2025

UCC
Coláiste na hOllscoile Corcaigh
University College Cork, Ireland

Towards an Intersectoral All-Island Network for Circular Bioeconomy Entrepreneurship

IRC NEW FOUNDATIONS REPORT

DR. ORLAGH REYNOLDS, UNIVERSITY COLLEGE CORK

Acknowledgements

This project was funded by the Irish Research Council under the New Foundations funding scheme.

The partner organisations were the Agri-Food and BioScience Institute (AFBI) and Ulster University. With thanks to AFBI advisor Chris Johnston and Ulster University advisor Professor Phil Jordan.

Thank you to Eddie Ferns for research assistance provided on this project.

We are grateful to the interview and workshop participants for their time and insights.

Contents

Executive Summary

This report presents findings from an all-island study exploring opportunities, challenges, and collaborative pathways for inclusive circular bioeconomy entrepreneurship. Funded by the Irish Research Council under the New Foundations scheme and developed in partnership with the Agri-Food and Biosciences Institute (AFBI) and Ulster University, the project supports policy development for an inclusive and sustainable bioeconomy transition aligned with key national and EU priorities. Findings are based on 15 interviews and an intersectoral workshop with circular bioeconomy entrepreneurs working across Ireland. Despite policy commitments in both jurisdictions to enhanced entrepreneurial action, significant challenges remain.

Key Findings:

- **Collaborative Potential:** There is a strong ethos of collaboration and mutual learning throughout Ireland. Entrepreneurs cited national networking events, EU policy alignment, and shared natural resources as motivators for cooperation.
- **Challenges to Integration:** Policy divergence, particularly post-Brexit, negative media framing (especially of bioenergy in NI), and lack of shared terminology hinder deeper cooperation.
- **Entrepreneurship & Job Creation:** High-value opportunities exist in marine resources, bio-based compounds, and regenerative agriculture. Entrepreneurs value EU and national funding schemes, but note high startup costs, regulatory rigidity, and international competition as barriers for current and potential circular economy entrepreneurs.
- **Just Transition:** While supportive policy frameworks exist in ROI (e.g., Project Ireland 2040, Our Rural Future), entrepreneurs in NI flagged limited policy engagement and a need for targeted skills development. The risk of leaving rural communities behind remains unless inclusive economic models are prioritised.

Key Recommendations:

1. Continued focus on circular bioeconomy in Shared Island Initiatives to align circular bioeconomy strategies across jurisdictions and reduce fragmentation.
2. Increase all-island networking and demonstration events with dedicated support for SMEs, farmers, and early-stage entrepreneurs.
3. Promote inclusive entrepreneurship by investing in education, training, and rural infrastructure aligned with Just Transition goals.
4. Enhance public awareness through targeted campaigns to build a common understanding of the circular bioeconomy.
5. Streamline access to funding by reducing bureaucratic barriers and supporting navigation of incentive schemes.

Introduction

The circular bioeconomy aims to create a system where biological resources, such as plants, animals, and microorganisms, are managed and utilized in a way that maximizes their value while minimizing waste and environmental impact (Marshall et al., 2022). It has a significant role to play in addressing multiple SDGs such as SDG 8: Promote inclusive and sustainable economic growth, employment and decent work for all, and SDG 12: Ensure sustainable consumption and production patterns. In a circular bioeconomy, resources are used efficiently and regenerated through natural processes, ensuring that they can be reused and recycled within the economy. This approach not only helps in reducing dependency on fossil-based, non-renewable resources, but can also lead to more sustainable and resilient economies. Key sectors involved in the circular bioeconomy include agriculture, forestry and aquaculture as well as industries that rely on bio-based materials such as food, bioenergy, and pharmaceuticals.

As Ireland's circular bioeconomy grows, InterTrade Ireland in Northern Ireland and key circular bioeconomy bodies in the Republic of Ireland such as the Irish Bioeconomy Foundation have called for better collaboration to achieve economic and environmental priorities. Both ROI and NI have strengths in biomass availability but differences in uptake and subsequently differences in opportunities for entrepreneurship. This research aimed to investigate these differences, examine how to leverage learnings from both, and enhance current understandings of and opportunities for circular bioeconomy entrepreneurship across the island of Ireland. It also brought key stakeholders together in the development of an all-island intersectoral collaborative network for circular bioeconomy entrepreneurship.

These topics were examined through a literature review as well as interviews and a workshop with multiple circular bioeconomy stakeholders. The workshop began the establishment of an intersectoral all-island network which will provide a basis for future all-island collaboration on circular bioeconomy entrepreneurship. This report outlines findings on the challenges of and opportunities for all-island collaboration, entrepreneurship, and a just transition. We present key recommendations for business, policymakers and other stakeholders.

