

### Circular Blue Bioeconomy

*SMARTCHAIN focuses on circular economy solutions for the blue bioeconomy, including improved utilization of rest raw material (RRM) and minimizing food loss and waste (FLW) in seafood supply systems in Iceland and Norway*

The European Commission has defined the bioeconomy as “the production of renewable biological resources and the conversion of these resources and waste streams into value added products, such as food, feed, bio-based products and bioenergy” with the blue bioeconomy referring to aquatic or marine environments, especially, with regards to novel aquaculture applications and non-food, food, and feed applications.

Blue bioeconomy development can support the achievement of broad societal goals such as the Sustainable Development Goals (SDGs) through an emphasis on sustainability, circularity, and innovative approaches.

The circular economy (CE) is a way to increase resource efficiency by intentionally narrowing, slowing, and closing materials and energy flows. Overarching CE principles are resource efficiency, optimizing value of biomass and sustainability (Stegman et al., 2020)<sup>1</sup>. A conceptual framework is applied here to visualise the circularity in blue bioeconomy systems such as aquaculture and fisheries (Figure 1). The hot spots where food loss and waste occur have been identified and the circular flows indicate utilization of rest raw material into value-added products and recycling of waste streams into fertilizers and bioenergy.

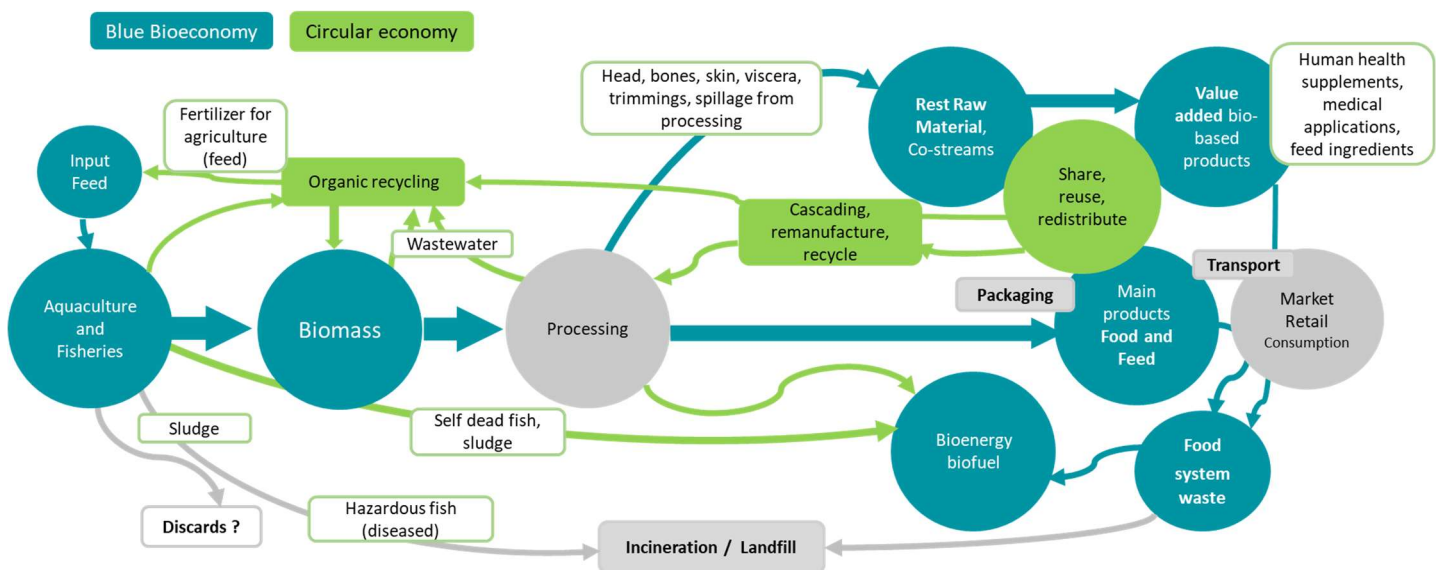


Figure 1 Conceptual framework for circularity of biomass in aquaculture and fisheries chains (Adapted from Carus, 2017)

