

# Beyond Profit: Sustainable Business Model Innovation in Ireland's Emerging Seaweed Bioeconomy

Wankya Ronald Kiduma and Ciarán Ó hAnnracháin

Faculty of Business, Atlantic Technological University, Donegal, Ireland

[ronaldkiduma@gmail.com](mailto:ronaldkiduma@gmail.com)

[Ciaran.OHannrachain@atu.ie](mailto:Ciaran.OHannrachain@atu.ie)

**Abstract:** In the transition toward sustainable economies, niche blue bioeconomy ventures must rethink how they create, deliver, and capture value beyond purely financial returns. This study examines how Ireland's seaweed-based small and medium-sized enterprises (SMEs) design and adapt sustainable business models within a context characterised by resource constraints, fragmented markets, and evolving regulatory frameworks. The research adopts a qualitative approach based on eight in-depth interviews conducted across Ireland, including six seaweed processing firms, one regulatory representative, and one sector expert. Using Resource-Based View (RBV) and Dynamic Capabilities (DC) frameworks, the study analyses how firms build, reconfigure, and deploy capabilities for sustainability-oriented innovation. Findings reveal a sector driven by entrepreneurial commitment and market-proximate experimentation, yet constrained by capability gaps, regulatory complexity, and limited institutional support. The paper contributes to understanding how micro-enterprises in the niche food business sectors operationalise sustainability in business models and highlights the need for coordinated policy and innovation support systems to enable scaling in emerging bio-based industries.

**Keywords:** Sustainable Business Models; Blue Bioeconomy; Seaweed SMEs; Dynamic Capabilities; Circular Bioeconomy

## 1. Introduction

The transition toward sustainable and circular economies has increased attention on bio-based industries (Bugge *et al.* 2016; D'Amato *et al.* 2017; Stegmann *et al.* 2020). Within this context, the blue bioeconomy, particularly seaweed production, has emerged as a promising sector due to its low-input biomass production, carbon sequestration potential, and applications across food, pharmaceuticals, and materials (Buschmann *et al.* 2017; Duarte *et al.* 2017; Barbier *et al.* 2020). Global seaweed production now exceeds 30 million tonnes annually, reflecting growing strategic importance. However, translating this ecological and economic potential into scalable and resilient business models remains a significant challenge (Van Den Burg *et al.* 2016; Araújo *et al.* 2021).

In Ireland, the seaweed sector is a small but strategically important part of the bioeconomy, consisting mainly of micro- and small-scale enterprises operating within fragmented value chains and evolving regulatory environments (Monagail and Morrison 2020; van den Burg *et al.* 2021). These firms are embedded in coastal communities and engage in activities including food production, nutraceuticals, cosmetics, tourism, and animal feed, often guided by strong sustainability orientations (Duarte *et al.* 2017; Campbell *et al.* 2019; Barbier *et al.* 2020; Araújo *et al.* 2021; van den Burg *et al.* 2021). However, growth is constrained by finance, capability gaps, and institutional complexity.

Although research highlights the technological and environmental potential of seaweed industries, limited attention has been given to how small firms operationalise sustainable business models in resource-constrained contexts (Araújo *et al.* 2021; van den Burg *et al.* 2021). The micro-foundations of capability development and sustainability integration also remain underexplored (D'Amato *et al.* 2017; Bocken *et al.* 2019).

Drawing on the Resource-Based View (RBV) (Barney 1991), and Dynamic Capabilities (DC) (Teece *et al.* 1997), this study examines Irish seaweed SMEs by asking: (1) how sustainability is integrated into business models; (2) what capabilities and supports shape innovation and growth; and (3) how resource and regulatory constraints affect scaling. The study advances understanding of sustainable entrepreneurship in emerging bioeconomy sectors.

## 2. Literature Review

This study examines sustainable business models (SBMs) within the bioeconomy using Resource-Based View (RBV) and Dynamic Capabilities (DC) perspectives to strengthen theoretical understanding. It identifies a significant gap in scholarly research on sustainable business models and innovation dynamics within the seaweed sector, where existing literature is largely dominated by industry and policy reports. The study contributes empirical and conceptual insights into innovation and governance in emerging seaweed enterprises and offers a

useful framework for research on micro-businesses operating in niche sectors characterised by unique structural and sustainability-related challenges.