Collaboration in Ireland's All-Island Circular Bioeconomy

Major decisions by the Government of Ireland and the Northern Ireland Executive on climate action and sustainable economic development will be required in the coming years. The Government of Ireland aims to position Ireland as an EU leader in the Circular Economy by 2030 (Department of Public Expenditure and Reform, 2021). Such ambition is also a feature of NI's Circular Economy Strategic Framework, and the Department of Agriculture, Environment and Rural Affairs Innovation Strategy 2021-2025 points to transformation of the bioeconomy as a key priority (DAERA, 2021). NI's Programme for Government also acknowledges the importance of embedding an entrepreneurial culture across society, and that collaboration is key to doing this successfully.

In ROI, throughout the Shared Island dimensions of the National Development Plan 2021 – 2030, all-island collaboration is cited as a key mechanism for sustainable recovery and development (Department of Public Expenditure and Reform, 2021). This includes strategies for enhanced circularity across sectors and supply chains, implementation of bioeconomy principles, and support for sustainable enterprise development. In the Government of Ireland Shared Island Dialogue Series discussion 'Building back together: Economic recovery on a shared island' it was stated that "many entrepreneurs do not instinctively look cross-border for growth opportunities" despite the potential this holds (Department of the Taoiseach, 2021).

Research conducted by the Irish Bioeconomy Foundation and InterTrade Ireland mapped bioeconomy activity across the island of Ireland in order to identify companies that have overlapping value chains and examine how a circular production chain can be formed to enhance collaboration, reduce waste and increase sharing of by-products between relevant companies (Irish Bioeconomy Foundation, 2024). Figure 1 illustrates the resulting interactive map demonstrating the extent of all-island bioeconomy activity.

Figure 1. Biomap. Adapted from Irish Bioeconomy Foundation and InterTrade Ireland (2024.

Additionally, researchers at Teagasc created a social network diagram of the key actors and institutions involved in the Irish bioeconomy, and cooperation between them (Harrahill and Macken-Walsh, 2020). Figure 2 illustrates the range of sectors involved across the island of Ireland, and the varying degrees of interconnectivity. Overall, it is clear that leveraging resource strengths across the island of Ireland and enhanced cooperation can help Ireland set an example of ambitious leadership on these shared priorities. New knowledge on how we can work together in this regard is required.

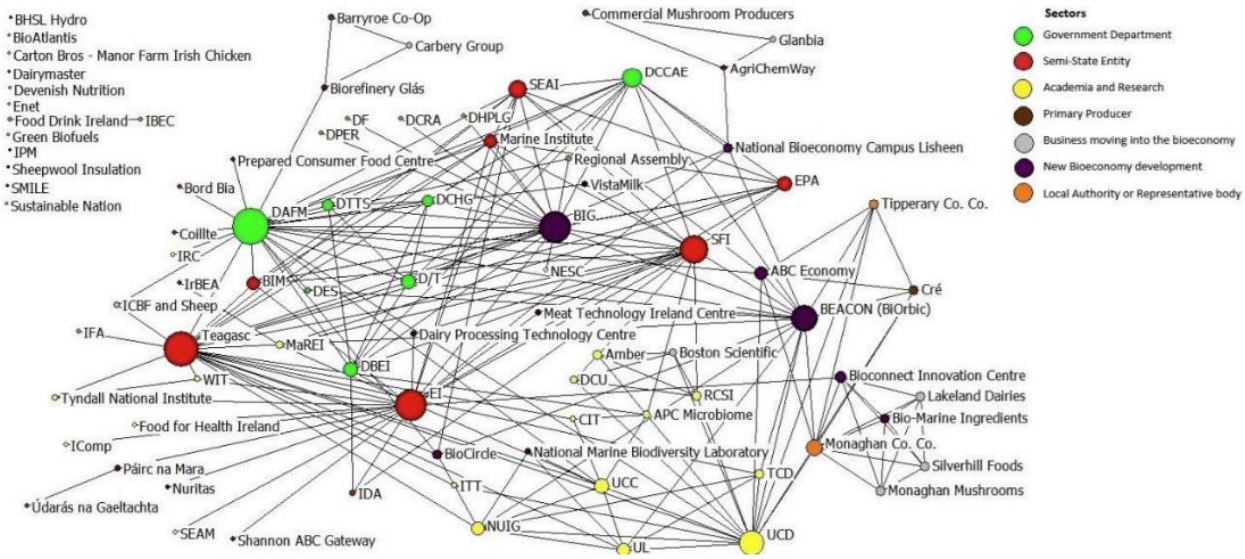

Figure 2. Ireland Bioeconomy Network Map. Adapted from Harrahill and Macken-Walsh (2020)

Job Creation and Entrepreneurship

More than 16 million people were employed in Europe's bioeconomy in 2021 (Biobased Industries Consortium, 2024). Areas such as bio-based material or new product creation and commercialisation, regenerative agriculture, waste management, and business operation and supply chain all hold the potential for entrepreneurial and innovative action through the creation of new business models. Supporting entrepreneurship is essential for fostering novel and creative ideas and approaches to collaborative circular bioeconomy innovation.

