

Summary of SME Feedback and Response to “Seaweed-Based Products for Decarbonization Road Map”

About This Document

Ocean Visions’ “Seaweed-Based Products for Decarbonization Road Map” (“Road Map”) was commissioned to provide a regularly updated, interactive, digital platform that lays out how seaweed-based products could contribute to global decarbonization, and what scientific, policy, and market conditions must be met to scale them responsibly. The Road Map consists of 9 product-specific and 2 cross-cutting chapters, each organized into State of Approach, Knowledge and Development Gaps, and First-Order Priorities sections. Together, these chapters seek to design actionable pathways for how seaweed-based products can contribute to global decarbonization between now and 2050, and what scientific, policy, and market conditions must be met to scale them responsibly.

Ocean Visions published the draft Road Map on the project webpage and solicited feedback via a public comment period from 5 May to 5 June 2026. The public comment period was facilitated with a Google Form to identify interest, requests for reviewing road map chapters (see Appendix A, “Pre-Review Survey Questions”) and anonymous nominations for additional reviewers. Following review, respondents were invited to participate in a post-review survey via a Microsoft Form (see Appendix B, “Post-Review Survey Questions”). Throughout the public comment period, the Ocean Visions project team (henceforth “project team”) reviewed and public feedback to inform revisions to the Road Map. The Road Map was published on 9 June 2026, though Ocean Visions notes that it will continue to be updated as a living resource.

This document presents an overview of the subject matter expert (SME) participation and feedback received on the draft Road Map and how the project team responded to feedback via Road Map revisions. The comments are summarized in aggregate by major themes and further illustrated with select quotes from reviewers.

This document was prepared by Nikhil Neelakantan (Ocean Visions) and Dr. Amelia-Juliette Demery (Ocean Visions) and published by Ocean Visions on 9 June 2026.

Acknowledgments

Ocean Visions is deeply grateful to the anonymous reviewers who generously contributed their time, expertise, and careful judgment to strengthen this Road Map. Their feedback sharpened the scientific rigor of the document, clarified its structure, improved its

accessibility for broad audiences, and helped ensure that its recommendations are more credible, more practical, and more responsive to the realities of seaweed-based product development. We especially appreciate the reviewers' willingness to engage both the details and the bigger-picture strategy of the document. We thank them for their generosity and shared commitment to advancing thoughtful, evidence-based pathways for decarbonization through seaweed-based products.

Summary of Participants

During the open comment period, the Pre-Review Survey reached 71 individuals, who nominated 41 additional people to review the Road Map. Of those contacted, 25 provided feedback through email or direct line edits. The Ocean Visions team also conducted 11 SME interviews to gather qualitative feedback. In total, the review period produced 151 feedback items that were considered for incorporation into the Road Map as of 9 June 2026. The Post-Review Survey received only six responses, so its results were not included in this report.

Summary of Thematic Commentary and Major Revisions

Reviewers praised the Road Map as a high-quality, well-structured, and accessible resource that combines strong analysis with practical value across highly multidisciplinary topics. Several also emphasized its usefulness to practitioners and expressed enthusiasm for continuing to support the work.

"I just finished reviewing the Animal Feed and Livestock Methane Inhibitors sections and they're phenomenal. As someone in the livestock sector who has been working on creating a consistent feed ingredient out of kelp, this initiative is so amazing and such a great resource. I think that the material is very thorough and very well written, I wish I had this a few years ago when I started working with kelp as a feed ingredient for cattle!"

"...very nice job with the report. It was very nicely structured with strong analysis while being accessible even considering how multidisciplinary it is."

"...I was impressed with the report quality and would love to continue helping make this a reality."

"I do want to commend you for the [Road Map], it is a tremendous amount of work to pull such a large amount of literature reports together in an accessible format. This is and can only become more impactful as a resource for this growing community."

Across the feedback set, the clearest pattern was convergence around several major needs: stronger evidence standards, clearer and more accessible structure, better monitoring and comparability, more realistic attention to processing and scale-up constraints, and deeper treatment of commercialization, governance, and social license. The interviews reinforced and extended these themes by surfacing practical barriers and market conditions that are not always captured in written review comments alone.

Feedback and Revisions by Major Theme

Feedback was aggregated into five major themes based on the chapter sections, strategic issues, and cross-cutting priorities raised by reviewers and interviewees:

1. Scientific rigor, safety, and evidence standards
2. Structure, readability, and accessibility for broad audiences
3. Monitoring, standardization, and comparability across the value chain
4. Processing, infrastructure, and scale-up constraints
5. Market confidence, commercialization, governance, and social license

Each theme includes a summary of feedback received, with two-three anonymous quotes of feedback, before summarizing how Ocean Visions incorporated the feedback.