## 2.1 Sustainable Business Models in the Bioeconomy

Sustainable business models (SBMs) extend traditional business approaches by integrating environmental and social value creation alongside economic performance (Boons and Lüdeke-Freund 2013; Bocken *et al.* 2014; Schaltegger *et al.* 2016). In the bioeconomy, SBMs are linked to circular resource use, ecosystem stewardship, and stakeholder collaboration (D'Amato *et al.* 2017; Geissdoerfer, *et al.* 2018). However, empirical research remains limited, particularly regarding how small firms operationalise SBMs under resource constraints. Existing studies focus mainly on technological innovation and macro-level transitions, with less attention to firm-level value creation and delivery processes (Bocken *et al.* 2014; D'Amato *et al.* 2017). This gap is evident in seaweed enterprises, which contribute to carbon sequestration, biodiversity, and sustainable food systems but operate within fragmented markets and evolving regulatory environments (Buschmann *et al.* 2017; Barbier *et al.* 2020; van den Burg *et al.* 2021; Araújo *et al.* 2021).

## 2.2 Resource-based View and Capability Constraints

The Resource-Based View (RBV) explains how firms achieve competitive advantage through valuable, rare, inimitable, and non-substitutable resources (Barney 1991). It is particularly relevant for SMEs in emerging bioeconomy sectors, where firms rely on intangible assets such as entrepreneurial expertise, ecological knowledge, and relational networks to support innovation (Baker and Nelson 2005; Parida *et al.* 2017). In seaweed SMEs, these challenges are intensified by the need to manage harvesting, processing, compliance, and market development simultaneously (Buschmann *et al.* 2017; Barbier *et al.* 2020; Araújo *et al.* 2021; van den Burg *et al.* 2021). However, while RBV explains differences in resource endowments, it provides limited insight into how firms adapt and reconfigure resources to support sustainability-oriented innovation, indicating the need for complementary theoretical perspectives.

## 2.3 Dynamic Capabilities and Innovation

Dynamic Capabilities (DC) provide an important analytical lens for SMEs in the seaweed sector by complementing the Resource-Based View (RBV) and focusing on firms' abilities to adapt to changing environments rather than merely possessing resources. For resource-constrained seaweed SMEs, DC supports the alignment of business activities and Sustainable Business Model (SBM) development through the capacities to sense opportunities, seize them strategically, and reconfigure resources in response to market, regulatory, and environmental changes (Teece *et al.* 1997; Teece 2018). This is particularly relevant in emerging sustainability-driven sectors characterised by uncertainty and rapid change. Research shows that DCs are shaped by learning, stakeholder interactions, and experimentation (Bocken *et al.* 2019), but their development is often constrained by weak institutional support and fragmented innovation ecosystems (Schot and Geels 2013; Adner 2017; Reim *et al.* 2019). Integrating RBV and DC helps explain how SMEs operationalise SBMs in emerging bioeconomy industries.

## 3. Methodology

This study investigates how sustainable business models are developed and operationalised in Ireland's seaweed sector. First, the research design is outlined. Then, the data collection procedures are described. Finally, the analytical approach used to interpret the findings is presented.

### 3.1 Research Design

A qualitative exploratory multiple-case study design was used to examine sustainable business model development in an emerging bioeconomy sector, integrating firm-level and system-level perspectives to understand interactions between internal capabilities and external institutional conditions.

The study focused on six seaweed-based SMEs operating within Ireland's small and geographically dispersed seaweed sector, mainly along the west coast. At the time of the research, only 14 active seaweed food-processing firms existed nationally, highlighting the sector's niche and emerging character. All firms produced seaweed-based food products but varied in business models and operational strategies. Most were micro-enterprises employing 1–3 staff, while one employed approximately 25 employees, offering insights into both early-stage and more established organisational contexts within Ireland's evolving marine bioeconomy.

### 3.2 Data Collection

Data were collected through eight semi-structured interviews conducted between March and May 2024 with six SME founders/managers, one regulatory representative, and one sector expert. Purposive sampling ensured variation in firm size, product focus, and sectoral experience. Interviews lasted 45–60 minutes, were recorded and transcribed verbatim, and averaged 12 pages each. The interviews explored business model design, sustainability practices, resource constraints, capability development, and regulatory and market interactions, generating a rich qualitative dataset capturing both strategic and operational perspectives.

### 3.3 Data Analysis

Data were analysed using Braun and Clarke's (2006) six-phase thematic analysis framework, selected for its flexibility in identifying patterns across qualitative data. The process involved familiarisation with transcripts, initial coding, theme development, theme review, theme definition, and final analysis. Coding combined inductive and deductive approaches, allowing themes to emerge from the data while being informed by the Resource-Based View (RBV) (Barney 1991) and Dynamic Capabilities (DC) frameworks (Teece *et al.* 1997; Teece 2018). Particular attention was given to resource configurations, capability development, and business model adaptation. An iterative constant comparison process was used to refine themes and strengthen coherence between empirical findings and theoretical constructs, thereby enhancing analytical depth and validity.