Through the introduction of new technologies and practices, the circular bioeconomy creates jobs across some of Irelands key sectors. ROI's 'Whole of Government Circular Economy Strategy 2022 - 2023' states that investing in new business models that lead to better consumption patterns could result in a 5% increase in Ireland's circularity gap, resulting in a saving of €2.3 billion annually (Department of the Environment, Climate and Communication, 2021). Further, the 'Circular Economy Programme 2021 – 2027' outlines planned supports for new circular economy business, including those in the bioeconomy, with "ecodesign, stimulation of repair and reuse activities, the sharing economy, and finding uses for byproducts" signalled as priority areas (Environmental Protection

Agency, p: 10). Ireland's Bioeconomy Action Plan 2023 – 2025 also focuses on entrepreneurship, innovation and commercialisation of biobased products, processes, and services. It aims to support pilot and demonstration projects alongside large-scale activity to foster inclusion in the bioeconomy (Department of the Environment, Climate and Communication, 2023). These plans recognise Ireland's position to commercialise on its circular bioeconomy strengths.

Similarly, the 'Circular Economy Strategy for Northern Ireland' outlines how new circular, and bio-circular business models will "result in higher levels of innovation and more targeted research and development and increasing focus on innovation active firms" (Department for the Economy, 2023, p: 43). The report estimates that nearly one-tenth of jobs in NI are currently contributing to the Circular Economy, with plans to double this. However, there is more focus on high -skilled jobs in STEM rather than the wide spectrum of jobs and skills that contribute to the circular bioeconomy. Across the island of Ireland, more in depth understanding of job types and job quality is required to ensure the circular bioeconomy fosters inclusive growth.

Just Transitions Through Entrepreneurship

Just Transition is defined as "Greening the economy in a way that is as fair and inclusive as possible to everyone concerned, creating decent work opportunities and leaving no one behind" (International Labour Organisation, 2024). It is a framework of interventions needed to secure livelihoods when shifting to sustainable production. In Ireland's transition to a circular bioeconomy, it is essential that rural communities and jobs are not left behind. Supporting the re-skilling of workers, helping SMEs to create new economic opportunities, and facilitating the diversification of economic activity in rural areas are all part of Ireland's just transition.

Circular bioeconomy practices must be embedded throughout value chains if they are to facilitate a just transition. This includes measures to involve local communities in the development and implementation of sustainable practices, and measures to support skills development and training for all levels of skilled jobs, particularly lower skilled positions such as waste sorting and collection. The Government of Ireland's 'Project Ireland 2040' emphasises a localised and decentralised economy as being necessary for the future of Ireland, and that exploration of opportunities from biomass is key when it comes to rural development (Department of Housing Planning and Local Government, 2018). Further, 'Our Rural Future 2021 – 2025' discusses the potential for job creation and entrepreneurship in circular bioeconomy for rural areas such as in agri-food, forestry, bio-based processing sectors, and

the development of new products and services such as bio-based materials and chemicals, bioenergy and biofuels (Department of Rural and Community Development, 2021). The report also highlights opportunities for innovative new business on the cutting edge of the transition. Rural expertise and the consideration of rural livelihoods is central to this.

The Department of Agriculture, Environment and Rural Affairs in Northern Ireland is also in the process of establishing a Just Transition Commission. This is a legislative requirement from the Climate Change Act 2022 of the Northern Ireland Assembly. The Commission will "(a) oversee the implementation of the just transition elements of this Act, and (b) provide advice to the Northern Ireland departments on how to ensure that proposals, policies, strategies and plans required under this Act comply with the just transition principle" (Northern Ireland Assembly, 2022). The Commission aims to ensure that a transition to a low carbon economy does not leave anyone behind and will be an important support in the transition to a circular bioeconomy. A 2020 report by the Nevin Economic Research Institute highlighted concerns that NI's agriculture emissions alone are nearly three times that of the UK, signifying significant agricultural employment and consequentially potential major impact from a move towards low carbon (Ní Lochlainn, 2020). The report recommends social dialogue with relevant actors, respect for workers' rights, skills development and the development of local economic diversification opportunities. The extant literature demonstrates some inconsistencies and uncertainty around job creation for who and whether a just transition can be ensured across the island of Ireland (Ní Lochlainn, 2020). This research aims to provide further insight into the challenges of just transition.

Methods

Literature Review

A literature review was conducted to investigate current opportunities for circular bioeconomy entrepreneurship across the island of Ireland. As this report seeks to inform research, practice and policy, the documents reviewed incorporated academic literature and policy documents from Ireland and Northern Ireland such as such as Enterprise 2025 Renewed, Project Ireland 2040, the Revised National Development Plan 2021- 2030, and the Invest NI Business Strategy 2017-2021.