1. Scientific Rigor, Safety, and Evidence Standards

Reviewers recommended different ways to strengthen the scientific rigor of the Road Map by tightening claims, clarifying uncertainty, and distinguishing early-stage evidence from demonstrated real-world outcomes. Reviewers called for clearer caveats, stronger evidence on safety, performance, and life-cycle impacts, and more disciplined treatment of carbon accounting, ecological risk, and commercial feasibility so the Road Map functions as a credible decision-support tool rather than a catalog of promising possibilities.

"...though seaweed products may be relatively low carbon compared to some products, we don't yet understand the biogenic carbon foundations of the seaweed production at sea sufficiently well to gage with accuracy how much carbon decarbonisation is taking place when including biogenic carbon in the equation."

"For seaweed to gain widespread acceptance as a nutritional source, more clinical trials are needed to verify its impact on human health, especially in populations new to seaweed consumption."

"Developing standardized testing for contaminants such as heavy metals, marine biotoxins, and iodine will be critical to ensuring the safety of seaweed-based food products."

The Road Map was revised to strengthen scientific rigor, clarify uncertainty and real-world applicability, add missing evidence and references, and keep the document focused by deferring suggestions that fell outside its intended scope.

Specific revisions taken:

- Strengthened discussion of key knowledge gaps, including clinical trials, contaminant monitoring, exposure assessment, standardized testing, genotype-phenotype mapping, and composition tracking across production chains.
- Clarified the distinction between current practice and future potential to reduce overstatement and improve decision relevance.
- Tightened language on carbon sequestration, ecological risk, and environmental constraints to better reflect uncertainty and evidence limits.
- Added references and new studies in areas where evidence was missing, limited, or underdeveloped.
- Deferred or declined suggestions that would have expanded the Road Map beyond scope, such as adding marine carbon removal content or undertaking broader structural redesign.

2. Structure, Readability, and Accessibility for Broad Audiences

Reviewers expressed that the Road Map's value depends not only on its content but on whether chapters are clearly structured, properly sequenced, and accessible to non-specialists. Across multiple chapters they called for better introductory framing, clearer section boundaries, simpler language, stronger definitions, and more readable tables and figures so each chapter can stand alone as an accessible public-facing resource.

"Some gap statements are sharp, while others are still loose. For example: 'biofuels from macroalgae are not yet economically viable' is clear, but 'public acceptance is still uncertain and hard to measure' is weaker unless linked to a concrete decision need..."

"In addition to the commercial names - would it be helpful to list what products these are in? Some are clearer than others"

The Road Map was revised to better connect technical development with market, governance, and community conditions by strengthening discussion of standards, commercialization, permitting, demand, and social license.

Specific revisions taken:

- Strengthened language on environmental and social monitoring for buyers and certification systems.

- Expanded discussion of food safety progress, Codex-related developments, and consumer adoption risks.
- Added stronger treatment of equitable benefit distribution, diversified livelihoods, and communication about industrial processing risks.
- Clarified commercialization needs by emphasizing permitting reform, regulatory pathways, revenue stacking, investor confidence, early offtake, and realistic market sizing.
- Reorganized content and revised priorities so market barriers, policy, demand activation, bankability, and permitting were more clearly aligned.

3. Monitoring, Standardization, and Comparability Across the Value Chain

Reviewers emphasized that stronger monitoring, standardized methods, and comparable frameworks are essential for evaluating claims, risks, and performance across seaweed value chains. Across food safety, quality assurance, lifecycle analysis (LCA), technological readiness levels (TRLs), carbon accounting, and buyer-facing environmental and social claims, they suggested that inconsistent methods and fragmented evidence limit regulatory confidence, investment, commercialization, and responsible scale-up, making shared measurement systems and clearer reference points a key enabling condition for the sector.

"I will stress that LCA is key and the main means by which we can, with some degree of certainty, substantiate decarbonisation through well documented best practices."

"The lack of consistency in tracking key compounds during the processing stages is a significant challenge. A standardized approach to monitoring bioactive compounds from cultivation through to final product would allow for more reliable claims and better regulatory compliance."

"Robust [monitoring, reporting, and verification] systems will be critical not only for demonstrating climate benefits, but also for enabling access to carbon markets and supporting investor confidence."

The Road Map was revised to make processing and infrastructure constraints more explicit, practical, and relevant to real-world scale-up.

Specific revisions taken:

- Clarified the differences between wet and dry processing pathways and added examples of liquid extract production from undried biomass.
- Strengthened discussion of onsite or near-site dewatering and drying, including shelf-life, throughput, and energy constraints.