## 4. Findings

The findings are structured as four interrelated analytical themes, derived from the thematic analysis and aligned with the integrative framework presented in Figure 1. These themes including (1) values-driven entrepreneurship, (2) resource constraints, (3) informal innovation practices, and (4) a fragmented and uncertain environment represent higher-order dimensions, while the subsections (e.g., market experimentation, multi-role structures) are embedded mechanisms within these core themes. Together, these dimensions explain how sustainable business models are enacted through the interaction of internal motivations, capability limitations, innovation practices, and external conditions.

### 4.1 Values-Driven Entrepreneurship as the Foundation of Business Models

Sustainability emerges as a core organising logic, shaping how firms define value beyond profit. Environmental stewardship, food system transformation, and ethical production underpin decision-making. As P8 stated, *"A regenerative form of food... based on food justice and food security,"* while P5 emphasised, *"Aquaculture is where it needs to be going... to prevent overexploitation."* Business models are strongly founder-centric, reflecting personal motivations and identities. P3 noted, *"I'm more of an educator than a businesswoman... I'm not in it for the money,"* while another respondent reflected, *"It's just because I love it... I wouldn't be alive if I didn't have too much."* These values shape not only value propositions but also constrain growth choices, reinforcing hybrid logics that integrate lifestyle, sustainability, and experimentation.

### 4.2 Resource Constraints Shaping Capability Development

Severe financial and human resource limitations directly influence how firms operate and scale. As P8 observed, *"The business has not had the trajectory that I hoped... mainly because of lack of finances,"* while P2 highlighted capability gaps: *"We are a small business... nobody in-house that has that knowledge."* These constraints result in multi-role organisational structures, where founders manage production, compliance, and commercial activities simultaneously. This limits specialisation and strategic capacity, particularly in critical areas such as marketing. As P1 stated, *"I'm lacking a lot in marketing. I desperately need someone... this is my weak point,"*, resource scarcity not only restricts growth but actively shapes how capabilities are developed and deployed.

### 4.3 Informal and Market-proximate Innovation Practices

Innovation is embedded in practice-based, iterative processes rather than formal R&D systems. Firms rely on experimentation, reinvestment, and direct market engagement. As P7 explained, *"We go out to test... get feedback, tweak and change. Try again,"* while P1 noted, *"All the money, I always reinvested... I did research, I did test and tried to understand."* This is complemented by strong customer proximity, enabling rapid feedback and co-creation. As P6 stated, *"We're a small business. So, we know our customers intimately,"* and P1 added, *"I*

always bring along some food for people to taste.” While this model fosters agility and responsiveness, it limits formal knowledge accumulation and standardisation, constraining scalability.

#### 4.4 Fragmented and Uncertain Institutional Environment

Firm-level dynamics are shaped by a weakly coordinated ecosystem and regulatory ambiguity. Collaboration remains limited, as P1 noted: “We are very bad at working and cooperating with each other... other companies are not interested in coming together.” However, when present, it enables growth, as P4 highlighted: “We have got a lot more consumers through that collaboration... and expansion to markets like Thailand and the UK.” Regulatory uncertainty further constrains development. P1 stated, “It is not clear what processes to follow... this hampers the efforts of the sector to grow,” while P8 added, “The sector is very confused... we should have proper regulation.” These institutional conditions create barriers to investment, coordination, and long-term planning.

