HIGH

[22] https://circuleire.ie/the-circular-economy/#what-is-the-ce
[23] Eunomia, 2017, The Case for a Circular Economy Strategy for Northern Ireland. https://www.bitcni.org.uk/wp-content/uploads/2018/04/eunomia_ni_ce_strategy_report.pdf

Circular economy opportunities in key sectors are generally opportunities to repurpose and recycle waste. Some barriers are specific to the priority sectors such as legislation or the availability of technology. In the absence of specific technological solutions in a particular area, innovation may be required to overcome technical barriers. The lists below provide a non-exhaustive sample of some sector-specific challenges with potential means to address them.

In general, due to their relatively small size, low environmental impact and risk, as well the small quantities of materials often involved in their operations, SMEs are subject to light touch or zero regulation. Due to this lack of compliance reporting requirement, resource data quality and availability is often poor to non-existent. The lack of publicly available data is not just a problem encountered with SMEs, but also with larger companies: the data sets available through the EPA and DAERA were of insufficient granularity to allow industrial symbiosis matches to be identified, or resource flow quantification and base line estimates to be produced with any confidence.

These data challenges are not unique, but must be addressed to realise the circular economy opportunities. Given that SMEs may not have the resources for data collection, waste service providers could be required to report on their behalf, or with sufficient granularity (company, quantity of waste and location of production and disposal end point) to inform waste flow mapping. DAERA and EPA could convene and reinforce how improvements in data collection and quality could advance circular economy across the island to make the case for review.

Through an assessment of the main resource flows and waste arisings, potential cross-border collaboration on the movement of waste materials and byproducts becoming process inputs are identified.. Where specific regulatory barriers are known, these are presented. The proximity of resources from the point of generation to the point of need is a key commercial consideration. Some materials by their nature and inherent value, such as metal rich materials, will travel further than materials of low value or bulk density such as construction waste or polystyrene.

Sharing success stories from SMEs that have adopted circular economy principles is essential to inspire and guide other businesses and plays a key role in translating high-level discourse on the circular economy into actionable strategies linked to key sectors. Throughout Part 2, IE and NI case studies are cited for the relevant target sector.

Sector: Construction

SECTOR INSIGHTS

The construction sector uses a considerable quantity of raw materials, produces large volumes of waste and is responsible for a high proportion of the UK and Ireland's carbon emissions. A sizeable proportion of these emissions come from its use of materials, primarily steel and cement. Cement is the key ingredient in concrete, which, after water, is the most consumed material in the world. According to the Global Cement and Concrete Association, cement production accounts for around seven percent of global CO2e emissions.

Construction and Demolition Waste (CDW) is the largest waste stream in the EU by volume, with about 850 million tonnes produced annually. Historically most CDW went to landfill. Today, circular business opportunities are commonplace: scrap metals are commonly recycled; asphalt can be crushed and reconstituted; clean and untreated wood is turned into timber and chipboard; and both gypsum, used to build walls, and glass from windows and tiles can be refashioned into a multitude of new products. However, just over half of all CDW in the EU is recycled. In 2016 the EC published a CDW Management Protocol, with the goal to improve waste identification and processing, and source separation and collection.

Given that over 99% of the construction companies on an all-island basis are SMEs, the potential to deliver significant impact through improved circularity and outreach into SMEs is high on both sides of the border.

Table 11 Construction sector data

Construction	Number of Businesses	Number of Employees	SME Percentage
IE	62,664 (2020)	157,349	99.9%
NI	11,195 (2023)	55,000	99.1%

WASTE ARISINGS

Construction and Demolition generated 9 million tonnes of waste in IE in 2021. Around 80% of this volume was soil and stone, and around 10% was waste concrete. Using UK Government GHG conversion factors this waste material is equivalent to 63,550 tonnes CO2e. The NI data provided by DAERA for 2021 indicates that 387,410 tonnes of C&D waste were produced that moved through waste licensed facilities, equivalent to 2,735 tonnes CO_2e.

CIRCULARITY OPPORTUNITIES

Key resource inputs to the construction sector have secondary (alternative) sourcing options. Where possible from national data sets, an indication is given in the table below of the number of sites that could take advantage of each opportunity by providing the input or receiving the output.

Table 12 Circular Opportunities, Construction

Resource	Alternative Supply / Use	Industry Partners available to supply	Alternative Supply Locations in IE and NI
Sand (in)	Foundry Sand	Cast Metal Sector	15 sites in NI, 12 sites in IE
Aggregates (in)	Rail Ballast	Rail	
Aggregates (in)	Foundry Slag	Cast Metal Sector	15 sites in NI, 12 sites in IE
Asphalt (in)	Road Planings	Highways & Tier 1	All
Concrete Road Furniture (in)	Mixed Plastics	Various	9 plastics reprocessors in NI, 6 in IE
Aggregates (in)	Incinerator Bottom Ash (IBA)	Incinerators	1 in NI, 2 in IE
Filter cakes (in)	Brick / Aggregates / Roof Tiles Cement Kilns	Chemical Cement industry	
Biomass (fibrous materials) (in)	Additive to brick, tile, and block	Agriculture	All
Plasterboard gypsum (in)	Cement, Agriculture	Cement manufacture Soil improvement	15 recyclers in NI, 16 in IE
Cement Kiln Fuel (in)	Waste Tyres, Refuse Derived Fuel / Solid Recovered Fuel (SRF)	End of Life Vehicles Material Recycling Facility	3000 ELV operators in IE. Few facilities for SRF in IE
Iron for cement Manufacture (in)	Mill Scale	Iron Foundries	
Cement clinker (out)	Paper Sludge Ash	Paper recycling	>25 sites in IE, significant cluster near Dublin. 20 sites in NI, significant cluster near Belfast
Crushed concrete (out)	Land spread for CO_2 capture	Agriculture	
Opportunities Within Sector			
Excavation Materials	Cement Substitutes	Construction	n/a
Soils	Cement Fossil Fuel Substitutes	Construction	n/a
Surplus Stock Management	Asset management	Construction	n/a
Demolition Arisings	Biochar	Construction	n/a
Excavation Arisings	Plasterboard	Construction	n/a

When considering circularity, and in particular industrial symbiosis (IS), the construction sector is unique in that 50% of the opportunities realised are within sector, compared to only 20% for other industries.[24] This is in part a reflection of the types of resources generated, such as aggregates, soils, and demolition waste, having limited application across other industries. Inert materials present opportunities for quick wins because of the lack of legislative and technical barriers inhibiting their movement within the economy. The relative low value of the materials concerned generally correlates to opportunities with partners in close proximity.

Desktop analysis of the construction sector reveals considerable potential for IS both cross-sector and within-sector. Because of the scale of construction projects underway and planned on the island of Ireland, the demands on raw materials will continue to be significant. The associated volumes of raw materials across infrastructure, home building, and utilities projects makes this an attractive area to explore regarding IS and carbon reduction potential. The challenge often encountered with construction synergies is visibility of secondary material availability and alignment of project schedules to allow a timely transfer of resources (i.e., matching supply and demand both technically and temporally).

A joint approach that transcends regional boundaries is exemplified by the collaboration between Belfast City Council and Dublin City Council to develop a Dublin to Belfast Economic Corridor. The ongoing feasibility study and resultant workshops associated with this Economic Corridor are forging pathways for cross-border collaboration, economic activities and knowledge sharing. This inter-council collaboration, synthesising opportunities, knowledge, and resources, can effectively catalyse and sustain the transition of SMEs into a more circular operational paradigm, embedding circular economy principles into the business fabric of the island.

With construction project clusters present in both Belfast and Dublin, an opportunity exists to address some of the challenges associated with successful incorporation of IS into construction project scheduling. An opportunity may exist to create material hubs in central locations to serve multiple projects in the construction corridor between the two capital cities. In the UK, infrastructure companies including Network Rail and National Highways are already investing in materials hubs. Network Rail's aggregate handling depots have helped deliver 2.3M tonnes of recycled ballast opportunity, with £9M saved in materials cost in the last decade.[25] The size, location, material inputs and commercial case are factors requiring detailed exploration.

The construction sector opportunities align broadly with opportunities to create alternative raw materials using by-products and wastes from other manufacturing processes and priority clusters. More exciting opportunities lie in some of the innovations taking place in biobased construction products which link into one of the island's dominant sectors, agriculture. There are well-established cases of biobased materials being used in the manufacture of brick, block, and tiles.

Within the construction sector, cement clinker production is a potential hot spot of circular economy opportunity. Opportunity exists for the substitution of primary raw materials input such as limestone, silica sand, and iron with secondary sources from iron and steel manufacture, energy production, and the chemical pharma sector. Another significant opportunity exists in the replacement of fossil fuels with materials arising from the bioeconomy, automotive and logistics, manufacturing, and household waste sectors. Practical and technical challenges often limit the use of alternative raw materials. Availability and proximity of necessary waste streams to cement plants, insufficient storage capacity, high concentrations of process- incompatible elements (e.g., sulphur, magnesium, chlorides or other), in addition to the presence of volatile organic compounds, are among the main reasons why alternative raw materials can currently replace only a small part of natural resources for clinker manufacturing. As in the case of alternative fuels, policy changes can facilitate technological advances and guide waste management practices closer to the circular economy.