Data Collection

Semi-structured interviews were conducted with stakeholders throughout circular bioeconomy value-chains, current entrepreneurs in the circular bioeconomy, and potential entrepreneurs. Interviews allowed us to gain further insight into themes emerging from desk research. An interview protocol was developed and shared with participants in advance, along with an ethics statement and consent form. We conducted 15 interviews between March and June 2023. Interviews were conducted both online and in person at participants' place of work. All were recorded and transcribed.

We also carried out an intersectoral demonstration and networking workshop in May 2023 with stakeholders to demonstrate early project findings and establish a network of circular bioeconomy entrepreneurs. In the workshop we ran a backcasting exercise with event participants to identify collaborative opportunities and aid networking. Backcasting involves collectively envisioning desirable future and working backward to identify the necessary actions and steps needed to achieve that future (Robinson, 1988). Findings from this exercise were included for analysis. Table 1 provides detail on which region and sector interviewees operate in.

Data Analysis

Qualitative analysis software (NVivo) was used to code the interview data, using a thematic analysis drawn from the interview protocol which was informed by the literature review. Key themes included opportunities and challenges of all-island collaboration, of job creation and entrepreneurship in the circular bioeconomy, and of a just transition. Notes from the workshop were also included to the analysis in NVivo under these themes.

Table 1. List of Interviewees

Name	Region	Sector
Interviewee 1	ROI	Marine
Interviewee 2	ROI	Bioenergy
Interviewee 3	NI	Bioenergy
Interviewee 4	NI	Pharmaceutical
Interviewee 5	ROI	Waste Management
Interviewee 6	ROI	Agriculture
Interviewee 7	ROI	Agriculture
Interviewee 8	NI	Bioenergy
Interviewee 9	ROI	Marine
Interviewee 10	NI	Bioenergy
Interviewee 11	ROI	Bioenergy
Interviewee 12	NI	Agriculture
Interviewee 13	NI	Agriculture
Interviewee 14	ROI	Bioenergy
Interviewee 15	ROI	Waste Management

Key Findings

Collaboration

Entrepreneurs across the island of Ireland highlighted a collaborative culture amongst those working in the circular bioeconomy, but discussed difficulty with turning this into action, particular collaboration across different sectors and between those in ROI and those in NI.

Collaborative culture

One entrepreneur discussed how people have been practicing bioeconomy principles long before the use of the term, and that this has led to natural and long-lasting partnerships and relationships in Irish culture (Interviewee 1, Marine, ROI). Others came to the same conclusion through the opposite premise in that they discussed how people in Ireland are naturally keen to support each other when there is a new movement:

"Everyone is starting out looking to learn from others and there is no such thing as barriers when you have collaboration" (Interviewee 12, NI).

"Most in the space are seeking growth, seeking opportunities, they're keen to network and collaborate, to learn from those in Northern Ireland and vice versa, and other areas of the bioeconomy to see how it works for them and how they could bring that learning back" (Interviewee 15, Waste management, ROI).

Others mentioned more strategic reasons for collaboration such as attracting investment through focusing on international collaboration and collaborating on teams with mixed expertise (Interviewee 5, Waste management, ROI). Similarly, strategic partnerships driven by EU promotion of the circular bioeconomy and EU and national funding opportunities were mentioned by several entrepreneurs:

"Bioeconomy is all the rage now…it has always been there but because the EU has promoted it very strongly recently, and the circular economy, there's very good EU and national incentives, DAFM offer quite substantial funding for projects" (Interviewee 1, Marine, ROI).

This strong policy support was mentioned as a driver of collaboration by many of the ROI entrepreneurs, but not the NI entrepreneurs. One entrepreneur also mentioned a strong Irish research sector as something that helps with collaboration due to a culture of knowledge sharing across different fields, and the training of new talent in the circular bioeconomy (Interviewee 9, Marine, ROI).

Two NI entrepreneurs discussed how local collaboration is most important in the bioeconomy as biomass is local and tends to have a small local market. While for these entrepreneurs any networking is only targeted towards local suppliers, most entrepreneurs across ROI and NI talked about the importance of national events for networking. A welcomed increase in events run by bodies such as Teagasc, InterTrade Ireland, Enterprise Ireland, Ireland's national bioeconomy research centre BiOrbic was a strong finding. For example:

"You attend these events with a specific need or interest, so you go in ready to network and ready to come out with a new relationship, so there's huge appetite for collaboration at events" (Interviewee 6, Agriculture, ROI).

"We're interested in making our supply chain circular and sustainable, that's the way it has to go so broader events for networking with broader stakeholders are needed, and new types of collaboration" (Interviewee 4, Pharmaceutical, NI).

Entrepreneurs across the island of Ireland demonstrated interest in increased collaboration between ROI and NI and commend events run by the organisations mentioned, but discussed several challenges related to differences between political and institutional supports.