#### 4.5 Integrating the Dimensions

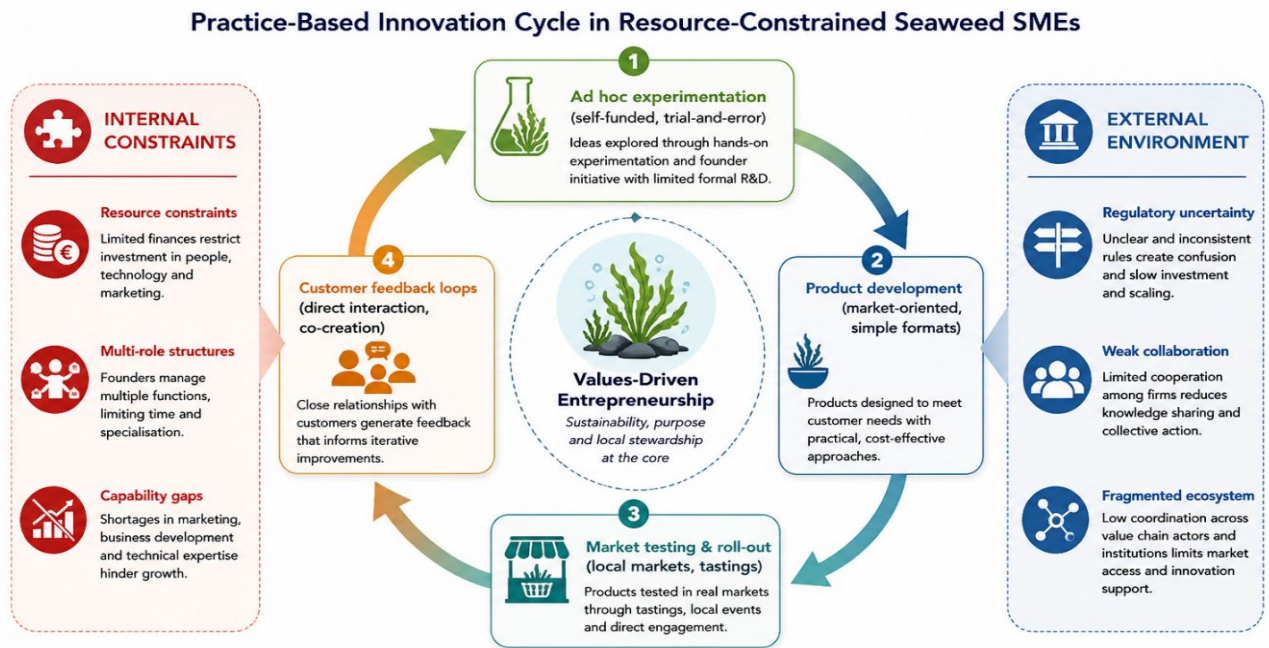
Figure 1, below visualises these four themes as an integrated system. Values-driven entrepreneurship defines the purpose and direction of firms; resource constraints shape capability development; informal innovation practices represent how firms respond; and the fragmented environment conditions what is possible.



Figure 1

The findings show that seaweed SMEs operate through hybrid business models shaped by sustainability, place-based identity, and experimentation rather than purely profit-driven logics. Value is created through natural resources and experiential knowledge, delivered via relational and proximity-based channels, and captured through premium and diversified revenue streams. However, these firms face major constraints, including limited resources, fragmented collaboration, weak institutional support, regulatory complexity, limited market access, and capability gaps. The study highlights that scaling sustainable business models depends not only on firm-level innovation but also on supportive policy frameworks, coordinated ecosystems, and stronger collaboration platforms.

Figure 2 presents an exploratory, empirically grounded representation of innovation processes within seaweed SMEs, illustrating an iterative cycle of experimentation, product development, market testing, and feedback-driven refinement. Rather than proposing a formalised or generalisable framework, the figure provides context-specific insight into how micro-enterprises in emerging bioeconomy sectors operationalise innovation under conditions of uncertainty and resource constraints, contributing modestly to understanding sustainability-oriented value creation in practice.



**Fig 2.** Practice-based innovation cycle in seaweed SMEs. The figure illustrates how informal, iterative innovation processes are embedded within resource constraints and shaped by a fragmented institutional environment. The model is derived from qualitative findings and represents a context-specific interpretation rather than a generalisable framework.

**Figure 2**

## 5. Discussion

This section examines the findings in relation to existing literature and theoretical frameworks. First, the micro-foundations of dynamic capabilities are discussed. Then, the sustainability-specific tension between agility and scalability is analysed, followed by implications for value creation in sustainable entrepreneurship.

### 5.1 Micro-foundations of Dynamic Capabilities in Sustainability-Oriented Contexts

The findings extend understanding of the micro-foundations of dynamic capabilities by showing that, in sustainability-oriented ventures, adaptability responds not only to market uncertainty but also to ecological and ethical commitments. Consistent with prior studies, capabilities emerge through experimentation, customer interaction, and iterative learning (Salunke *et al.* 2011; Teece 2016; Wenzel *et al.* 2021). However, these processes are guided by sustainability values rather than solely efficiency or growth objectives. In line with research on resource-constrained SMEs (Senyard *et al.* 2014; Salunke *et al.* 2019), capability development is shaped by entrepreneurial action, environmental stewardship, and local embeddedness. Stakeholder co-creation supports both innovation and alignment with sustainability and community values (Ramaswamy and Ozcan 2014, pp1-80; Aarikka-Stenroos and Ritala 2017). Similarly, adaptive experimentation reflects continuous negotiation between ecological responsibility, product viability, and market acceptance (Bocken *et al.* 2019; McGrath 2019, pp 25-120).

### 5.2 A Sustainability-specific Tension: Agility, Scaling, and Integrity

Although tensions between flexibility and scalability are common in SMEs (Rosenbusch *et al.* 2011; Coad *et al.* 2016), the findings show that in sustainability-oriented ventures this becomes a normative and strategic dilemma. In seaweed SMEs, scaling is constrained not only by limited resources and weak formalisation (Teece 2018; Bocken *et al.* 2019; Barbier *et al.* 2020; van den Burg *et al.* 2021), but also by commitments to local sourcing, low-impact production, and authenticity, reflecting the “emergent vs. incumbent” tension identified by Hockerts and Wüstenhagen (2010). Unlike conventional SMEs, growth may threaten ecological responsibility, traceability, and community embeddedness (Boons and Lüdeke-Freund 2013; Schaltegger *et al.* 2016), requiring continuous balancing between expansion and sustainability values.