<sup>1</sup> Stegman et al. (2020) The circular bioeconomy: Its elements and role in European bioeconomy clusters. Resources, Conservation & Recycling: X, 6. doi: <https://doi.org/10.1016/j.rcrx.2019.100029>

## Indicators

*Sustainability indicators were selected from pre-existing frameworks relevant to the topic of circular blue bioeconomy. The COM framework, was at the time (in 2022) insufficient to cover fisheries and aquaculture sectors, and therefore, the FAO's indicators for the bioeconomy were added including criteria of fisheries and farm management, and specific criteria for energy efficiency, waste management and wastewater etc.*

## Sustainability framework and indicators

The objective in SMARTCHAIN was to select framework and indicators relevant to assess circular blue bioeconomy activities in general and more specifically for fisheries and aquaculture. The primary framework selected was the European Commission's "Sustainability criteria for the blue economy", which was further cross-referenced with the FAO's "Indicators to monitor and evaluate the sustainability of bioeconomy" and the GRI standards. The final selection resulted in a dashboard of indicators for the environmental, social, economic and governance dimensions (Deliverable 3.1).



## CSR reporting

*The non-financial reporting on sustainability performance is becoming increasingly detailed and more common, especially among larger companies*

To explore the utility of the selected indicators for circular bioeconomy assessment, CSR reports of companies in the fisheries and aquaculture supply chains in Norway and Iceland were reviewed. Relevant themes from the SDG goals have been adapted, in the reporting, for example, in Iceland the CSR reporting of companies follow a joint policy of social responsibility based on the UN SDG goals (Fisheries Iceland<sup>2</sup>). The main themes in the reports are on life below water, innovation and development, circular economy, minimizing carbon footprint, energy use and switching to alternative energy sources. Many reports are prepared in accordance with the GRI Standard and ESG reporting guide. Sustainability reports may play an important role as a supporting tool in the transition of organisations towards more circular economy models, since their content can help to measure, monitor, and communicate the organisations' transition and to establish goals in the short/medium term (Ibáñez- Forés et al., 2022)<sup>3</sup>.

## ESRS

*The ESRS are a set of new standards and indicators that aim to standardise the way in which companies report on non-financial aspects*

Although sustainability has often been defined as depending on three pillars (economic, social, environmental) it has become increasingly accepted that governance must be included among them as a dimension that is crucial to the achievement of sustainability goals. This emphasis is also evident in the private sector's Environment Social Governance (ESG) standards. It is foreseen that the new Corporate Sustainability Reporting Directive (CSRD) and the European sustainability reporting standards

<sup>2</sup> Fisheries Iceland (SFS) The association's goal is to safeguard the interests of the fisheries sector, including companies in aquaculture. [Ábyrgur sjávarútvegur \(sfs.is\)](https://www.sfs.is/).

<sup>3</sup> Valeria Ibáñez- Forés, et al., (2022). Sustainability reports as a tool for measuring and monitoring the transition towards the circular economy of organisations: Proposal of indicators and metrics (2022). Journal of Environmental Management, 320, 2022, 115784, <https://doi.org/10.1016/j.jenvman.2022.115784>

## Stakeholder engagement

*In-depth interviews and focus groups were conducted to gauge the view of stakeholders in Iceland and Norway on the challenges involved in transforming the fisheries and aquaculture food supply systems towards more sustainable and circular bioeconomic systems*

## Analytical framework

*The data analysis is based on institutional theory and four broad categories,:*

- 1) Regulatory (domestic and international regulations, policies, roadmaps, strategies etc);*
- 2) Resources (tangible (material, financial, physical) and intangible (knowledge and skills);*
- 3) Market (customers, consumers, partners or competitors in the value chain, service providers and industry associations);*
- and 4) Social (the community at large, NGOs, local communities, the media, and issues like image and reputation and corporate social responsibility and organizational values)*

(ESRS) will put pressure on the private sector to update their CSR reporting practices which have been relying on national framework references or other standards, such as GRI, SDGs and the UN Global Compact.