[24] Source: NISP® (National Industrial Symbiosis Programme) UK
[25] https://www.networkrail.co.uk/sustainability/reducing-waste/

BOX 8 IRELAND CASE STUDY: CONSTRUCTION

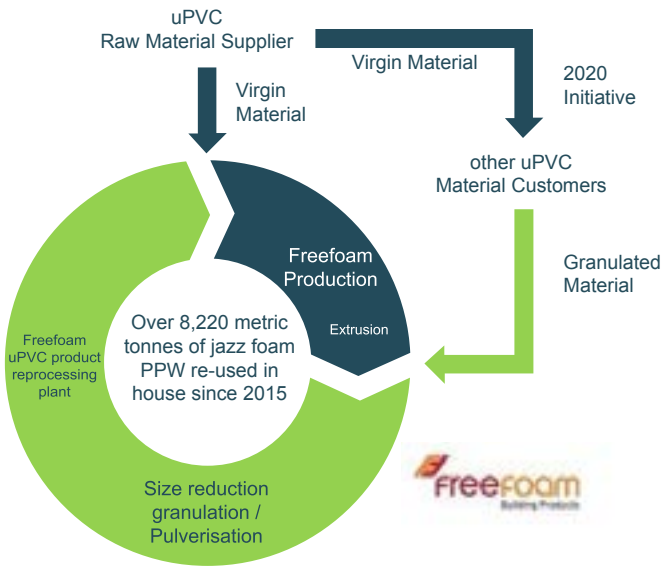
Freefoam's Circular Approach in the Construction Industry[26]

Within the construction industry, limited recycling increases waste and associated costs. A collaboration involving Freefoam Building Products (known for innovative uPVC fascia and soffit products), Glenveagh Properties and others took steps to reduce waste through a targeted recycling initiative.

Through a project funded by CIRCULÉIRE, Freefoam engaged actively in recycling low-density polyethylene (LDPE) and cardboard packaging, an initiative that included their own production and compatible packaging materials from other industry contractors. In partnership with Shabra Plastics, Freeform devised a closed-loop system linking Freefoam's Co. Cork production plant with Shabra's Co. Monaghan facility, assuring a continual flow and reuse of LDPE and cardboard, underscoring Freefoam's dedication towards creating a sustainable, closed-loop production model.

Addressing challenges related to separation and recycling of building materials, Freefoam partnered with LSM Ireland to install balers on site, each dedicated to handling a distinct material type, such as propylene IBC bags and ensuring the minimised transportation volumes back to the UK-based mixing plant. A V16 standard model baler played a pivotal role in managing materials that had reached their usage threshold or were damaged, transforming them into bales destined to be reconstituted into long-life fence posts by a company located in Co. Clare. Through systematic baling and recycling practices of LDPE and waste cardboard, Freefoam demonstrated a viable pathway towards mitigating operating and waste expenses but also exemplified a replicable model of the circular economy within the construction industry.

2015 - 2021 FREEFOAM - JAZZ UPVC FOAM POST PRODUCTION WASTE (PPW) CLOSED LOOP



[26] https://circuleire.ie/circuleire-awardees-2020-2022/); https://lsmbalers.ie/lsm-ireland-helping-to-improve- sustainability-practices-in-the-building-sector-making-the-case-for-recycling-in-lowering-operating-and-waste-costs/

BOX 9 INTERNATIONAL BEST PRACTICE: CONSTRUCTION WASTE

REUSE OF CONSTRUCTION WASTE[27]

The reuse of Construction and Demolition Waste (CDW) can mitigate the need for virgin raw materials. Germany is among the leading European CDW recyclers at an estimated 68 million tonnes recycled annually. The Netherlands recycles the highest proportion at about 90% of material recycled. Industry reuse requires a clean supply from demolition sites with no hazardous materials (e.g. asbestos, leaded paint) that may affect health, environmental or building quality standards. Based on volume estimates, recycled aggregates can cover 12 to 20 percent of the total aggregates demand for the foreseeable future. Eighty percent of the demand would still require natural primary aggregates, even in countries where recycling rates reach near 100 percent.

Databanks of construction materials from demolition sites in the area concentrate the supply locally, enabling a marketplace for recovered CDW materials. One example is the Building as Material Banks project (https://www.bamb2020.eu/). These databases store basic information on materials – including volume, location, date available, composition, and basic characteristics. A web platform then allows entities to search for specific material and arrange to access the necessary materials. The city of Mikkeli in Finland is currently developing a 3D tool for tracking CDW on-site and a databank & digital marketplace for recovered construction material. This is a spin-off from the EU-funded CIRCTER project, which examines the geographies of the circular economy.

SECTOR SYNOPSIS: CONSTRUCTION

- The construction sector has opportunities both within sector (the reuse of construction arisings and materials between discrete projects) and with clusters including bioeconomy, chemical and pharma (supplying alternative raw materials). The main challenges are around visibility of materials and aligning the schedules of projects such that material is available at the time of need, both of which can be addressed through a resource matching platform.
- The construction sector is especially conservative, as appropriate when dealing with the safety of both workers and end users. Raw materials are subject to rigorous testing criteria, and there is a general unwillingness to try alternatives unless they also have been subject to rigorous testing. Organisations such as the UK's Building Research Establishment conduct pilot testing and disseminate the results to address the conservative approach to innovation in this sector. An opportunity exists for InterTradeIreland or its economic development partners to convene R&D support organisations such as universities and the construction sector clusters to create the relationships required to pilot specific innovation opportunities.
- The reuse of materials across construction projects is typically considered at the 'project live' stage when works on site have already begun. The realization of circular opportunities is then competing with the objectives of hitting milestones and avoiding delay penalties, making them more difficult to prioritise and achieve. The most effective time to consider material efficiency options is at the design and procurement stage of a project, allowing for appropriate scheduling into (not competing with) operations. InterTradeIreland, its economic development partners, and relevant departments in each jurisdiction have a part to play in educating SMEs on the financial benefits that can be unlocked by considering these opportunities as soon as possible in the design/procurement stages, as well as exerting influence on public sector projects to include contractual clauses linked to the use and quantification of secondary materials and reduction of waste arisings.
- Maintaining value in waste streams often relies on avoiding contamination through segregation. Lack of perceived value and shortage of space often result in materials being combined in one skip which reduces their value, making reuse and recycling harder to achieve. A construction materials hub (e.g., in the Dublin Belfast Economic Corridor) could alleviate on-site storage pressures, creating a greater opportunity

[27] https://cordis.europa.eu/project/id/637186; A. Sommer, building a more sustainable future (youris.com).

to segregate smaller volumes of material. The creation of a materials hub would also alleviate some of the challenges outlined in the next point, effectively creating a buffer where larger volumes of secondary material could be stored until they are needed on another project. The Dublin Belfast Economic Corridor Feasibility study should be closely monitored as a materials hub appears to be in consideration as part of their study. The hub requires careful sizing based on current C&D waste arising and should allow materials that have been tested and certified as safe by a remediation company to be stored at the facility for reuse on other construction projects. The hub should be managed by both Councils and with regulatory oversight by NIEA and the EPA. InterTradeIreland could facilitate the upskilling of construction companies on both sides of the border to make best use of the opportunity by supporting them to access secondary materials on a cross border basis to enable greater circularity in cross-border construction activity.

- The existing waste exemption regimes either side of the border do not cover the large volumes of materials used in construction projects and the process of obtaining licences can be lengthy, often meaning an opportunity is lost as the 'path of least resistance' is taken to use virgin primary aggregates rather than the secondary equivalent. The opportunity to streamline existing EOW and exemption regulation to make them more agile in their reaction to industry needs has already been identified. This will also address the SMEs' perception of EOW as a laborious process best avoided.

- Insufficient transparency of material arisings and material needs across project supply chains and infrastructure projects hinders the efficient realization of opportunities. This is often the case within larger construction companies where different departments can work in silos unaware of the opportunity to share data and spot potential for the waste from project to be the input to another. Although data sharing is a common challenge across sectors, a resource platform to host resource data across the island of Ireland is recommended as an action for InterTradeIreland and its economic development partners to investigate further. Such a platform already exists in NI as is used by INI RMS and in IE some platforms are in development such as CMEx (Construction Materials Exchange). Data sharing across these platforms would enable the identification and realisation of cross-border synergies. This could be considered in the delivery of the Investment Strategy for Northern Ireland.

- In the UK International Synergies Ltd. and AECOM jointly convened a national Major Infrastructure Resources Optimisation Group (MIROG), consisting of representatives from major national infrastructure providers including HS2, National Grid, Network Rail, National Highways, Environment Agency Flood Defences, Heathrow Airport, Anglian Water and EDF Energy (Nuclear). The purpose was to mutually discuss resource requirements and material arisings from major projects and form links to allow arisings reuse. This model is one which could be replicated for the island of Ireland with InterTradeIreland bringing the respective organisations together.

SECTOR INSIGHTS

The term bioeconomy has been widely used in international policy and defined in several ways. The Irish National Policy Statement on the Bioeconomy 2018 defines it as a key facet of the circular economy that uses renewable resources such as crops, fisheries, and forestry to produce food, products and energy while reducing waste. Bioeconomy encompasses activities across multiple sectors, including agriculture, the marine, forestry, waste management, energy, and biopharmaceuticals. A sustainable bioeconomy encapsulates both traditional sources of raw materials and introduces non-traditional sources of alternative raw materials into feedstock streams for existing and future developed processes. When viewed as an aggregation of its composite sectors, the bioeconomy represents a substantial area of circular opportunity.

As sector opportunities are context-specific, the bioeconomy opportunities for the island of Ireland are disaggregated for analysis into component sectors. Agriculture & Fisheries and Food & Drink are the primary focus based on their relative contributions to the island of Ireland economy; a brief introduction to the circular economy in Bio Based Textiles and Paper Manufacturing is also provided.