### 5.3 Beyond Profit: Sustainability as a Structuring Logic of Value Creation

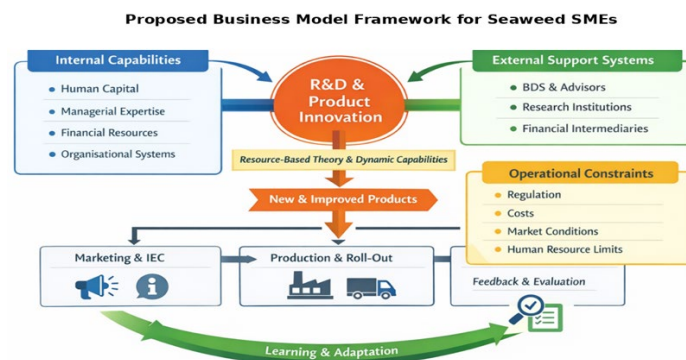
The findings reinforce that sustainable entrepreneurship redefines value creation by integrating environmental, social, and economic objectives (Bocken *et al.* 2014; Schaltegger *et al.* 2016; Geissdoerfer *et al.* 2018). Unlike conventional firms, seaweed SMEs embed ecological stewardship and community engagement into core operations, shaping decision-making and limiting strategic choices. Although firms create environmental and social value, they often struggle to capture corresponding economic value due to weak institutional support (D'Amato *et al.* 2017; Geissdoerfer *et al.* 2018). This creates a structural misalignment where sustainability contributions are insufficiently rewarded by markets and policy systems (Doh *et al.* 2017; Teece 2018). Consequently, sustainable entrepreneurship reshapes capability development, scaling dynamics, and value appropriation processes within firms.

## 6. Policy Implications and Recommendations

The findings highlight the need for integrated policy measures that address the structural and institutional barriers facing seaweed SMEs. Regulatory ambiguity emerged as a major constraint, with unclear compliance processes limiting innovation, investment, and business scaling. Policymakers should therefore prioritise clear, coherent, and streamlined regulatory frameworks that reduce administrative burdens and improve institutional coordination. Such reforms would enhance predictability, lower entry barriers, and support entrepreneurial experimentation within the bioeconomy. More broadly, the study suggests that sustainable sector development requires an enabling ecosystem in which regulatory clarity, institutional stability, and targeted support mechanisms operate as mutually reinforcing conditions for innovation and market growth.

The study highlights significant resource and capability constraints within seaweed SMEs, particularly the reliance on informal and self-funded experimentation due to limited tailored financial support. This underscores the need for mission-oriented funding mechanisms designed for micro-enterprises in emerging bioeconomy sectors, combining financial assistance with capability development in marketing, product innovation, and regulatory compliance. The findings also reveal a fragmented innovation ecosystem characterised by weak collaboration and limited knowledge exchange. Policymakers should therefore promote coordinated knowledge networks linking entrepreneurs, researchers, policymakers, and market actors to strengthen collective learning, resource sharing, and innovation capacity. Such ecosystem-based approaches are essential for supporting sustainability-driven innovation and long-term sectoral development.

Finally, the study highlights the lack of structured mechanisms for translating sustainability-oriented experimentation into scalable business models within seaweed SMEs. Although firms exhibit strong values-driven innovation, these practices remain largely informal and difficult to replicate. This underscores the need for a context-specific sustainable business model framework that formalises existing practices while preserving flexibility, strengthening value capture, and integrating capability development with market responsiveness. Such a framework should align with regulatory and financial support systems to ensure that business scaling remains consistent with environmental sustainability and community embeddedness. Overall, the findings demonstrate that supporting sustainable entrepreneurship in emerging bioeconomy sectors requires coordinated policy approaches that integrate regulatory clarity, targeted finance, capability development, and ecosystem collaboration. In response, the proposed framework presented in Fig. 3 offers a practice-oriented tool for embedding sustainability across value creation, delivery, and capture while strengthening innovation capacity and long-term sectoral development.



**Figure 3: Proposed Business Model Framework for Seaweed SMEs**

The proposed framework explains how sea vegetable SMEs generate and commercialise innovation within resource-constrained environments by integrating internal capabilities, external supports, and iterative market engagement. Grounded in Resource-Based Theory and Dynamic Capabilities, it emphasises that competitive advantage arises not from resource possession alone, but from the ability to organise, deploy, and reconfigure these resources in response to changing market conditions.