Challenges of collaboration

One challenge frequently mentioned by entrepreneurs in NI was policy stagnation and uncertainty as a result of Brexit. Policy stagnation was described as something that has led to less interest in networking and collaboration, but one entrepreneur also suggested that it has caused division among the community of people working in NI's circular bioeconomy:

"When there's nothing happening people will look for other opportunities and no one is willing to commit to innovation and risk when they're facing uncertainty" (Interviewee 3, Bioenergy, NI).

"*The uncertainty can bring people together or divide them…division in the community is what I've been seeing, people are sick of waiting and it can cause all sorts of frustrations"* (Interviewee 8, Bioenergy, NI).

Another challenge mentioned by NI entrepreneurs was negative media framing of the bioeconomy, particular bioenergy in NI and the UK, and a general negative perception among the public:

"Northern Ireland media framing of bioeconomy presents a one-dimensional argument and so people would be against burning trees for example, and this causes tension in communities" (Interviewee 10, Bioenergy, NI).

Another NI entrepreneur discussed how, in an attempt to set up a trade body in NI, they decided not to include biomass in the title due to the associated negative perception of this term and discussed how they considered biomaterials or bio-compounds instead (Interviewee 8, Bioenergy, NI).

Finally in both NI and ROI, entrepreneurs mentioned lack of awareness and understanding of circular bioeconomy terminology as a challenge for collaboration as people might not identify as being part of the circular bioeconomy. Two ROI entrepreneurs mentioned that collaborative events do not cater to all stakeholders. Farmer collaboration was cited as particularly difficult by entrepreneurs in NI, as even though they are a key stakeholder, *"they prefer to talk to each other rather than someone selling them*

something at some event or trying to create a relationship with unclear benefit to them" (Interviewee 3, Bioenergy, NI).

Job Creation and Entrepreneurship

Competition

Many ROI entrepreneurs and some NI entrepreneurs discussed how the competitive nature of sectors of the circular bioeconomy in Ireland creates ample opportunity for jobs and entrepreneurship. Marine and willow in particular were mentioned in ROI and NI while hemp was also highlighted in ROI as a growing area that should be a focus for entrepreneurs. This competition is said to be the result of natural resources advantages on the island of Ireland, a skilled workforce, and an entrepreneurial culture:

"The blue economy is growing as it's a replenishable source of products, and the opportunities are really big in life sciences dealing with natural materials from marine" (Interviewee 1, Marine, ROI).

"Willow chip is too good to burn and has many other properties, so there are endless compounds opportunities for entrepreneurs" (Interviewee 3, Bioenergy, NI).

"I'm jealous that I'm not 21 anymore because there's miles of seaweed that I've seen all my life, peat moss is the same, open your eyes its everywhere, industry stumbles into things, entrepreneurial people are needed to unlock value" (Interviewee 5, Waste Management, ROI).

"Investment is in people as much as technologies, Irish people have a strong entrepreneurial spirit and ability" (Interviewee 6, Agriculture, ROI).

Several entrepreneurs across the island of Ireland also mentioned how growing consumer interest in natural, plant-based products are driving opportunities for the creation of new products in Ireland, especially for reasons of health and sustainability (Interviewee 9, Marine, ROI).

EU and national supports

As was found for collaboration, EU and national supports were discussed by many entrepreneurs in ROI as a strong incentive for starting a business in the circular bioeconomy:

"Incentives in Ireland are probably the best in the world for young entrepreneurs." (Interviewee 9, Marine, ROI).

"The SSRH support scheme is structured well…it's worth the bureaucracy and red tape to have a solid, secure, sustainable scheme that actually pays off." (Interviewee 11, Bioenergy, ROI).

"Overall, there will be a top-down push away from combustion of biomass, but there will be high value utilization opportunities for biomass, I'd see that as sustainable opportunity well into the future and that will have to continue to be incentivised by the government" (Interviewee 2, Bioenergy, ROI).

Global trends

Two entrepreneurs, one from NI and one from ROI specifically discussed how global political instability has and will continue to drive focus towards biomass as a cheaper, more stable and more sustainable energy source, creating opportunities for new jobs:

"With the Ukraine war and energy costs globally increasing, demand is there for biomass. There's uncertainty that can't be regulated for and more will come down the line" (Interviewee 2, Bioenergy, ROI).

"There's a push for electrification of everything and I suppose there's benefits to getting into heat pumps or other emerging technologies, but its horses for courses and there will be incentives to get into both" (Interviewee 8, Bioenergy, NI).

Despite the above opportunities, most entrepreneurs discussed challenges they have faced which they see future entrepreneurs facing in entering the circular bioeconomy. Many of these were related to international competition, startup costs, and the downsides of some of the factors mentioned above such as policy.

Costs

Entrepreneurs across the island of Ireland mentioned that, while not specific to the circular bioeconomy, starting a business is a capital intensive and often lengthy process (Interviewee 1, Marine, ROI), with one entrepreneur mentioning that *"there is no income for 3 to 4 years while your growing,*

so difficult to get into newly" (Interviewee 3, Bioenergy, NI). The issue of transport costs was also mentioned by two entrepreneurs. For example:

"Biomass is very local and if you think about how transport costs are so high relative to the value of the material, you need local infrastructure to make it worthwhile" (Interviewee 11, Bioenergy, ROI).