BIOECONOMY: AGRICULTURE & FISHERIES

The Agriculture and Fisheries sector comprises the growing of crops, raising of animals, and fishing. Most GHG emissions arise from livestock methane and chemical fertilizers and pesticides use on crops. The Fisheries sector is responsible for only 1.7% of the overall emissions attributable to Agriculture and Fisheries, so can be considered a low carbon footprint industry in comparison. IE's fishing industry is predominantly located on the western seaboard and around southern and eastern harbour towns.
In 2021, the Central Statistics Office reports agrifood sector in total employed 170,400 people (including 100,875 in crop and animal production and 6.125 in forestry and fishing),[28] representing 7.1% of the total workforce across 135,000 farms, 2,000 fishing vessels & aquaculture sites and 2,000 food production and beverage enterprises. With 62% of IE's land area devoted to agricultural use (to NI's 77%), the sector accounts for 32% of IE's GHG emissions.

Table 13 DAERA Statistical review, 2022 on Agriculture, Forestry & Fishing[29]

DAERA Statistical review 2022	IE	NI
Agriculture as % GVA	1.0	1.9
Agricultural, Forestry & Fishing employment	96 000	19 000
Land area devoted to agriculture (%)	62	77
Farms (number)	135 000	26 000

Table 14 Agrifood sector data

Type of business: IE	Number of businesses	Number of employees	Market size
Raising of animals	83,160	178,793	€21b
Meat processing	136	11,157	€5b
Vegetable growing	1,177	10,448	€569m

Source: IBIS World[30]

[28] Department for Agriculture, Food and the Marine, 2022, Annual Review and Outlook for Agriculture, Food and the Marine.
[29] https://www.daera-ni.gov.uk/publications/statistical-review-ni-agriculture-2007-onward
[30] https://www.ibisworld.com/ireland/industry-statistics/

The NI agriculture and fishing sector contributes 1.9% of the total GVA, compared to IE's 1.0%. The sector employs 19,000 people in NI, dominated by dairy, pig and chicken farmers; 1,322 are employed full time in the fishing industry. IE is the main destination for live animal exports from NI, accounting for 54% of total sales.[31] Agriculture was responsible for 28% of NI's net greenhouse gas emissions (2021); sector emissions increased by 0.3 MtCO2e in 2021. Government carbon emissions targets in this sector focus on fleet efficiency improvements, electrification and zero carbon fuels, with no mention of waste arisings, recycling or recovery.

CIRCULARITY OPPORTUNITIES: AGRICULTURE & FISHERIES

The key resource flows for Agriculture & Fisheries have the following identified potential substitution opportunities and partner industries required.

WASTE ARISINGS

Waste arisings from the sector include a variety of animal byproducts (ABP), crop residues, manure, and packaging materials such as hard and soft plastics. Agriculture and Forestry generates around 60,000 tonnes of commercial and industrial waste per year in IE. 53,000 tonnes, or 7% of the total food waste in Ireland comes from the primary production of food, primarily from crops which are deemed of insufficient quality to be offered for sale. According to EPA statistics only around 2% of the agricultural and fisheries annual waste arisings comes from the fishing and aquaculture activities.

Table 15 Circular Opportunities, Agriculture & Fisheries

Resource	Alternative Supply / Use	Industry Partner	Alternative Supply Locations
Fertiliser (in)	Digestate, Filter cakes, Brewery waste	AD, Food & Drink Food & Drink	> 100 sites in NI, >50 in IE Many sites across the island
Crop residues/organic waste (out)	Waste to energy Raw material for brick, block, and tile Natural fibre inputs Synthesis into chemical and pharma precursors	AD Construction Textiles Chem & Pharma	Many sites across the island
Agriculture wrap (out)	Plastic recycling	Plastic recycling	>20plastics reprocessors in NI, >20 in IE
	Waste to energy	Energy	2 incinerators in IE
Manure (out)	Waste to energy	Waste to energy	> 100 sites in NI, >50 in IE
Eggshells/shellfish waste, Diesel, Animal Feed (out)	Calcium raw material Biodiesel Food Waste	Glass manufacture Energy Food & Drink	2 sites in NI, 14 in IE

[31] https://www.daera-ni.gov.uk/sites/default/files/publications/daera/23.24.051%20Stats%20Review%20Internal%20for%202022%20Final.pdf

Crop residues, organic waste and manure can all be used in Anaerobic Digestion (AD) plants to generate biogas which can be used after treatment in the gas grid or in a gas engine to produce electricity. The by-products of some biomass energy recovery technologies such as AD and pyrolysis are rich in plant nutrients (nitrogen, phosphorus, carbon, and potassium) and thus suitable for application in the agricultural supply chain or as the starting point for chemical and pharmaceutical raw materials. Biomass combustion ashes can reduce the requirements for fertilizer application. Pyrolysis as an energy technology solution also produces biochar which provides nutrients and improves soil carbon sequestration properties.

AD therefore can address the twin objectives of delivering a renewable energy source and an opportunity to close loops with the agricultural supply chain through digestate application. There are currently over 150 AD plants across the island with more planned on both sides of the border. Agriculturally based centralised AD plants typically use farm products (livestock manures and crops) as the main feedstocks, with other organic materials from food processing, for example. Centralised AD facilities can involve several farms within a estimated 10km radius. Normally digestate is distributed back to the supplying farms for fertiliser rich in plant nutrients, closing resource loops and reducing reliance on imports. Further options exist for biogas beyond Combined Heat and Power plants: NI is pioneering technology to produce liquid natural gas to allow the transport of fuel over a wider distance (Greenville Energy), and also breaking down methane into hydrogen to further valorise by-products.

Eggshells and shellfish waste from fisheries can be used to replace calcium-based raw materials in construction, and fish processing by-products can be used to generate a range of useful materials for cosmetics and pharma applications including proteins, amino acids, peptones, carotenoids, and collagen. In IE there are few significant AD, Mechanical Biological Treatment, Mechanical Heat Treatment or Advanced Thermal Treatment plants and just one combustion Energy from Waste plant. There are some Material Recycling Facilities but they have been focused on Refuse Derived Fuel production due to the rising landfill levy.

BIOECONOMY: FOOD & DRINK

The Food & Drink sector comprises the manufacture and processing of food and drink products and manufacture of fertilisers, pesticides and machinery that support the food production supply chain. With the policy drive to reduce food and drink waste volumes going into landfill, animal feed, AD and composting solutions dominate.

In 2020, according to data from the CSO (Central Statistics Office), Food & Drink Service Activities involved 15,370 enterprises in IE and supported 112,118 jobs.

From DAERA waste data, in NI 141,301 tonnes of biodegradable waste were sent to landfill during 2021/22, (an increase of 11.8% from the quantity reported in 2020/21), equivalent to 462KT CO_2e.

Table 16 Sector profile, Food & Drink, IE

Type of business: IE	Number of businesses	Number of employees	Market size
Spirits production	83	2,442	€1b
Beer production	153	1,259	€2b
Chocolate & Confectionery Production	65	1,579	€269m
Manufacture of Dairy Products	287	12,201	€6b
Bread & Bakery Goods	885	7,587	€914m

Source: IBIS World[32]

In NI the food and drink sector comprises around 600 companies worth over £5.4 billion and is the largest manufacturing sector at 39% of total manufacturing sales. The larger business concerns are found in dairy, meat (beef, sheep, and poultry) and spirit and beer production.

WASTE ARISINGS

Raw materials contribute up to 35% of all the beverage industry's GHG emissions and packaging contributes 23%. The main types of waste arising are biodegradable organic materials (e.g., spoilt food stuffs), filter cakes, chemical residues, liquid wastes (wastewater) and packaging materials. According to the EPA, IE generates approximately 1.1M tonnes of food waste annually (circa 500,000 tonnes from manufacturing), equivalent to 3.6MT CO_2e (CO_2 equivalent).[33] Only one third of this waste is collected.

[32] https://www.ibisworld.com/ireland/industry-statistics/
[33] Ireland's National Food Waste Prevention RoadMap 2022

CIRCULARITY OPPORTUNITIES: FOOD & DRINK

The table below sets out the resource substitution opportunities for the food and drink sector and their potential partner industries.

Table 17 Circular Opportunities, Food & Drink

Resource	Alternative Supply / Use	Industry Partner	Alternative Supply Locations
Oils and greases (out) (Animal and vegetable oils and fats)	Oil and grease Biofuel feedstock	Oil recovery Chemical / Renewable fuel production	7 sites in NI
Food waste (out)	Food donations Animal feed Energy recovery Compost Food Ingredients Chemical substitutes	Third sector Agriculture and farming Waste to energy (including AD & pyrolysis) Compost facility/Agriculture Food & Drink Pharmaceuticals	All locations 160 Waste to energy sites 300 composting sites
Filter cakes (out)	Fill materials Soil enhancer	Construction Agriculture	All locations
Chemicals (in)	Various. Primarily for use in lower grade applications such as pH correction in on site wastewater treatment plants	Metal Fabrication Power Plants	Yes
Cleaning materials (in)	Process cleaning	Chemical	
Packaging (in)	Recycled waste packaging Textiles Plastic alternatives	Various Textile sector R&D	All
Packaging (out)	Recycle / Reuse	Plastics reprocessor	>20 plastics reprocessors in NI, >20 in IE
Water (in/out)	Recycled water	Wastewater Treatment Plant Technology	-
Yeast and brewing Residues (out)	Phenolic compounds	Pharma and cosmetics	>150 pharma companies in IE

Anaerobic Digestion is a well- established technological solution for food waste and other organics in IE. The wide availability of suitable feedstocks due to the dominance of agriculture and clusters of food and drink processors provide an opportunity to create more energy from organic arisings. The use of farm wastes in AD can create significant cross-border opportunities, and most of the organic waste collected is currently exported to NI for processing and treatment. The number of AD sites in IE is planned to increase substantially over the next few years.