- Revised cultivation sections to better reflect offshore dewatering, mechanized harvesting, and other operational scale-up challenges.
- Expanded treatment of preservation, modular processing, species variability, and flexible biorefinery systems that can adapt across feedstocks and markets.
- Improved specificity around engineering and supply-chain gaps, including pretreatment, storage, water-seaweed interactions, drying efficiency, and cost drivers.

4. Processing, Infrastructure, and Scale-Up Constraints

Reviewers and interviewees emphasized that scaling seaweed products depends on practical processing and infrastructure realities. Across multiple chapters, feedback highlighted dewatering, drying, preservation, logistics, pretreatment, offshore systems, and modular processing as major constraints on cost, quality, throughput, and emissions, suggesting more visibility of these operational barriers so pathways to scale are grounded in real engineering and supply-chain challenges.

“Cascaded value extraction from FRESH seaweed is crucial to make the seaweed industry economics start to show black figures...”

"Considering environmental risks: potential higher water usage, chemicals used during processing, recommend adding R+D priorities to better understand the true scope of these gaps and if there are mitigation measures/alternative approaches that can be taken to support sustainable use of natural resources in processing"

"The current text focuses primarily on biochemical extraction cascades and hydrocolloid-centered biorefineries, while thermochemical approaches may be particularly relevant for wet, heterogeneous, or stranded biomass such as pelagic Sargassum."

The Road Map was revised to better integrate market, policy, and social conditions into its treatment of decarbonization pathways, with stronger attention to commercialization, community impacts, and enabling institutions.

Specific revisions taken:

- Strengthened discussion of environmental and social monitoring, buyer expectations, and certification-related needs.
- Expanded treatment of food safety, consumer adoption, equitable benefit distribution, and communication about industrial processing risks.
- Clarified commercialization needs by emphasizing permitting reform, regulatory pathways, revenue stacking, investor confidence, early offtake, and realistic market sizing.

- Reorganized sections so market barriers, policy, and demand were better aligned and treated as parallel drivers of scale-up.
- Revised priorities and key actions to better reflect bankability, permitting, market development, and demand activation.

5. Market Confidence, Commercialization, Governance, and Social License

Reviewers and interviewees stressed that seaweed-based products will not scale through technical progress alone; they also require stronger market confidence, governance, commercialization capacity, and social license. Across textiles, blue food, fuels, cultivation, and interview discussions, feedback highlighted the importance of standards, policy clarity, buyer expectations, permitting, investor confidence, equitable benefit distribution, community trust, and realistic business models, pushing the Road Map to treat decarbonization pathways as social, institutional, and commercial projects as much as technical ones.

"Can one benefit of this also be the promotion of diversified livelihoods (i.e. being able to save money or grow income using new co-products)?"

"It will also be critical to inform communities on the risks in the previous section on the industrial processes as, even if it doesn't use pesticides, there are other ongoing processes that can impact communities...[and]...human rights protection"

"Early market signals and financing mechanisms can accelerate technology development and support pilot and demonstration projects before full-scale deployment."

The Road Map was revised to better integrate market, governance, and social considerations into its treatment of seaweed-based decarbonization pathways.

Specific revisions taken:

- Strengthened discussion of environmental and social monitoring, buyer expectations, and certification-related needs.
- Expanded treatment of food safety, consumer adoption, equitable benefit distribution, and communication about industrial processing risks.
- Clarified commercialization needs by emphasizing permitting reform, regulatory pathways, revenue stacking, investor confidence, early offtake, and realistic market sizing.
- Reorganized sections so market barriers, policy, and demand were better aligned and treated as parallel drivers of scale-up.
- Revised priorities and key actions to better reflect bankability, permitting, market development, and demand activation.

Other Revisions

Beyond the major themes, public feedback captured many chapter-specific improvements that strengthened the Road Map’s overall quality and consistency. These included copy edits, citation and terminology fixes, table and figure revisions, species and company additions, glossary clarifications, and cross-chapter alignment on issues such as LCA placement, TRL language, and the distinction between knowledge gaps and first-order priorities. A small number of useful comments were logged for backlog or future follow-up where they required more evidence, time, or structural redesign than this revision cycle allowed.

Appendix A. Google Pre-Review Survey Questions

Question 1: E-mail

Type: Valid email

Required: Yes

Question 2: Please enter your full name

Type: Short-answer text

Required: No

Question 3: If you are interested in reviewing one or more chapters of the Seaweed-based Products for Decarbonization Road Map, please share your preferred email contact below. We will use this email to share the chapters of the road map you'd like to review.