At its core are SME competences of human capital, managerial expertise, financial resources, and organisational systems which shape firms' capacity to innovate. These capabilities are activated through R&D, encompassing both experimental and incremental product development. Innovation is thus an adaptive, learning-driven process supported by continuous resource recombination. External support systems, including Business Development Services, research institutions, and financial intermediaries, extend internal capabilities by providing specialised knowledge and addressing capability gaps. However, firms operate under significant constraints related to regulation, costs, market dynamics, and limited human resources, which shape strategic decision-making and innovation pathways. The framework highlights the importance of continuous marketing and education to build consumer awareness in emerging markets, alongside the need for reliable production and distribution systems to support commercialisation. Crucially, feedback and evaluation mechanisms enable iterative learning, allowing firms to refine products and strategies over time.

Overall, the framework positions innovation as a dynamic, capability-driven, and cyclical process, where SMEs continuously adapt to environmental conditions while balancing sustainability, market demands, and resource limitations within the evolving blue bioeconomy.

## 7. Contributions

This study contributes to the literature by demonstrating how sustainable business model innovation is enacted within Ireland's emerging seaweed sector, a niche and resource-constrained marine bioeconomy context. Addressing calls for greater firm-level insight beyond technological perspectives (D'Amato *et al.* 2017), the findings show that dynamic capabilities in Irish seaweed SMEs develop through informal, practice-based processes shaped by regulatory uncertainty, limited resources, and market experimentation, extending previous work on SME capability development (Senyard *et al.* 2014; Teece 2018). The study also highlights the importance of experiential learning, local ecological knowledge, and stakeholder collaboration as critical micro-foundations of innovation, reinforcing and contextualising existing co-creation and learning literature (Ramaswamy and Ozcan 2014; Bocken *et al.* 2019).

## 8. Conclusion

Ireland's emerging seaweed bioeconomy illustrates both the promise and challenges of sustainable entrepreneurship. While firms demonstrate strong commitment to sustainability and innovative practices, their ability to scale is constrained by capability gaps and institutional fragmentation. Supporting these enterprises requires not only financial investment but also coordinated policy frameworks, knowledge networks, and regulatory clarity. By aligning profitability with environmental and social value, the seaweed sector can play a key role in advancing resilient, circular, and regenerative economies.

## 9. Limitations and Future Research

This study is exploratory in nature, and its findings should be interpreted within clearly defined boundaries. First, the empirical base is limited to six SMEs, which, while enabling rich and in-depth insights, restricts the breadth of representation across the Irish seaweed sector. Consequently, the findings cannot be fully generalised to the wider sector. Second, the qualitative design prioritises contextual depth and firm-level understanding over broad generalisability, capturing sector-specific dynamics shaped by Ireland's evolving marine bioeconomy landscape. Future research will build on this work through larger comparative studies across regions and marine sectors. In particular, further research will be conducted to analyse how policy implementation and regulatory systems influence sustainable business model development in the seaweed sector, and how these governance mechanisms can be better aligned and improved to support Seaweed SMEs more effectively.

## Declaration of Conflict of Interest

The authors declare that there are no conflicts of interest associated with this study. Furthermore, the authors confirm that this manuscript has not been submitted, in whole or in part, to any other journal or publication for

consideration. All research participants have been fully anonymised, and no identifying information is disclosed, ensuring the confidentiality and privacy of respondents.

## Acknowledgements

The author gratefully acknowledges the financial support provided by Atlantic Technological University Donegal, Faculty of Business, which made this research possible. The author also extends sincere appreciation to the supervisor and co-author for their guidance, mentorship, and valuable intellectual contributions to the development of this paper.

## Ethics Declaration

This study received ethical approval from the ATU Ethics Board (Approval Ref: IREC-ATUD-23-036).

## AI Declaration

Artificial intelligence tools were not used in the generation of the content presented in this paper.