The cost of growing and hiring skilled workers was also highlighted by a number of entrepreneurs, although it was mentioned that talent is abundant in Ireland and internationally.

International Competition

While competition was largely discussed as something driving opportunity for new innovations, job creation and entrepreneurship, competition in the international market was mentioned by 2 entrepreneurs as a barrier:

"I'm competing ultimately with big pharma, with long-established skincare brands, so it's hard to position myself against maybe the natural or organic or sustainable lines they all have readily available to customers in NI" (Interviewee 4, Pharmaceutical, NI).

"There is a risk that manufacturing will be moved to Asia, and it makes it very hard to be competitive when you are competing with these economies where labour and energy is much cheaper" (Interviewee 9, Marine, ROI).

EU and national incentives

Two NI entrepreneur discussed how support schemes are very attractive but have been poorly structured in NI. For example:

"A delay of 6 years in implementation caused stress and completely stagnated the market as sites held off" (Interviewee 6, Bioenergy, ROI).

Similarly in ROI, several entrepreneurs discussed the downsides of gaining supports, specifically costs, time and lack of understanding:

"Funding is great, but bureaucracy is obscene, what really is the outcome and impact long term, so much potential but no clear guidance or lead" (Interviewee 3, Bioenergy, NI).

Regulation

Entrepreneurs in ROI and NI both discussed difficulties they have faced in innovating due to rigidity of regulations in some sectors of the circular bioeconomy:

"It's difficult to 'stretch your legs and get the bruises' with the guys who are very focused on spec, very spec rigid due to the nature of their site" (Interviewee 11, Agriculture, NI).

"Hemp is treated under the misuse of drugs act from a regulatory point…struggles around insurance, constantly changing regulation, I think it will be solved in the near future, there's just a lack of understanding because of a lack of research" (Interviewee 2, Agriculture, ROI).

Liability of newness

Not specific to the circular bioeconomy is the general difficulty faced when entering a new market, or in becoming an entrepreneur for the first time. For example, difficulty of "sifting through too much help and advice" (4) was mentioned, as was the challenge of transitioning from scientist to entrepreneur when entrepreneurs must grasp *"new terminology like B2B, venture capital, angel investment, even business model"* (Interviewee 4, Pharmaceutical, NI).

Just Transition through New Entrepreneurial Opportunities

Entrepreneurs across the island of Ireland spent considerably less time during interviews and in the workshop discussing how the circular bioeconomy might facilitate a just transition through entrepreneurship than they did the previous topics. Entrepreneurs generally agreed that the circular bioeconomy can and should be inclusive and create opportunities for jobs at different skills levels for both rural and urban communities. However, while in ROI entrepreneurs acknowledged existing and emerging policy support, in NI, some entrepreneurs discussed poor understanding and lack of policy as an issue in driving a just transition:

"The policy isn't there and there's no one getting behind it…they will have to think about replacement of jobs and the impact of that like in the midlands in the South if it's really going to work for communities" (Interviewee 8, Bioenergy, NI).

One ROI entrepreneur discussed a shift in bioeconomy focus away from rural livelihoods towards technical new product development jobs:

"Marine bioeconomy has been of interest to coastal and island communities for 1000s of years, it has been fundamental to diet, it's been a source of organic fertilizer for soil, but now you see the focus shift to high value products, high value extraction, and that's a different type of skillset and different focus" (Interviewee 1, Marine, ROI).

Several entrepreneurs mentioned the fact that people need to see how money will be made before seeing the circular bioeconomy as something that supports a just transition, and that successful examples and case studies across different sectors are scarce:

"I haven't seen a 'blockbuster product' in willow that paves the way or makes a template of how this should be done" (Interviewee 14, Bioenergy, ROI).

Finally, several ROI entrepreneurs mentioned that starting a business in the circular bioeconomy has natural benefits for the local community in that circular business models and supply chains are designed to solve multiple issues and therefore lend themselves to a just transition (Interviewee 5, Waste Management, ROI).

Discussion of Recommendations

This research set out to explore what opportunities exist for current and potential entrepreneurs in the circular bioeconomy across the island of Ireland, with a focus on identifying shared challenges, unique strengths, and potential for all-island collaboration. Despite the opportunities identified for current and potential entrepreneurs and a strong cultural and strategic foundation for collaboration, significant structural and perceptual barriers hinder deeper integration and innovation.