The ESRS cover Cross cutting standards on General requirements and General disclosures as well as Topical standards in three areas: 1) Environment: Climate change, pollution, water and marine resources, biodiversity, and circular economy; 2) Social: Own workforce, workers in the value chain, affected communities, and customers and end-users; 3) Governance: Business conduct. The new ESRS standards are tailored to EU policies, particularly the Green Deal, while building on and contributing to international standardization initiatives.

## Interviews and focus groups

The main objective of the stakeholder engagement activity was to identify the stakeholders' perception on the drivers and barriers regarding transformation of the food system as well as assessing synergies and trade-offs. Selected findings from the stakeholder activities (interviews, focus groups) are shown in Figure 2. The pie chart indicates how frequently certain topics emerged in the different theme categories. The resource and regulatory issues dominated the discussion in both countries.

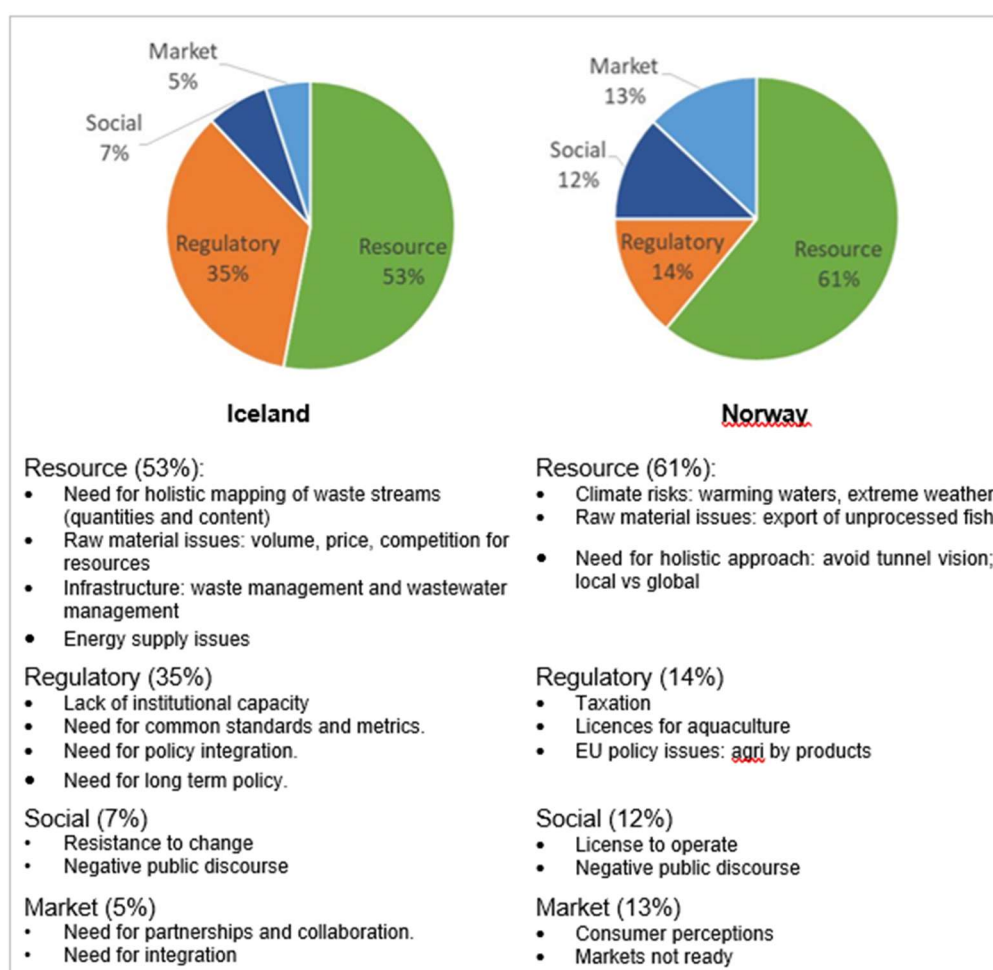


Figure 2 Summary and selected findings from stakeholder interviews on the perception of challenges and barriers in Iceland and Norway (Saviolidis et al.2023, Deliverable 3.2)

## Circularity in seafood supply chains - Recommendations

A transition towards a circular economy for the blue bioeconomy can contribute to resource efficiency gains which are integral to sustainable development. At the same time, it can also stimulate increased profit by turning waste streams or lower value products into value or higher value streams. Advancing the circular blue bioeconomy can also contribute to internationally agreed upon goals: the SDGs.