## References

- Aarikka-Stenroos, L. and Ritala, P. (2017) 'Network management in the era of ecosystems: Systematic review and management framework', *Industrial Marketing Management*, 67, 23–36, available: <https://doi.org/10.1016/j.indmarman.2017.08.010>.
- Adner, R. (2017) 'Ecosystem as Structure: An Actionable Construct for Strategy', *Journal of Management*, 43(1), 39–58, available: <https://doi.org/10.1177/0149206316678451>.
- Araújo, R., Vázquez Calderón, F., Sánchez López, J., Azevedo, I.C., Bruhn, A., Fluch, S., Garcia Tasende, M., Ghaderiadekani, F., Ilmjärv, T., Laurans, M., Mac Monagail, M., Mangini, S., Peteiro, C., Rebours, C., Stefansson, T., and Ullmann, J. (2021) 'Current Status of the Algae Production Industry in Europe: An Emerging Sector of the Blue Bioeconomy', *Frontiers in Marine Science*, 7, available: <https://doi.org/10.3389/fmars.2020.626389>.
- Baker, T. and Nelson, R.E. (2005) 'Creating Something from Nothing: Resource Construction through Entrepreneurial Bricolage', *Administrative Science Quarterly*, 50(3), 329–366, available: <https://doi.org/10.2189/asqu.2005.50.3.329>.
- Barbier, M., Araújo, R., Rebours, C., Jacquemin, B., Holdt, S.L., and Charrier, B. (2020) 'Development and objectives of the PHYCOMORPH European Guidelines for the Sustainable Aquaculture of Seaweeds (PEGASUS)', *Botanica Marina*, 63(1), 5–16, available: <https://doi.org/10.1515/bot-2019-0051>.
- Barney, J. (1991) 'Firm Resources and Sustained Competitive Advantage', *Journal of Management*, 17(1), 99–120, available: <https://doi.org/10.1177/014920639101700108>.
- Bocken, N., Boons, F., and Baldassarre, B. (2019) 'Sustainable business model experimentation by understanding ecologies of business models', *Journal of cleaner production*, 208, 1498–1512, available: <https://www.sciencedirect.com/science/article/pii/S0959652618331767> [accessed 23 Mar 2026].
- Bocken, N.M., Short, S.W., Rana, P., and Evans, S. (2014) 'A literature and practice review to develop sustainable business model archetypes', *Journal of cleaner production*, 65, 42–56, available: <https://www.sciencedirect.com/science/article/pii/S0959652613008032> [accessed 23 Mar 2026].
- Boons, F. and Lüdeke-Freund, F. (2013) 'Business models for sustainable innovation: state-of-the-art and steps towards a research agenda', *Journal of Cleaner production*, 45, 9–19, available: <https://www.sciencedirect.com/science/article/pii/S0959652612003459> [accessed 23 Mar 2026].
- Braun, V. and Clarke, V. (2006) 'Using thematic analysis in psychology', *Qualitative Research in Psychology*, 3(2), 77–101, available: <https://doi.org/10.1191/1478088706qp0630a>.
- Bugge, M.M., Hansen, T., and Klitkou, A. (2016) 'What Is the Bioeconomy? A Review of the Literature', *Sustainability*, 8(7), 691, available: <https://doi.org/10.3390/su8070691>.
- van den Burg, S.W., Dagevos, H., and Helmes, R.J.K. (2021) 'Towards sustainable European seaweed value chains: a triple P perspective', *ICES Journal of Marine Science*, 78(1), 443–450, available: <https://academic.oup.com/icesjms/article-abstract/78/1/443/5580339> [accessed 23 Mar 2026].
- Buschmann, A.H., Camus, C., Infante, J., Neori, A., Israel, Á., Hernández-González, M.C., Pereda, S.V., Gomez-Pinchetti, J.L., Golberg, A., Tadmor-Shalev, N., and Critchley, A.T. (2017) 'Seaweed production: overview of the global state of exploitation, farming and emerging research activity', *European Journal of Phycology*, 52(4), 391–406, available: <https://doi.org/10.1080/09670262.2017.1365175>.
- Campbell, I., Macleod, A., Sahlmann, C., Neves, L., Funderud, J., Øverland, M., Hughes, A.D., and Stanley, M. (2019) 'The environmental risks associated with the development of seaweed farming in Europe-prioritizing key knowledge gaps', *Frontiers in Marine Science*, 6, 379461.
- Coad, A., Segarra, A., and Teruel, M. (2016) 'Innovation and firm growth: Does firm age play a role?', *Research Policy*, 45(2), 387–400, available: <https://doi.org/10.1016/j.respol.2015.10.015>.