Fats, oils, and greases can be processed and either recovered for reuse or converted into biodiesel. Frylite Solutions (Co. Tyrone) are a significant company in this field.

Plastic, glass, and metal packaging can be recovered and recycled into new products or remade into new packaging. Both IE and NI have capacity for recycling: over twenty plastics reprocessors, nineteen metal recyclers in NI and twenty-two in IE, two glass manufacturers in NI and fourteen in IE.

BOX 10 IRELAND CASE STUDY, FOOD & DRINK

SymbioBeer is an EPA industrial symbiosis demonstration pilot, facilitated by Irish Manufacturing Research, between St. Mel's Independent Brewing Company and Panelto Foods, both in Longford town. St. Mel's Brewery experimented with various types of surplus breads from Panelto Foods seeking a substitute for malted barley that would not impact on taste. Having tested cooked dough as a substitute across their portfolio of beers, St. Mel's Brewery's pilot batches developed a new "bread to beer" recipe that they were able to produce at industrial scale – launching SymbioBeer Project No.1, a Belgian Style Golden Ale in December 2020. Rolling out cooked dough as a malted grain substitute across St Mel's portfolio of beers could deliver a potential annual reduction of 3% in carbon dioxide emissions.

BIOECONOMY: TEXTILES

NI has a rich heritage in textile and garment manufacture with linen and tweed; in IE textile manufacture is predominantly wool-based. The sector makes a modest contribution to the all-island economy with an estimated 500 companies across the island. As a result, the circular opportunities offered for this study are not currently replicable and scalable.

Globally, advances are being made in the use of a wide variety of bioeconomy residues to substitute for both synthetic fibres and energy/water intensive natural fibres such as cotton. The historic strong links between the Irish agriculture and textile sectors, and presence of both agriculture and textile clusters, may present an opportunity to explore and advance new inward investment opportunities for the required processing technologies.

Textile offcuts present an opportunity to work with the construction and automotive industries in the production of insulation materials, engineering, and manufacture in the form of absorbents and in agriculture in the provision of soil stabilisers and enhancers.

Table 18 Circular Opportunities, Textiles

Resource	Alternative Supply / Use	Industry Partner
Cloth offcuts / Roll Ends (out)	Engineering absorbants Insulation materials Stuffing materials. Craft projects Chemical Feedstock Waste to Energy	Engineering / Manufacturing Construction Automotive Textiles / Bedding Arts & Crafts Chemical production Waste to energy plant
Paper & Cardboard (out)	Paper & Card Production Toilet Paper Packaging Materials Waste to Energy	Paper Mill, Toilet Paper Production Packaging Production Waste to energy plant
Plastic Films (out)	Plastic Recycling Waste to Energy	Plastic Reprocessor Waste to energy plant
Hard Plastics (out)	Textile production	Textiles
Metals (out)	Metal Feedstock	Metal Recycling Metal Fabrication Cast Metal Foundry
Water (in/ out)	Process additive Process washing	Textiles, Food & Drink, General Manufacturing Engineering, Plastics
Solvents (in)	Waste solvent, Reclaimed solvent Waste to Energy	Chemical Engineering, Solvent recovery operation, Waste to energy plant or cement kiln
Textile fibres (in)	Agricultural wastes	Agriculture Bioeconomy wastes

BOX 11 NORTHERN IRELAND CASE STUDY: TEXTILES

Titanic Denim, a Belfast-based, luxury sustainable denim brand, uses reclaimed denim and textiles to craft their designs. The company not only gives a second life to discarded materials but also reduces demand for new raw materials. In a collaboration with Community Textile Recyclers (Comtex), a major textile recycler in IE, Titanic Denim has found a way to obtain materials in a cost-efficient manner that contributes to the reduction of textile waste, a pressing concern in waste management and environmental conservation. Collaboration with Comtex enables Titanic Denim to collect discarded denim garments quarterly, resulting in a significant annual cost saving and enabling reuse of materials that might otherwise be sent to landfill. The collaboration demonstrates a circular approach to resource usage, material sourcing, and waste reduction that delivers ecological responsibility and sustainable economic practicability and viability in the textiles industry.

BIOECONOMY: PAPER

As with textiles, the paper industry is not economically significant enough on the island to offer scalable and replicable circular opportunities as this time. Examples of alternative fibre sources include Huhtamaki in Armagh which adds 50% grass fibres into their recycled mix when producing packaging products such as egg cartons. Other opportunities exist to convert arisings such as paper sludge into biochar through pyrolysis technology, with application to agriculture and forestry land as a source of important nutrients. Paper sludge can also be supplied to the construction sector for use in the manufacture of lightweight block and brick.

Table 19 Circular Opportunities, Paper		
Resource	Alternative Supply / Use	Industry Partner
Ash (out)	Fill materials Bulking agents Cement substitute	Construction Products Construction Products Cement Manufacture
Chemical residues (out)	pH correction	Wastewater Treatment
Lime grits and sludges (out)	pH correction, Flocculant	Wastewater Treatment Wastewater Treatment
Sodium Carbonate (in)	pH correction, Process additive	Chemical Chemical Pharma Food & Drink
Paper & Card (in)	Recycled paper & card (office & packaging waste)	All sectors
Fibres (in)	Agricultural wastes	Agriculture Bioeconomy wastes

SECTOR SYNOPSIS: BIOECONOMY

- Bioeconomy opportunities are primarily centred around capturing food waste and crop residues which can return nutrients back to agricultural land and provide feed for livestock, and feedstocks for chemical, pharmaceutic, construction products and energy recovery. Both NI and IE have challenging targets for renewable energy generation. The bioeconomy sectors have waste resources and byproducts which can be readily converted into biofuels such as ethanol and hydrogen.
- Food safety standards are paramount and therefore the opportunity to realise waste-derived input substitutions are generally limited. However, many opportunities exist for the use of wastes and byproducts in other industries, such as SUP substitutions in packaging with starch derived materials, or protein and phenolic extractions as feedstocks for the pet food and pharmaceutical sectors. Other sectors that can benefit from the chemical and fibrous contents of bio-based residues are construction (in the manufacture of building materials such as bricks, blocks, and tiles) and textiles in expanding the options for natural fibres in garment production.
- Organic waste by its nature degrades quickly, therefore a reuse solution must be implemented to be realized. A facilitated support programme can add value in providing resources to assist businesses both side of the border to realise solutions quickly.
- Materials often have low bulk density (particularly crop residues) which can limit their commercial viability to travel distances to a point of need. This challenge can be addressed through facilitated support and/or the use of a resource matching platform. This will enable the match between industries to be made at the closest point of proximity to reduce haulage costs. Mapping on unmatched resources from a resource matching platform can also provide an evidence base to support inward investment of capacity to areas where feedstocks are available.
- Technology solutions for bioeconomy-sourced materials consist of some limited but well established technologies which have been proven at industrial scale. AD is widely used across the island of Ireland with a significant number of new plants planned by the end of the decade. Materials are travelling in particular from the South to the North to take advantage of the more developed

infrastructure although the least impactful and efficient solution is to improve infrastructure either side of the border to mimimise the distances required for materials to travel. Pyrolysis is a newer technology with lower capital costs, which besides providing further opportunities to return biodegradable matter back into the agricultural supply chain, also can provide a source of biofuel. Technology investment is required to extract the higher value elements from these biodegradable resources. Alongside its economic development partners, InterTradeIreland has a role to play in the development and promotion of technologies and either providing, or signposting, sources of grant funding to help SMEs offset development costs.

- Projects and networks on both sides of the border are realizing circular economy opportunity (e.g. AgriFood and Biosciences Institute and Circular Bioeconomy Cluster South West), in part due to InterTradeIreland's role as convener of the major players either side of the border to ensure the best application of resource, avoidance of duplication of effort, improved collaboration and knowledge sharing.

Sector: Advanced Manufacturing

SECTOR INSIGHTS

Advanced Manufacturing involves the use of innovative technologies such as Artificial Intelligence (AI), big data analytics, cloud computing, and 3D printing to improve products or processes. Advanced Manufacturing encompasses several subsectors including aerospace, polymers, materials handling, agri-engineering, automotive, renewable energy, and construction products. The sector itself is rich in small and micro-SMEs, with a wealth of young start-up businesses within more established larger organisations.

Reported data for the numbers of businesses in Advanced Manufacturing for IE has proven elusive. However, there are 260,000 businesses in the IE manufacturing sector, with 29% of these reported as being in high technology sectors.

INI identifies 2,200 businesses working in the advanced manufacturing space, worth £3.2 billion to the economy and employing 46,000.[34] The sector in NI has strengths in plastics and polymer research, composite design and manufacturing, precision manufacturing, materials handling, electronics, and off-site construction.

Carbon reduction in this sector focuses on electrification, which will lead to increased electricity demand. As buildings, transport and business and industrial processes shift from reliance on fossil fuels, there may be opportunities for onsite electricity generation from recovered materials (e.g. through pyrolysis). This could allow for a quicker transition from fossil fuelled electricity generation to renewable alternatives, as transitioning the whole energy sector will involve collaboration and engagement across government, industry, domestic and business energy consumers to deliver a secure, affordable, and clean energy system for all.

WASTE ARISINGS

The publicly provided data for the island of Ireland is not granular enough to identify individual streams that arise from Advanced Manufacturing. Our experience of working with the sector, however, suggests the following:

- The sector tends to generate small volumes of waste often containing high-value resource such as precious and rare earth metals.
- Composites are a particular problem for the sector, with materials containing ‘sandwiches’ of metals, plastics, carbon, and glass fibres proving a challenge to separate into their component parts.