One of the major issues that emerged in interviews is the *need for mapping all FLW streams* both in terms of quantities but also in terms of the content and quality of these streams. The findings show that realising the potential of a more circular blue bioeconomy requires the *development of target-based overarching strategies* and the implementation of a *systemic approach cutting across different sectors* (e.g., agriculture, tourism, transport, and energy sector).

### Key sources for further information

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#### Scientific publication:

Saviolidis, N.M., Ólafsdóttir, G., Strand, A.V., Mehta S., Myhre, M.S., and Bogason, S. (2024). Barriers in the transition to a more circular blue bioeconomy in Norway and Iceland: multistakeholder perspectives. Submitted for publication

#### Deliverables:

Saviolidis, N.M. and Ólafsdóttir, G. (2022). Sustainable resource use and circularity: Selected indicators. The SMARTCHAIN project co-funded by ERA-NET, EU Horizon 2020 G.A. No 817992, and Norges forskningsråd (RCN), Innovation Fund Denmark (IDF), The Icelandic Centre for Research (RANNIS) / Technical Development Fund (TF). *Deliverable: D3.1*, University of Iceland, Reykjavík, 33 pages.

Saviolidis, N.M., Ólafsdóttir, G., Mehta S., Strand, A.V., Myhre, M.S., and Bogason, S. (2023). Stakeholder engagement. Summary of results from stakeholder engagement activities in fisheries and aquaculture systems The SMARTCHAIN project co-funded by ERA-NET, EU Horizon 2020 G.A. No 817992, and Norges forskningsråd (RCN), Innovation Fund Denmark (IDF). The Icelandic Centre for Research (RANNIS) / Technical Development Fund (TDF). *Deliverable: D3.2*, University of Iceland, Reykjavík, 28 pages.

#### Conference presentations:

Saviolidis, N.M., Ólafsdóttir, G., Myhre, M.S., Strand A.V., & Mehta, S. (2023) Drivers and barriers for the advancement of a circular blue bioeconomy in Iceland and Norway. International Conference on Resource Sustainability (icRS 2023) August 7-9th 2023, University of Surrey, UK.

#### Webinars:

Saviolidis, N.M., Ólafsdóttir, G. (2022). Barriers to increased sustainability and circularity in the blue bioeconomy: Preliminary findings Smartchain Stakeholder Workshop/webinar August 31<sup>st</sup>, 2022 <https://www.youtube.com/watch?v=oeOuQr2VWSQ&t=35s>

Saviolidis, N.M., Ólafsdóttir, G. & Bogason, S. (2023), Barriers to a circular blue bioeconomy in Iceland, webinar arranged by an NKJ co-funded network “What do sustainable agro-marine food systems mean in different Nordic contexts?” June 14th, 2023. Nordic Joint Committee for Agricultural and Food Research

Saviolidis, N.M., Ólafsdóttir, G., Myhre, M.S., Strand, A.V., Mehta S., & Bogason, S. (2023) Drivers and barriers for the advancement of a circular blue bioeconomy in Iceland and Norway. Smartchain webinar Oct.11th, 2023 <https://www.youtube.com/watch?v=FrWweyAjQCO>

Saviolidis, N.M., Ólafsdóttir, G. (2024). Circularity in blue bioeconomy value chains: metrics, challenges and opportunities. Smartchain webinar March 21st, 2024 <https://www.youtube.com/watch?v=ufDki5v9OCY&t=88s>

*Disclaimer: This “brief” reflects only the authors' view and the EU Funding and national funding Agencies are not responsible for any use that may be made of the information it contains*

## SMARTCHAIN – Smart solutions for advancing supply systems in blue bioeconomy value chains

<https://bluebioeconomy.eu/smart-solutions-for-advancing-supply-systems-in-blue-bioeconomy-value-chains/>  
<https://www.sintef.no/en/projects/2021/smartchain/>



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