- D'Amato, D., Droste, N., Allen, B., Kettunen, M., Lähtinen, K., Korhonen, J., Leskinen, P., Matthies, B.D., and Toppinen, A. (2017) 'Green, circular, bio economy: A comparative analysis of sustainability avenues', *Journal of Cleaner Production*, 168, 716–734, available: <https://doi.org/10.1016/j.jclepro.2017.09.053>.
- Doh, J., Rodrigues, S., Saka-Helmhout, A., and Makhija, M. (2017) 'International business responses to institutional voids', *Journal of International Business Studies*, 48(3), 293–307, available: <https://doi.org/10.1057/s41267-017-0074-z>.
- Duarte, C.M., Wu, J., Xiao, X., Bruhn, A., and Krause-Jensen, D. (2017) 'Can Seaweed Farming Play a Role in Climate Change Mitigation and Adaptation?', *Frontiers in Marine Science*, 4, available: <https://doi.org/10.3389/fmars.2017.00100>.
- Geissdoerfer, M., Vladimirova, D., and Evans, S. (2018) 'Sustainable business model innovation: A review', *Journal of Cleaner Production*, 198, 401–416, available: <https://doi.org/10.1016/j.jclepro.2018.06.240>.
- Hockerts, K. and Wüstenhagen, R. (2010) 'Greening Goliaths versus emerging Davids — Theorizing about the role of incumbents and new entrants in sustainable entrepreneurship', *Journal of Business Venturing*, Sustainable Development and Entrepreneurship, 25(5), 481–492, available: <https://doi.org/10.1016/j.jbusvent.2009.07.005>.
- McGrath, R.G. (2019) *Seeing around Corners: How to Spot Inflection Points in Business before They Happen* [online], Harper Business,
- Monagail, M.M. and Morrison, L. (2020) 'The seaweed resources of Ireland: a twenty-first century perspective', *Journal of Applied Phycology*, 32(2), 1287–1300, available: <https://doi.org/10.1007/s10811-020-02067-7>.
- Parida, V., Pesämaa, O., Wincent, J., and Westerberg, M. (2017) 'Network capability, innovativeness, and performance: a multidimensional extension for entrepreneurship', *Entrepreneurship & Regional Development*, 29(1–2), 94–115, available: <https://doi.org/10.1080/08985626.2016.1255434>.
- Ramaswamy, V. and Ozcan, K. (2014) *The Co-Creation Paradigm* [online], Stanford University Press, available: <https://doi.org/10.1515/9780804790758>.
- Reim, W., Parida, V., and Sjödin, D.R. (2019) 'Circular Business Models for the Bio-Economy: A Review and New Directions for Future Research', *Sustainability*, 11(9), 2558, available: <https://doi.org/10.3390/su11092558>.
- Rosenbusch, N., Brinckmann, J., and Bausch, A. (2011) 'Is innovation always beneficial? A meta-analysis of the relationship between innovation and performance in SMEs', *Journal of business Venturing*, 26(4), 441–457.
- Salunke, S., Weerawardena, J., and McColl-Kennedy, J.R. (2011) 'Towards a model of dynamic capabilities in innovation-based competitive strategy: Insights from project-oriented service firms', *Industrial Marketing Management*, 40(8), 1251–1263.
- Salunke, S., Weerawardena, J., and McColl-Kennedy, J.R. (2019) 'The central role of knowledge integration capability in service innovation-based competitive strategy', *Industrial marketing management*, 76, 144–156
- Schaltegger, S., Hansen, E.G., and Lüdeke-Freund, F. (2016) 'Business Models for Sustainability: Origins, Present Research, and Future Avenues', *Organization & Environment*, 29(1), 3–10, available: <https://doi.org/10.1177/1086026615599806>.
- Schot, J. and Geels, F.W. (2013) 'Strategic niche management and sustainable innovation journeys: theory, findings, research agenda, and policy', *The dynamics of sustainable innovation journeys*, 17–34.
- Senyard, J., Baker, T., Steffens, P., and Davidsson, P. (2014) 'Bricolage as a Path to Innovativeness for Resource-Constrained New Firms', *Journal of Product Innovation Management*, 31(2), 211–230, available: <https://doi.org/10.1111/jpim.12091>.
- Stegmann, P., Londo, M., and Junginger, M. (2020) 'The circular bioeconomy: Its elements and role in European bioeconomy clusters', *Resources, Conservation & Recycling: X*, 6, 100029.
- Teece, D.J. (2016) 'Dynamic capabilities and entrepreneurial management in large organizations: Toward a theory of the (entrepreneurial) firm', *European economic review*, 86, 202–216.
- Teece, D.J. (2018) 'Business models and dynamic capabilities', *Long Range Planning*, 51(1), 40–49, available: <https://doi.org/10.1016/j.lrp.2017.06.007>.
- Teece, D.J., Pisano, G., and Shuen, A. (1997) 'Dynamic capabilities and strategic management', *Strategic Management Journal*, 18(7), 509–533.
- Van Den Burg, S.W.K., Van Duijn, A.P., Bartelings, H., Van Krimpen, M.M., and Poelman, M. (2016) 'The economic feasibility of seaweed production in the North Sea', *Aquaculture Economics & Management*, 20(3), 235–252.
- Wenzel, M., Danner-Schröder, A., and Spee, A.P. (2021) 'Dynamic Capabilities? Unleashing Their Dynamics through a Practice Perspective on Organizational Routines', *Journal of Management Inquiry*, 30(4), 395–406.