[34] https://www.economy-ni.gov.uk/news/minister-highlights-importance-northern-irelands-advanced-manufacturing-sector

CIRCULARITY OPPORTUNITIES

The table below sets out the substitution opportunities for the major resource flows and the partner sectors required to increase circularity.

Table 20 Circular Opportunities, Advanced Manufacturing

Resource	Alternative Supply / Use	Industry Partner	Alternative Supply Locations
Acids / Polishing and etching sludges (out)	pH correction	Wastewater treatment	Over 1,000 sites across the island
Sand (out)	Aggregates Glass manufacture	Construction, Glass, ceramic fixtures	2 sites in NI, 14 in IE
Alkalis (out)	pH correction	Wastewater treatment	Over 1,000 sites across the island
Paint solvents (out)	Solvent reuse	Solvent recovery plant	
Paints (out)	Paint	Third Sector	
Metals (out)	Metal recycling	Scrap metal recycling / foundry	19 sites in NI, 22 sites in IE
Grinding Discs and other abrasives (out)	Cement production	Cement kiln	3 manufacturers in IE
Sandblast (out)	Metal recovery	Cast Metal Foundry	15 sites in NI, 12 in IE
Wastewater (out)	Metal recovery	Technology application	
Foundry Slag (out)	Aggregates	Construction	All
Minerals / Aggregates (in)	IBA, Foundry sands, filter cakes	Construction Metal Fabrication Wastewater filtration	
Wood (in)	Pallets, wood offcuts	Timber merchants Pallet suppliers Furniture Manufacture	23 wood recyclers in NI, 21 in IE
Wastewater (out)	Recycle / Reuse	Technology application	
Composites (out)	Recycle / Reuse	Specialist recycler	

The opportunities that present themselves within advanced manufacturing can be summarized as follows:

- Composite materials and the application of new technology such as pyrolysis, to segregate the resource into its component parts. This will allow the recovery of high-value metals and the creation of renewable energy streams from plastics and other degradable components.
- Moving away from SUP and oil-based plastics to sustainable bio-based equivalents such as starch-based packaging.
- Potential for shared services including water, water treatment, steam and electricity generation on site.

BOX 12 NORTHERN IRELAND CASE STUDY, ADVANCED MANUFACTURING

ENCIRC

The Encirc plant in Enniskillen provides a circular supply chain for glass production that minimises environmental and social impacts. As well as producing 100% recycled glass, Encirc is committed to reducing carbon footprints throughout its products' life cycle. Alongside industry body Glass Futures, Encirc has followed fuel-switch initiatives by using biofuel in its furnaces, creating over 200 new jobs and securing current positions.

SECTOR SYNOPSIS: ADVANCED MANUFACTURING

- Advanced manufacturing mobilises various high-value materials which makes it attractive for industrial symbiosis. Composite materials, and in particular carbon and glass fibres, present a technical challenge to recovery and recycling activities.
- As advanced manufacturing is still a relatively young sector in a period of growth, the main challenge is currently the small volumes of materials which present an opportunity for aggregation. Pyrolysis provides a solution to some of the more challenging composite materials arising from this sector and the sizing of the opportunity would benefit from some of the cluster mapping work already undertaken by InterTradeIreland (Mapping the Potential for All-Island Sectoral Ecosystems 2015). In NI the Makers Alliance could provide a conduit for engagement with advanced manufacturing businesses to aid the quantification of materials and aggregation opportunities, in line with its roadmap which includes aims 'for wider UK and RoI engagement.'
- Composite materials require separation into their component streams to allow reuse and recycling. In cases where no separation technology is known, innovation is required to enable reuse; furthermore, known separation technologies may not be commercially viable in all circumstances. This provides an area of interest and value to the all island R&D organisations, which InterTradeIreland and its partners can bring to the fore as part of the work with its already established cluster groups.
- Demanding technical specifications in some industries, such as aerospace, mean that recycled materials are unable to reliably meet quality standards. Reuse opportunities outside of sector then become key to reuse, once again strengthening the case for facilitation of cross-sectoral links and a resource platform to increase visibility.

Sector: Chemical & Pharmaceuticals

SECTOR INSIGHTS

The chemicals sector is made up of the manufacture of industrial chemicals and the conversion of raw materials into chemical products. The sector overlaps with the production of plastics. Digital transformation has been identified as essential to reduce carbon emissions in this sector., but focuses primarily on Scope 1 and 2 carbon emissions. As the circular economy reduces Scope 3 emissions, manufacturing agglomeration, a noted solution for carbon reduction, would be an ideal solution to reduce carbon across Scope 1, 2 & 3 emissions and allows for localised resource sharing and sophisticated circularity.

The sector comprises over 300 businesses in IE which employ over 7,000 employees and contribute over €110b to the economy. The bio-pharmaceutical sector includes 24 of the 25 largest biopharmaceutical companies in the world and exports €39b worth of products.

Table 21 Pharmaceutical sector data, IE

Type of business: IE	Number of businesses	Number of employees	Market size
Basic pharmaceuticals	105	4,414	€17b
Pharmaceutical preparations	186	22,982	€94b

Source: IBIS World[35]

In NI the pharmaceutical sector employs about 1900 employees in 100 companies. Most of the employees are concentrated in a handful of large indigenous pharmaceutical companies, notably Almac and Norbrook.

[35] https://www.ibisworld.com/ireland/industry-statistics/

WASTE ARISINGS

The lack of granularity in the waste data obtained for the island of Ireland means sector-specific resource data for the chemical and pharma sector is not available. ISL experience suggests the following waste challenges and opportunities will be present:

- The challenges with managing and classifying hazardous waste make it difficult to identify commercially viable circular opportunities
- End of use packaging waste is also a significant challenge to the sector with product residues limiting the ease of return and reuse of packaging containers.

CIRCULAR OPPORTUNITIES: CHEMICALS

Table 22 Circular Opportunities, Chemicals & Pharmaceuticals

Resource	Alternative Supply / Use	Industry Partner	Alternative Supply Locations
Wastewater (out)	Recycled water	WWTP technology	
Filter cakes (out)	Fill materials	Construction	All
Acids (out)	pH correction	Wastewater treatment Food & Drink Paper & card Manufacture	Over 1,000 sites across the island
Alkalis (out)	pH correction	Wastewater treatment Food & Drink Paper&Card Manufacture	Over 1,000 sites across the island Multiple sites
Organic solvents (out)	Solvent reuse	Solvent recovery plant	
Plastic drums (out)	Plastic recycling	Plastics recycling	>20 sites in NI, >20 in IE
Metal drums (out)	-Recycle/reuse	Scrap metal recycling	19 sites in NI, 22 in IE
Pallets (out)	-Recycle/re-use/ remanufacture	Wood recycling/Biomass/ Third Sector	23 wood recyclers in NI, 21 in IE

BOX 13 INTERNATIONAL CASE STUDY: CHEMICALS

BRENNTAG

Brenntag is the global market leader in chemical distribution. The German-based international company manages complex supply chains for both chemical manufacturers and consumers by simplifying market access to products and services. Brenntag UK & Ireland's history began in 2006 with the acquisition of Albion Chemicals in Belfast to supply the island of Ireland; Brenntag supply many products to businesses across NI from their Belfast base. Brenntag initiated a take-back scheme for certain containers such as IBCs (Intermediate Bulk Container) and 25 litre plastic drums as a service enhancement. Brenntag chose to work with Glenn Drum Recycling as they had a modern washing facility with both bespoke cleaning and pressure testing of the IBCs and drums from 1000L to 25L capacities. The collaboration led to the saving of 12.5t per annum of virgin material usage and over £80,000 cost savings annually.

SECTOR SYNOPSIS: CHEMICAL & PHARMACEUTICALS

- There are synergies requiring links to the bioeconomy regarding the potential for raw material input substitution especially when considering the move from oil-based precursors. InterTradeIreland and partner agencies can convene the Chemical, Pharmaceutical and Bioeconomy clusters to explore opportunities to develop these new business opportunities. Some of this work is already progressing in existing Bioeconomy clusters, so care is required to consult and ensure that duplication of effort is avoided.

- The material arisings from this sector are often classified as hazardous waste which makes their reuse and transport expensive and subject to additional legislative requirements. The best value and most likely route for success would be to use the Chemical & Pharma clusters as fora to sow the seeds of discussion by reinforcing the concept and getting the respective companies to explore collaboration opportunity. There is a case for sector-specific matching which could be convened through InterTradeIreland and its existing cluster work, and approaching INI to explore sector-focused work streams and workshops with the existing resource matching services in NI. Similarly, there are opportunities to collaborate with Enterprise Ireland to deliver similar outputs in Ireland.

- As with the bioeconomy, the end product of pharmaceutical manufacture is supplied into the human consumption supply chain, which places additional requirements for traceability and the need to have stringent technical acceptance and risk assessment prior to use. The REACH regulations have increased the requirements in this sector. Therefore, the need to explore cross sector opportunities comes to the fore, for instance into construction where traceability will not be a primary concern. This another example that reinforces the need for an independent facilitation body to be able to identify and progress these cross-sector opportunities.

- One of the most challenging aspects of applying circular economy principle to chemicals is the constantly evolving knowledge of the properties of chemicals and their hazards. For instance, it is not possible to assume that any virgin material put on the market and considered safe at that time can still be considered safe later in its life cycle.[36] This is a challenge that the sector itself is best placed to address, and a facilitation body could monitor and assist with (in line with the recommendations above).