Collaboration in Ireland's All-Island Circular Bioeconomy

There is a strong ethos of collaboration and mutual learning throughout Ireland. Entrepreneurs across both jurisdictions emphasized national networking events run by, for example, Teagasc and InterTrade Ireland, and shared natural resources as enablers of cooperation. Strategic motivations for

collaboration were also evident, including access to EU funding, international partnerships, and mixed-expertise teams. ROI entrepreneurs highlighted strong institutional support and a vibrant research ecosystem as key enablers of national cooperation. Despite the collaborative culture, several barriers persist with NI entrepreneurs citing Brexit-related uncertainty and policy stagnation as major impediments. Issues of public perception and understanding due to negative media framing of bioenergy in NI, and inconsistent interpretations of the term circular economy and activity within it were also reported to limit engagement. Extant literature has recommended that neither top-down nor bottom-up coordination and collaboration mechanisms alone are sufficient and that a cross-sectoral, whole of government approach is necessary to facilitate collaboration in Ireland (Barrett et al., 2021). The findings here suggest a whole of island approach is also necessary. Mechanisms for enhanced collaboration between different sectors and different value chain actors are key to progress circular bioeconomy innovation (Overbeek and Hoes, 2018).

Entrepreneurship and Job Creation

High-value opportunities were discussed in marine resources, bio-based compounds, and regenerative agriculture. These opportunities are driven by Ireland's natural resource base, skilled workforce, and entrepreneurial culture. Growing consumer demand for natural, organic, plant-based products, especially for health and sustainability reasons, was also seen as a driver of new product development. ROI entrepreneurs highlighted EU and national incentives asl well as global trends as critical enablers of entrepreneurial activity. Policy across Ireland should continue to support entrepreneurial activity in this space by building on these existing strengths and advantages. However, starting a business in the circular bioeconomy is capital-intensive, with long lead times before profitability. This combined with reported bureaucracy and inconsistent approaches to implementation of available schemes, innovation-stifling regulation, and the steep learning curve of starting up in the circular bioeconomy demonstrates that significant barriers exist for current and potential circular economy entrepreneurs. There is scope for further work on streamlining existing supports for funding to make this accessible and inclusive.

Just Transitions through Entrepreneurship

While less frequently discussed, the concept of a just transition emerged as a critical but underdeveloped theme. Entrepreneurs agreed that the circular bioeconomy should create inclusive opportunities across skill levels and geographies. However, the extent to which this is being realized varies. In ROI, there is growing policy support, but some entrepreneurs noted a shift away from rural

livelihoods toward high-tech product development. While supportive policy frameworks exist in ROI (e.g., Project Ireland 2040, Our Rural Future), entrepreneurs in NI flagged limited policy engagement and a need for targeted skills development. The challenges identified are consistent with the literature on just transition progress in Ireland (Ní Lochlainn, 2020), and it is clear that the risk of leaving rural communities behind remains unless inclusive economic models are provided for and prioritised.

Key Policy Recommendations

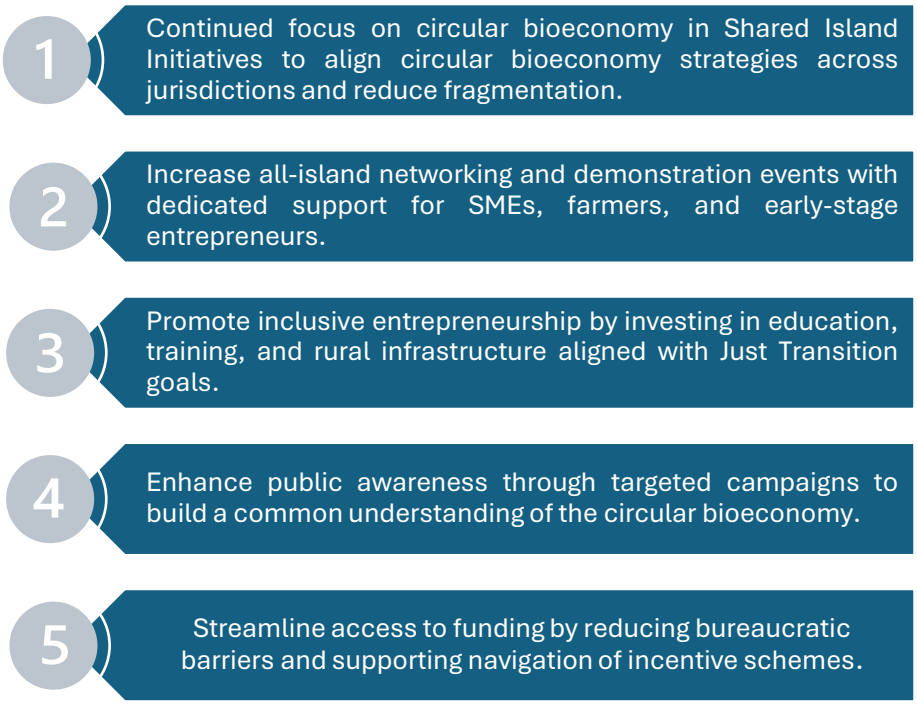

Figure 3 Key Recommendations

References

Barrett, P., Vehvilainen, A., Inglis, J.D. and Kulišić, B., (2021). *Deploying the Bioeconomy in the EU: A Framework Approach for Bioeconomy Strategy Development.* European Commission. Available online: https://bioeast.eu/wp-content/uploads/2021/07/ PSF-Final-Report_Deploying-the-Bioeconomy-in-theEU_A-Framework-approach-for-bioeconomy-strategydevelopment_July-2021.pdf

