LCA in the blue bioeconomy: ecosystem services and carrying capacity

Date: Tuesday, 26 November 2024

Theme: Blue Bio Resources

Workshop Summary

The workshop convened to discuss and advance Life Cycle Assessment (LCA) methodologies tailored to blue biomass production, including seaweed and microalgae cultivation, aligning efforts to promote sustainability. The key goal was to address the limitations of available LCA approaches, initially designed for terrestrial systems, and adapt them to marine and freshwater ecosystems while providing validated recommendations to policymakers, particularly DG MARE and DG ENV.

Opening Discussion: Why LCA for Marine and Algae Systems?

LCA has proven invaluable for assessing environmental impacts across value chains, but its relevance to marine ecosystems is still evolving. Given the upcoming in Green Claims Directive, the workshop aimed to harmonize community-driven LCA approaches, align efforts across stakeholders, and provide policy-relevant recommendations to support standardisation, facilitating the algae sector's growth within a sustainable framework.

Standardization Challenges and Opportunities (Maris Stulgis, DG MARE)

Maris Stulgis underscored LCA's role in validating environmental footprints for products and its importance in policymaking. Some of the challenges the algae sector faces are due to the sheer number of LCAs (over 100 different studies have been analysed) and insufficient participation by algae experts in standardisation processes such as CEN-454. Initiatives like EU4Algae are working to engage more stakeholders with technical expertise to define meaningful standards. Upcoming recommendations for the next round of algae product EN standards are expected to address this gap.

Product Environmental Footprint (PEF) and Future Outlook (Mauro Cordella)

Mauro Cordella outlined the EU's journey in LCA standardization through the Product Environmental Footprint (PEF) methodology, launched in 2013 and integrated into policies like the Green Deal. Upcoming developments include new Product Environmental Footprint Category Rules (PEFCRs) for aquaculture, marine fish, and animal feed (2024–2025) and an EF4.0 database (2026–2027).

While EF methods are increasingly applied in policymaking, inconsistencies from shadow PEFCRs (developed outside EU oversight) and data variability persist. Future efforts will focus on coherence, governance review, training, and better integration across policies.

EU4Algae Initiative and Addressing Knowledge Gaps (Efthalia Arvaniti)

Efthalia Arvaniti presented the EU4Algae's focus on increasing algae production in Europe to meet growing global demand. Despite numerous algae LCA studies, the sector faces challenges such as unclear guidelines, limited data availability, and insufficient consideration of marine-specific impacts like ecosystem services. As part of an upcoming relevant EU4Algae report that will be published next month on the topic, recommendations included promoting circular solutions, integrating ecosystem services with PEF, and verifying algae's environmental performance to protect algae's positive branding.

Harmonization of Algal LCAs (Margarida Costa)

Margarida Costa emphasized the need for harmonized LCA methodologies to support market-ready algae products across the five algae signature Horizon projects, LOCALITY, REALM, AlgaeProBanos, Seamark and CircAlgae. Current LCAs often lack accessibility for non-expert end-users, limiting their utility for industry and policymakers. A workshop in January 2025 will launch some clustering processes to streamline LCA methodological approaches that can effectively inform decision-making and regulatory compliance.

A global network of LCA practitioners (Jean-Baptiste Thomas)

Jean-Baptiste presented a global movement of LCA practitioners he is leading that is associated with algae and other low-trophic aquaculture sectors, increasing harmonisation efforts, especially involving marine systems of seaweed and shellfish value chains.

Complementary Tools for Sustainability (Sophie Koch)

Sophie Koch discussed the integration of complementary tools with LCA, such as Ecosystem Services (ES) and Carrying Capacity (CC), to address gaps in marine ecosystem assessments. These tools capture benefits like ecosystem restoration and measure environmental thresholds, providing a comprehensive framework for sustainability evaluations. A balanced approach combining LCA, ES, and CC could enhance algae production's contributions to ecological health.

Moderated Discussion and Key Takeaways

The panel discussion with the audience was moderated by Jean-Baptiste Thomas centred on aligning LCAs with existing policies like the Marine Strategy Framework Directive (MSFD) and the Green Claims Directive. Participants highlighted the importance of simplifying sustainability assessments for SMEs and co-locating algae farms with aquaculture to maximize efficiency. Specific points included:

- **Policy Integration**: LCAs should incorporate MSFD criteria, enabling policymakers and industry to align sustainability metrics.
- **Simplified Tools for SMEs**: There is a pressing need for accessible, low-cost tools to help SMEs substantiate sustainability claims without overburdening resources.
- **Co-Location**: Integrating algae production with other operations (e.g., fish aquaculture) offers opportunities to scale up while minimizing environmental impacts.
- **Define better Ecosystem Services** build a definition and expectations
- **Focus on Restoration**: Aligning business activities with restoration goals could link LCA methodologies to broader environmental finance directives.
- **Harmonization and Best Practices**: Creating harmonized LCA standards would provide SMEs with actionable frameworks, ensuring consistent practices across the algae sector.

Closing Remarks

The workshop concluded with a call for greater collaboration among researchers, industries, and policymakers to refine LCA methodologies and integrate them with ecosystem service assessments. These efforts will help substantiate sustainability claims, advance regulatory alignment, and support the EU's broader circular bioeconomy goals. Future initiatives will focus on stakeholder engagement, training, and accessibility to foster innovation and environmental legitimacy in the algae sector.