[36] Croner-I, The circular economy and the chemical industry , 2019

Sector: Tourism & Hospitality

SECTOR INSIGHTS

Tourism is one of Ireland's most important sectors and vital to the Irish economy. In 2019 the industry was estimated to be worth €9.3 billion and supported 260,000 jobs across the island. In 2023 Accommodation and Food Service Activities sustains 57,000 jobs in 4,465 businesses in NI, 6.2% of the employed population. 4,325 of these businesses are SMEs. Hotels and Food Service generate around 80,000 tonnes of commercial and industrial waste per year in IE. In 2019 a total of 10.8 million overseas trips were made to Ireland, generating earnings of €6,867 million.[37]

WASTE ARISINGS

Resources used include food ingredients and technical equipment, water, and energy. Waste includes leftover food and processing, packaging, and structural waste (underutilised assets).

Table 23 Sector profile, Tourism & Hospitality, IE

Type of business: IE	Number of businesses	Number of employees	Market size
Hotels	2,114	56,292	€4b
Catering services	671	8,056	€398b

Source: IBIS World[38]

Although a priority sector for growth, with regard to circular economy the sector is more challenging due to the predominance of sole suppliers and micro size businesses. This means that individual resource flows may be small and therefore commercially unattractive to work with in isolation; aggregation and clustering presents an option to address this challenge.

The areas for gain would appear to be in addressing knowledge gaps within the sector, such as the avoidance of single use plastics and the potential to work with local social enterprises in the reuse and recycling of materials once they have reached the end of life within the sector.

[37] Tourism and Travel Quarter 4 2019 - CSO - Central Statistics Office
[38] https://www.ibisworld.com/ireland/industry-statistics/

CIRCULAR OPPORTUNITIES: TOURISM & HOSPITALITY

The table below gives a more detailed representation of the types of opportunity available for circular activity in the tourism and hospitality sector.

Table 24 Circular Opportunities, Tourism & Hospitality

Resource	Alternative Supply / Use	Industry Partner
WEEE (out)	Donations Reconditioning Recycling	Social Enterprises & community groups IT Service Providers WEEE recyclers
Food Waste (out)	Composting Energy Recovery	Compost facilities (incl. 'home' composting) Anaerobic Digestion Biofuel production
Textiles (out)	Garment & accessories Craft projects Absorbents Insulation materials	Garment manufacturers Social enterprises Manufacturers & engineering Construction supplies
Mattresses (out)	Metal recovery Fabric recycling 'Shoddy'	Metal recyclers Manufacturers of industrial wipes Waste to Energy
Furniture (out)	Donations Reuse (reupholster etc.) Wood recovery	Social enterprises / community groups Furniture recyclers Wood recyclers
Oils & Fats (out)	Recycle Energy recovery Biofuel production	Oil & solvent recovery AD, Cement, Chemical sector, biofuel production
Cans, Plastics, Paper & Card (out)	Segregation and recycling	Waste reprocessors
Oil Based Plastics (in)	Bio based plastics	Bioeconomy sector, Chemical sector
Paper & Card (in)	Digital media Recycled / FSC (Forest Stewardship Council labelled)	Advanced manufacturing

The Ellen MacArthur Foundation highlights several ways the hospitality sector can work in a more circular manner, case studies highlight several innovative restaurants in mainland Europe, including Nolla[39] in Denmark. Nolla pursues their goal of eliminating waste and minimising impacts in several ways, including procuring locally sourced produce, banning single-use packaging within their supply chain, procuring supplies based on recycled content and reuse potential, and replacing restaurant bins with composting machines whose compost is returned to their suppliers.

[39] https://ellenmacarthurfoundation.org/articles/the-role-of-restaurants-in-a-circular-urban-food-system

Hotels and accommodation could explore servitisation models of supply of goods such as bed linens, bathroom towels, furniture and also other building services such as lighting, heating etc. Here the option exists to sell the service the items provide, rather than the physical items themselves. This allows for the supplier to take back items, such as furniture and bed linen, once they reach their end of life and for these to be refurbished and reused or recycled into new raw materials. The Sustainable Hospitality Alliance provides a knowledge resource for the sector globally and is a signatory of the Global Tourism Plastic Initiative (United Nations). Hotels within the alliance, such as the Merrion Hotel in Dublin, are leading the way in sustainable and regenerative operations.[40]

Within the island of Ireland itself online support and guidance on sustainability is offered by organisations such as Tourism Ireland and the Irish Tourism Industry Federation (ITIC) in IE, with Tourism Northern Ireland providing equivalent services (including a sustainability toolkit) in the North.

BOX 14 IRELAND CASE STUDY: TOURISM & HOSPITALITY

RETURNR IRELAND[41]

In IE it is estimated that over 138 million pieces of single-use food packaging are disposed of each year over the lunchtime period alone. Following the principles of designing out waste and keeping resources in use, Returnr Ireland provides stainless-steel cups and containers which are manufactured with 70% recycled steel and recyclable to prevent the use of single-use takeaway packaging. It also provides reusable coffee bean canisters to reduce triple foiled coffee bean packaging.

Returnr Ireland is operational in more than 20 cafes and quick service restaurants across Ireland. Outlets charge their customers a deposit on the container. After use, the customer rinses and returns the container to any café in the Returnr network to get their deposit back.

SECTOR SYNOPSIS: HOSPITALITY AND TOURISM

Opportunities within the tourism and hospitality sector include:

- Textiles, such as bed linen and tableware, can be recycled into insulation materials, both acoustic and energy insulation, as well as used for creating new goods and lower value items such as spillage absorbents and engineering rags.
- Organic arisings, such as food waste, can be segregated and collected for AD. With small scale and micro-AD becoming more widespread there may be potential for hospitality venues to investigate its applicability for their own energy generation requirements. Proprietary equipment is available to process food waste from hotels and larger catering establishments.
- Resource flows in the hospitality and tourism sector are often small in volume; aggregation and clustering are vital to realising opportunities in this sector, which places an additional cost and management burden on a sector led by SMEs.
- Existing clusters, such as Causeway & Glens (NI) and South Kerry Development Partnership (IE) may be used to pilot circular economy projects. Due to the high number of small businesses and sole traders, materials aggregation through clusters would appear an efficient way forward.
- There are opportunities for improving knowledge within the sector around circular options. Sustainable transport options include hydrogen and ELVs. Moving from single use disposable packaging to bulk reuseable packages, for instance in bathroom toiletries, and moving marketing materials and event materials to digital-based solutions.
- Moving to local supply chains reduces haulage miles and provides closer proximity opportunities to close loops in the supply chain (such as composting food waste and returning to growers)
- Convening small businesses to share best practice and innovative ideas will require tapping into existing networks and supply chains.

[40] https://sustainablehospitalityalliance.org/the-merrion-hotel-joins-alliance/
[41] https://wks.circuleire.ie/public/site/resource-library

Part 3: Enabling SMEs

The experience of the Invest NI Resource Matching Service (RMS) has provided insight into some of the challenges and requirements in delivering cross-border circular economy opportunities. The RMS provided examples of seven cross-border synergies that delivered £60k of costs savings, £200k of additional sales and 5k tonnes of CO2e reduction. Resources included a wide variety of plastics and textiles, with one synergy between Survitec and Mamukko resulting in polyurethane offcuts from life rafts and life belts being turned into messenger bags and sold into the high-end fashion market. The RMS-facilitated opportunities were identified through collaboration with SMILE, an equivalent support programme in IE 2008-2017, or by IE companies attending RMS workshops attracted by the benefits that could be realised.

ENABLING SMALL AND MEDIUM ENTERPRISES

Given their overall proportion of businesses on the island, SMEs are indispensable for transforming linear wasteful linear economies into circular ones. Although their impact may be small individually, SMEs are highly relevant collectively. On a global scale SMEs make up around 90% of total businesses and contribute to over 50% of total global employment according to World Bank statistics. Around 99.8% of businesses in IE are classed as SMEs and 99.9% in NI. It is essential therefore, to understand awareness among the SME community in NI and IE about the circular economy, and the particular challenges they face in taking up specific circular economy opportunities across the island.

The density of SMEs within the all-island economy makes them of particular importance in delivering the objectives of Net Zero (NZ) carbon emissions through improved resource efficiency. However, SMEs are under time pressure to fulfil daily operational activities, have limited budget to invest, and limited resources available to them in terms of infrastructure, personnel or skills to act on new opportunities.

Time: SMEs in particular are often time constrained, focused primarily on the day to day running of their businesses and often viewing circular activity as a “nice to have”. Time constraints to evaluate and implement changes to processes to become more circular are another common barrier, and one which was at the forefront of stakeholder feedback. The typical situation encountered in an SME is that one individual fulfils multiple roles and responsibilities, whereas in larger organisations a dedicated individual, or even a team, has responsibility for delivering resource efficiency and carbon reduction.
The perceived time investment in completing the required transfer paperwork, particularly if cross border movements are involved, and the bureaucracy of EOW are other disincentives to using waste-derived inputs over their virgin material counterparts.

Finance: Although many steps in becoming more circular are no- or low- cost, where capital investment is required the availability of finance and shorter pay back periods often required by SMEs become a challenge. This may mean the required investment in technology, personnel, innovation and business infrastructure cannot be justified. Identifying and accessing support funding may be intimidating to the SME community, along with understanding and fulfilling the requirements of the application process and conditions of funding.

Infrastructure: Infrastructure challenges relate to the cost and/or availability of suitable technology to process secondary materials for their reuse in a manufacturing process. If the waste alternative to replace virgin materials requires pre-processing to make it technically suitable for use, then knowledge of commercially viable options is required.

Knowledge & Skills: An SME’s ability to realise circular opportunities may be negatively impacted through the lack of skills and knowledge of the benefits of switching to a circular economy and its positive contribution to the bottom line.