Biobased Industries Consortium (2024). *European Bioeconomy in Figures 2008-2021*. Available online: https://biconsortium.eu/sites/biconsortium.eu/files/publications/European%20Bioeconomy%20in%20Figures%202014%20-%202021_2.pdf

Department for the Economy (2023). *Circular Economy Strategy for Northern Ireland.* Available online: https://www.economy-ni.gov.uk/consultations/circular-economy-strategy-northern-ireland

Department of Agriculture, Environment and Rural Affairs (2021). *Innovation Strategy 2021-2025.* Government of Ireland Available online: https://www.daera-ni.gov.uk/sites/default/files/publications/daera/20.21.143%20DAERA%20Innovation%20Strategy%20Final%20%281%29.PDF

Department of Housing Planning and Local Government (2018). *Project Ireland 2040.* Available online: https://npf.ie/wp-content/uploads/Project-Ireland-2040-NPF.pdf

Department of Public Expenditure and Reform (2021). *National Development Plan 2021 - 2030.* Government of Ireland. Available online: file:///C:/Users/EXT04033/OneDrive%20-%20University%20College%20Cork/Documents/200358_a36dd274-736c-4d04-8879-b158e8b95029%20(1).pdf

Department of Rural and Community Development (2021). 'Our Rural Future 2021 – 2025'. Available online: https://www.gov.ie/pdf/?file=https://assets.gov.ie/132413/433aebac-f12a-4640-8cac-9faf52e5ea1f.pdf#page=null

Department of the Environment, Climate and Communications (2021). *Whole of Government Circular Economy Strategy 2022 – 2023*. Government of Ireland: Available online: https://www.gov.ie/pdf/?file=https://assets.gov.ie/207622/bd90130d-494e-4d32-8757-46d36c77b912.pdf#page=null

Department of the Environment, Climate and Communications (2023). *Bioeconomy Action Plan 2023-2025.* Government of Ireland. Available online: file:///C:/Users/EXT04033/OneDrive%20-%20University%20College%20Cork/Documents/273984_64aa20ef-3907-46fe-a599-73ba208a1edf%20(1).pdf

Department of the Taoiseach (2021). *Shared Island Dialogue Series: Building Back Better Together: Economic recovery on a shared island*. Government of Ireland. Available online: file:///C:/Users/EXT04033/OneDrive%20-%20University%20College%20Cork/Documents/204630_5c148c48-eb7b-49b2-9703-7c955d7c64e9%20(1).pdf

Environmental Protection Agency (2021). *Circular Economy Programme 2021 – 2027*. Available online: https://www.epa.ie/publications/circular-economy/resources/EPA_Circular_Economy_2021_Programme_Apr22_Web.pdf

Harrahill, K., and Macken-Walsh, A. (2020). Networks in the Irish Bioeconomy. Available online: https://www.teagasc.ie/media/website/rural-economy/rural-economy/spatial-analysis/bioeconomy-map/BIW_Day5_Networks.pdf

International Labour Organization (2024). *Climate change and financing a just transition.* Available online: https://www.ilo.org/resource/other/climate-change-and-financing-just-transition

Irish Bioeconomy Foundation and Intertrade Ireland. (2024). Biomap. Available online: https://bioeconomyfoundation.com/biomap/

Marshall, D., O'Dochartaigh, A., Prothero, A., Reynolds, O., & Secchi, E. (2022). Why businesses need to embrace the bioeconomy. *MIT Sloan Management Review*, *64*(1).

Ní Lochlainn, A. (2020) Supporting People and Place: Planning for a Just Transition for Northern Ireland, NERI Working Paper Series, NERI WP 2020/N0 71, Dublin: NERI.

Northern Ireland Assembly (2022). Climate Change Act (Northern Ireland) 2022. Available Online https://www.legislation.gov.uk/nia/2022/31/contents/enacted

Overbeek, G. and Hoes, A., (2018). *Deliverable 3.1 Synthesis of Market Perspectives to Develop Bio-based Value Chains. Biovoices – Connecting Biobased Forces for a Sustainable World*. Available online: https://www.bioeconomy-library.eu/wp-content/ uploads/2019/10/D3.1-Report-with-a-synthesis-ofmarket-perspectives.pdf

Robinson, J.B., (1988). Unlearning and Backcasting: Rethinking Some of the Questions We Ask About the Future, *Technological Forecasting and Social Change, Vol.33, No.4, pp. 325–338.*