Type: Short answer text

Required: Yes

Question 4: Please check the box of each chapter you would be interested in reviewing.

Type: Multiple-choice format

Required: Yes

Options:

- Agricultural Supplements
- Animal Feed
- Biofuels
- Bioplastics
- Construction materials
- Critical Minerals
- Food Products
- Livestock Methane Inhibitors
- Textiles and Fabrics
- Cross-cutting: Biorefineries
- Cross-cutting: Cultivation

Question 5: If you know of specific people you think would be interested in contributing a review to the Seaweed-Based Products for Decarbonization Road Map, please list them here with their name and their preferred contact information so that we can reach out.

Type: Long answer text

Required: No

Appendix B. Microsoft Post-Review Survey Questions

Section 1: Demographics

Question 1: Please list your full name

Type: Text

Required: No

Settings: Optional to support anonymous feedback

Question 2: Please list your affiliation/organization

Type: Text

Required: Yes

Question 3: From the selection below, choose your geographic region

Type: Choice

Required: Yes

Settings: Single answer, drop-down or multiple-choice format

Options:

- Africa
- Asia
- Europe
- Latin America and Caribbean
- North America
- Oceania

Question 4: From the selection below, choose the sector that best matches your professional position

Type: Choice

Required: Yes

Settings: Single answer, drop-down or multiple-choice format

Options:

- Academic or government scientists
- Representatives of national and sub-national governments/representatives of Indigenous nations
- Industry representative focused on seaweed
- Other Industry
- Philanthropy
- Investor

Question 1: Please list your full name

Type: Text

Required: Yes

Question 2: Please list your affiliation/organization

Type: Text

Required: Yes

Question 3: From the selection below, choose your geographic location (country/region)

Type: Choice

Required: Yes

Settings: Single answer, drop-down or multiple-choice format

Options:

- [Placeholder: Region/Country Option 1]
- [Placeholder: Region/Country Option 2]
- [Placeholder: Region/Country Option 3]
- [Placeholder: Region/Country Option 4]
- [Placeholder: Region/Country Option 5]
- [Placeholder: Add remaining regions/countries from source image]

Question 4: From the selection below, choose the sector that best matches your professional position

Type: Choice

Required: Yes

Settings: Single answer, drop-down or multiple-choice format

Options:

- [Placeholder: Sector Option 1]
- [Placeholder: Sector Option 2]
- [Placeholder: Sector Option 3]
- [Placeholder: Sector Option 4]
- [Placeholder: Sector Option 5]
- [Placeholder: Add remaining sector options from source image]

Section 2: Feedback Preferences

Question 5: Which Road Map section(s) did you review?

Type: Choice

Required: Yes

Settings: Multiple answers allowed

Options:

- Agricultural Supplements
- Animal Feed
- Biofuels
- Bioplastics
- Construction materials
- Critical Minerals
- Food Products
- Livestock Methane Inhibitors
- Textiles and Fabrics
- Cross-cutting: Biorefineries
- Cross-cutting: Cultivation

Question 5: Which Road Map section(s) did you review?

Type: Choice

Required: Yes

Settings: Multiple answers allowed

Options:

- [Placeholder: Road Map Section 1]
- [Placeholder: Road Map Section 2]
- [Placeholder: Road Map Section 3]
- [Placeholder: Road Map Section 4]
- [Placeholder: Road Map Section 5]
- [Placeholder: Add all Road Map sections from source image]

Section 3: Optional Additional Feedback Questions

Question 6: What are the most important strengths of the section(s) you reviewed?

Type: Text

Required: No

Settings: Consider enabling long answer

Question 7: What are your suggestions for improving priorities or structure?

Type: Text

Required: No

Settings: Consider enabling long answer

Question 8: Is there anything unclear or confusing that you could not include in the feedback?

Type: Text

Required: No

Settings: Consider enabling long answer

Question 9: Additional comments or suggestions

Type: Text

Required: No

Settings: Consider enabling long answer

Section 4: Broader Input

Question 10: Are you open to us reaching out to discuss your feedback in more detail?

Type: Choice

Required: Yes

Settings: Single answer

Options:

- Yes, you can reach out to me to discuss my feedback.
- No, you cannot reach out to me to discuss my feedback.

Section 5: Consent

Question 11: May we attribute your comments in the summary report?

Type: Choice

Required: Yes

Settings: Single answer

Options:

- Yes, you may include my name and organization in the summary report.
- Yes, but just include my name in the summary report.
- Yes, but just include my organization in the summary report.
- No, keep my comments anonymous.