Also evident in the knowledge and skills gap is addressing cross-sector working. ISL's delivery experience has evidenced that the majority of opportunities to share resources occur outside one's sector (with the notable exception of construction). This presents a barrier to companies who don't have contacts and networks typically outside their own sector. This lack of visibility means they have no idea how their waste could be used by another company, or what alternative inputs could be available to them.

Scale: SMEs consume and produce smaller volumes of resources than their larger counterparts. The commercial case for individual business opportunities viewed in isolation may require clustering and aggregation to create a viable commercial case.

SME RESOURCE EFFICIENCY STATUS - SURVEYS

The 2022 Eurobarometer - SMEs, resource efficiency and green markets survey and the 2023 FSB Northern Ireland Business Survey - Wave 2 offer an overview of the resource efficiency actions adopted, and barriers to adoption, by SMEs within the EU, UK, and IE. Both surveys were conducted with the same questions and response options. The surveys were conducted 1 year apart, during which time the energy crisis and supply chain difficulties arising from the war in Ukraine may have impacted responses. The Tables below provides an overview of the data on resource efficiency actions and perceived barriers to acting on resource efficiency.

Table 25 Top Resource Efficiency Actions taken by SMEs

Q. What actions, if any, is your company undertaking to use its resources more efficiently?

Survey	Eurobarometer 2022			Analysis		
Survey Size	13,343	484	459	EU	IE	UK
Answers	EU	IE	UK	Rank	Rank	Rank
Minimising waste	64%	50%	75%	1	2	1
Saving energy	61%	38%	63%	2	3	3
Saving materials	57%	21%	54%	3	5	4
Recycling, by reusing materials or waste within the company	47%	52%	74%	4	1	2
Switching to greener suppliers of materials	33%	29%	47%	5	4	5

SMEs in IE and UK are minimising waste and recycling by reusing materials or waste within the company; both actions are aligned with investments in programmes such as SMILE (IE) and RMS (NI) that support waste reuse through industrial symbiosis; notably Europe ranks this activity lower than both IE and the UK more generally. In both IE and UK, saving materials and switching to greener suppliers of materials are the least actioned of the 5 choices presented.

Table 26 Top Barriers for SMEs taking Resource Efficiency Action

Q. Did your company encounter any of the following difficulties when trying to set up resource efficiency actions?

Survey	Eurobarometer 2022			Analysis		
Survey Size	13,343	484	459	EU	IE	UK
Answers	EU	IE	UK	Rank	Rank	Rank
Complexity of administrative or legal procedures	34%	9%	15%	1	4	5
Cost of environmental actions	27%	22%	26%	2	1	2
Lack of supply of required materials, parts, products or services	24%	21%	28%	3	2	1
Lack of specific environmental expertise	23%	8%	24%	4	5	3
Difficulty in choosing the right resource efficiency actions for your company	21%	12%	16%	5	3	6
Lack of demand for resource efficient products or services	20%	9%	23%	6	4	4

The data on challenges faced by SMEs across IE and UK reveals a consistent response that the two most encountered barriers to trying to set up resource efficiency activities were cost of environmental actions, and lack of supply of required materials, parts, products or services. Policy makers and support organisations in IE and NI may choose to tailor their strategies and support mechanisms according to these identified barriers, focusing on financial aids and supply chain robustness in IE and enhancing the supply chain and expertise in NI.

A common misconception is that becoming more circular requires businesses to tear up their existing models. Improvement can also be made by embedding resource efficiency measures into existing business models, positively impacting the bottom line and the environment, actions that are more readily understood and easily adopted by the average SME. Provision of targeted support and a skilled resource being made available to SMEs is possible through existing mechanisms such as ERDF through Smart Specialisation in IE, and the UK Prosperity Fund.

Part 4: Recommendations

Throughout the report specific opportunities have been identified for intervention to foster the circular economy across IE and NI. The main overarching recommendations are:

- Raise awareness across the various stakeholders through strategic communication
- Empower SMEs to take action themselves through training and information
- Enable their actions by providing support in specific forms: expertise, data transparency, and investment
- Foster a consistent integration of the circular economy within SMEs across NI and IE through a robust, collaborative approach and policy alignment that transcends regional boundaries.

Recommendation 1: There is a need to raise awareness across audiences (government, industry and its representation, education and training bodies) of the concept of circular economy in jargon-free terms, and use case studies and examples to communicate the business benefits possible through its implementation

Awareness and comprehension of circular economy are important motivators for stakeholders to act on circular economy opportunities. Interviews conducted as part of this research project underscore the importance of effectively communicating the proven business benefits of circular economy to SMEs: cost savings, profitability, improved competitiveness, reduced supply chain risk, additional sales and new markets, and innovation

- Government departments and trade associations can inform SMEs of the relevant legislation and government strategies, especially cross-border. Simplify messaging (avoid jargon) to ensure accessibility for SMEs. Resource efficiency and cost reduction are well received and well understood, whereas circular economy and sustainability are not yet as well received.

Awareness campaigns targeting SMEs can make the business case for circular economy adoption by illustrating the business advantages to circular economy principles aligned to SME priorities. These should highlight the financial benefits of the circular economy, particularly where resources and waste management are concerned, and demonstrate how innovative practices can open opportunities in new markets, products, and services, helping businesses stay competitive amidst evolving consumer demands for sustainable offerings. This should be balanced with support that informs SMEs of the relevant legislation and government strategies, and the implications for circular economy related trade.

- Build awareness among policy makers and businesses of the connection between Net Zero, Climate Change and Resource Efficiency. Host a webinar/seminar inviting experts such as CREDS. Disseminate via trade, sector associations, business networks, and chambers of commerce and industry.

More work needs to be done to increase awareness among both policymakers and industry about the potential of circular economy to reduce Scope 3 carbon emissions and deliver net zero targets. Research conducted by the Centre for Research into Energy Demand Solutions (CREDS) at Oxford University in 2018 concluded that resource efficiency measures had the greatest potential to deliver carbon mitigation. For this reason, the focus should be on circular economy opportunities to close material loops, a strategy that is accessible for most SMEs.

- Government departments and trade associations can draw on success stories and best practice that SMEs can relate to and, in some cases, easily adopt or seek their own innovative circular economy solutions. Source case studies from existing programmes and networks involved in supporting circular economy activity in each jurisdiction.

Success stories and examples of best practice make abstract concepts relatable to SMEs, encouraging them to adopt, adopt, or innovate their own circular economy solutions. Facilitators, including the INI RMS and IE SMILE can provide success stories. The NI Resource Network (NIRN) and INI RMS offer networks and platforms where businesses can access resources, knowledge, and opportunities to integrate sustainable practices into their operations. Existing networks and membership organisations such as the Federation of Small Businesses, the Small Firms Association, the Re-discovery Centre & CirculEIRE, Business in the Community NI and IE, all have dedicated digital resources and teams that can signpost SMEs to additional financial or strategic support to adopt circular economy practices.

- Existing network membership organisations (e.g, trade associations and chambers of commerce) can align communications to facilitate knowledge exchange, collaborative initiatives, and unified advocacy for regulatory adaptations, enhancing both environmental and economic sustainability.

Consistent communications with trade associations and chambers of commerce facilitate knowledge exchange, collaborative initiatives, and unified advocacy for regulatory adaptations. Stakeholders support engagement via digital channels and events to help address SME time pressures while providing access to informative webinars, disseminating knowledge on waste minimisation, resource efficiency, and innovative sustainable practices. Organisers of prominent events like the Balmoral Show in NI or the Tullamore Show in IE can support with digital tools to reach a broader audience of SMEs who may not be attending in person. This broader outreach alongside industry-specific sustainability events such as the Irish Chamber of Commerce Sustainable Business Awards in IE or the All- Ireland Sustainability Awards in NI, provides a stage to showcase success stories and the opportunity to access support networks.

Recommendation 2: There is a need for governments and training providers to collaborate to empower SMEs through skills development and training, building familiarity with circular economy opportunities, policy and regulatory requirements.

Stakeholders emphasised the need to address industry-specific challenges for SMEs, and underscored the importance of empowering SMEs to make changes that realise the benefits of the circular economy. Each industry sector brings unique hurdles and opportunities in the adoption and implementation of circular economy principles, whether in managing waste, exploiting renewable resources, or innovating more sustainable processes.

- Educational and professional institutions can increase focus on circular economy skills development in vocational and educational training, such as that being developed by the European Commission ERASMUS+ SPIRE SAIS project. These initiatives could be considered by local and national authorities in NI and IE to address circular economy-related skills deficits, stimulating innovation and productivity.

Government training support programmes can facilitate educational initiatives to build circular economy skills, drawing on existing vocational and educational circular economy tools. Linking with, and scaling up, existing support mechanisms would provide a route to market for any educational initiative.

- Trade sector associations can address sector-specific concerns, such as regulation and standards, specific supply risks, technology and innovation through sector-specific strategies and communications.

Engaging trade and/or sectoral associations would help to address sector-specific concerns. Recognising the individual challenges allows for tailored educational and support strategies that directly address the specific needs and operational modalities of SMEs in different sectors.

- Government bodies responsible for strategies at the educational, post-graduate and vocational levels can liaise with vocational and educational trainers and regulators to design training that demystifies the regulatory landscape, including EOW and TFW requirements. Trade, sector, cluster and membership organisations representing the target sectors can liaise to roll out training to target industry sectors.

- The regulatory landscape, particularly End of Waste and Trans-Frontier Waste requirements, present a barrier to SME uptake of circular principles. Training and advice on regulatory issues such as waste categorisation and licensing would allow them to benefit from secondary materials markets. Meeting TFW requirements is perceived as particularly difficult; the INI RMS demonstrated that companies will seek resource solutions domestically before considering a cross-border option. Companies report preferring a more distant domestic source to a more proximate cross-border supply due to this perceived barrier. Because of its long-term relationships with cluster managers across the island, InterTradeIreland could provide support at the cluster/network level; however, other agencies and departments with direct responsibility for enterprise and the environment will have a more significant role to play.

Recommendation 3: There is a need to encourage implementation by providing free support to business. Consideration should be given to use of a resource matching platform for data transparency and how to boost investment in innovation and infrastructure.

SMEs are under time pressure to fulfil daily operational activities, have limited budget to invest, and limited resources available to them in terms of infrastructure, personnel or skills to act on new opportunities. Expertise and facilitation is paramount to ensuring uptake of cross-sectoral collaborative opportunities and non-traditional supply chains among SMEs.

- Relevant government departments should consider establishing a cross-border collaboration between programmes supporting industry waste avoidance (such as NI's Resource Matching Service) to realise additional impact through cross-border resource reuse opportunities, foster eco-innovation and a long-term culture of reuse.

Current cross-border material flows are predominantly company to waste processor flows such as biodegradables and plastics, driven by a lack of suitable infrastructure in IE to reprocess them. These reprocessing markets and technologies are well-established and visible in the marketplace to customers. The broader circular reuse opportunities, as presented above and described in Part 2, require facilitation to identify and advance the circular economy opportunities.

- Relevant government departments could incentivise cross-border synergy realisation and strategic alignment between business support activities through impact metrics for existing and future support programmes.

- Relevant government departments could build critical mass of support through cross-fertilising existing support platforms in NI and IE, including the NI Resource Network, Federation of Small Businesses, Invest NI Resource Matching Service (RMS), Small Firms Association, Business in the Community NI and IE, Chambers of Commerce, CircuIEIRE and the Re-discovery Centre to gain scale/critical mass for circular economy awareness and support. InterTradeIreland and its partners could convene representatives of these programmes to enhance interdepartmental and inter-jurisdictional collaboration to align objectives, share data where appropriate and focus on impact.

Stakeholders expressed a need for localised circular economy support aimed directly at SMEs because often proximity to support is a challenge to SMEs. In IE, the Local Enterprise Offices, Enterprise Ireland, and Skillnet Ireland, offer sustainability supports. For instance, the LEO Green for Business programme offers assistance to enhance cost savings, improve resource efficiency, reduce environmental footprints and greenhouse gas emissions, while fostering improved corporate image, customer access, and bolstering resilience against climate change impacts. In NI, collaboration with local councils and enterprise centres would provide similar local access to circular economy support for SMEs such as through the Belfast City Council, City for Growth programme. This programme provides advice and mentoring aimed at building business resilience and catalysing innovation, offering support for business growth and sustainability, business planning, improvement, and efficiency. Through strategic collaboration with and support for local activities, government departments can add further value to existing

supports that SMEs are already accessing at the local level across IE and NI.

Data transparency: Improving visibility of available resources, be they materials, logistics, expertise or manufacturing capacity, is necessary to drive circular business opportunities.

- Governments supporting circular economy programmes should consider adding an all-island resource matching platform (such as that used by the INI RMS, SYNERGie®) to their offer, increasing the visibility of resources and technologies to businesses, and hosting supporting information such as industry sector and resource specific case studies

The INI RMS has a resource matching platform software called SYNERGie® that visualises available resources and technologies, and providing company direct access is currently under consideration. A secure platform for data sharing can allow participating companies to be verified but remain anonymous until the point at which they wish to make a deal on a particular resource with another company.

- Regulators in both jurisdictions can align data reporting requirements to produce a holistic view of material and waste movements across the entire island, informing implementation and strategy.

Transparent, accessible, and consistent data requirements across both NI and IE would greatly enhance the adoption of an all-island circular economy. Aligning data requirements on either side of the border would facilitate a holistic view of material and waste movements across the entire island. Currently governments lack visibility on imported and exported resources which could harbour extended value.

- Secondary raw materials in particular lack visibility compared to their primary equivalents, including their industry sources and technical suitability. Regulators can align waste reporting with listing on a resource matching platform to bring visibility and credibility to secondary raw materials.
- A resource hosting platform can provide the visibility businesses need to search for resources in close proximity to their own sites. The proximity of resources from the point of generation to the point of need is a key commercial consideration. Some materials by their nature and inherent value, such as metal rich materials, will travel further distances that materials of low value or bulk density such as construction waste or polystyrene.

With construction clusters present in both Belfast and Dublin, there is an opportunity to address some of the challenges associated with successful incorporation of industrial symbiosis into construction project scheduling. An opportunity may exist to create material hubs in central locations to serve multiple projects in the construction corridor between the two cities, potentially in collaboration with the Dublin-Belfast Economic Corridor.

Investment: The need for further financial incentives and programmes to assist SMEs to action the circular economy is highlighted by stakeholders and evidenced by the European Commission's Eurobarometer survey of SMEs 2022.

- Government's continued support for mechanisms that provide tangible resources, mentors, training, and direct support to SMEs will support further circular economy implementation. Examples in IE include The Circular Economy Fund, Innovation Grant Scheme, and The Circular Economy Programme, to provide monetary aid and structured support for circular economy practices among SMEs. Enterprise Ireland offer Green Plus grants, Climate Action Voucher, and various Research , Development and Innovation Supports as listed in the Whole of Government Circular Economy Strategy 22-23." In NI, entities like the Invest NI Resource Efficiency team, Innovation team, and R&D team support SMEs. Existing SME support initiatives include the RMS and Resource Efficiency Grants, along with funded consultancy and R&D and Innovation support.

Collaborative funds such as the Shared Island Initiative for more joint circular economy projects were raised frequently with stakeholders. These funds could be used with priority sectors to support wider ambitions for a transition to a circular economy and amplify its potential impact due to the potential for cross sectoral innovation.

Infrastructure: Stakeholders noted a clear imperative to augment recycling and waste management capacities within the national infrastructure of both NI and IE to enable access to high quality secondary resource flows and reduce the export of valuable resources in the form of waste. InterTradeIreland and/or other relevant economic development actors, should consider commissioning a study on all-island infrastructure to identify investment needs and propose best routes to implementation

Enhanced recycling capabilities unlock economic opportunities by transforming waste into valuable resources. A symbiotic approach between NI and IE, centring on the integration of advanced recycling technologies and development of efficient waste management systems could significantly elevate the collective sustainability agenda by leveraging economies of scale in waste flows to make the infrastructure investment viable.

Recommendation 4: Relevant stakeholders should collaborate to agree how they can foster a consistent integration of the circular economy within SMEs across NI and IE through a robust, collaborative approach and policy alignment that transcends regional boundaries. Consideration could be given to funding a dedicated resource to enable this to happen on an all-island basis

Rationale: Disparities in policy, legislation, and strategic approaches between IE and NI pose challenges for SMEs across the island. These challenges include navigating different rules on each side of the border, inconsistent administrative requirements and incentives, and a lack of clear information. The hurdles are particularly daunting for SMEs engaged in cross-border operations and managing both IE and NI requirements. Robust local supply chains reinforce the economic and environmental strength of a region, while curbing the carbon footprint associated with logistics. Local supply networks deliver the dual advantages of enhanced resource security and reduced environmental impact. With access to a strong local supply chain SMEs can develop sustainable practices, where resources circulate more efficiently, waste is innovatively repurposed, and regional economies are bolstered through local supply chains. The strategic interlinking of local supply chains and collaborative inter-regional initiatives mutually support a more resilient, resource-efficient economy in NI and IE.

The integration of the circular economy within SMEs across NI and IE necessitates a robust, collaborative approach that transcends regional boundaries. An example of this approach is the collaboration between Belfast City Council and Dublin City Council to develop a Dublin to Belfast Economic Corridor. The ongoing feasibility studies from the Economic Corridor are identifying pathways for cross-border collaboration, economic activities and knowledge sharing. Furthermore, through business surveys and service reviews, councils can ensure that policies and initiatives are rooted in the real-world needs and challenges faced by SMEs. The EuroCities Network is an exemplary model of how partnerships can elevate collective capabilities; cities across Europe are sharing practices on achieving net zero. These inform policies that enhance the adoption of the circular economy. This inter-council collaboration, synthesising opportunities, knowledge, and resources, can effectively catalyse and sustain the transition of SMEs into a more circular, sustainable operational paradigm, embedding circular economy principles into the business fabric of the island.

Key opportunities for an integrated approach to the circular economy include:

- A cross-border forum with private and public sector representation to break silos across borders and sectors, build relationships, and provide consistency for businesses. Engagement across departments and areas (economy/industry, environment, skills and innovation) would build appreciation of the synergistic opportunities for coordinated investment and incentives.

- Relevant government departments in both jurisdictions can develop and align to a single, all-island comprehensive circular economy delivery plan that ensures to the extent possible alignment of strategy, metrics and incentives. Both jurisdictions currently share the European Commission framework, which provides a starting point for a single framework to assess success along agreed metrics. This work may be informed by the cross-border forum described above.

- End of Waste (EOW) is needs revision in both IE and NI to remove perceived and actual barriers to waste reuse. Revising EOW licensing would improve flexibility and responsiveness, aligning processes between jurisdictions. This would enable SMEs to more fully embrace the opportunity to designate their surplus resources for reuse and stimulate the secondary materials market across both jurisdictions.

- Secondary materials can be a more expensive option than primary materials. National policy has a part to play in bridging the economic gap between primary materials and their secondary equivalents, using instruments such as the UK's aggregate tax. These market forces disincentivize circular economy opportunities for reuse.

Given its unique all-island role, InterTradeIreland is strongly placed to convene and connect the relevant organisations, accelerating both the business opportunities and the delivery of net zero targets.

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