

## Research Proposal

A. PROJECT TITLE	2.5 Building a blue economy sector - seaweed
"SHORT" TITLE	Blue Seaweed Economy / Building a seaweed sector
B. THEME / PROGRAMME	Theme 2: Blue economy

C. PROJECT KEY RESEARCHERS			
Role	Name	Institution / company	Email
Project Leader	Serean Adams	Cawthron Institute	serean.adams@cawthron.org.nz
Key Researcher	Nigel Bradly	Envirostrat	
Key Researcher	Rob Major	Cawthron Institute	
Key Researcher	Marie Magnusson	UoW	
Key Researcher	Victoria Jollands	Envirostrat	
Key Economics Researcher	Sandra Cortez	Envirostrat	
Key Researcher	Leo Zamora	Cawthron	
Key Researcher	Tom Wheeler	Cawthron	
Key Researchers	Emma Newcombe	Cawthron	
Vision Mātauranga	Shaun Ogilvie	Cawthron	
Vision Mātauranga	Te Rerekohu Tuterangiwhiu	Cawthron	

D. ABSTRACT
<p>Seaweed has enormous potential to contribute to the Sustainable Seas' vision of healthy marine ecosystems that provide value for every New Zealander. With the right framework grounded in Ecosystem Based Management (EBM) principles, a thriving seaweed sector could provide meaningful economic, environmental, social and cultural benefits to local communities and broader impacts nationally. However, NZ currently has no sector platform (or framework) to support and guide its development.</p> <p>Globally, seaweed represents &gt;30% of aquaculture production volume. It's value in 2018 was USD\$13B with a growth rate averaging 8% per year in the previous 3 years<sup>1</sup>. In contrast, NZ has a fledgling but highly dynamic sector operating at small scale. The fragmentation and uncertainty facing investors and producers, and the complexity of the decision-making they currently face reinforce the need for an overarching framework. There are important examples of product innovation and science-based applications, but these are limited by a constrained supply chain that does not include aquaculture which has high labour and space costs associated with it.</p> <p>This project will create a NZ seaweed framework to fit within the broader Blue Economy. The framework will be adaptive and incorporate principles of Ecosystem Based Management, Te Taio, Blue Economy, and the four pou framework. It will focus on the needs of current and future seaweed sector stakeholders and participants to produce a framework they can collectively implement.</p>
 <pre>graph LR; A[Seaweed Sector Research (RA1)] --&gt; B[Draft Framework (RA1)]; B --&gt; C[Case Studies (RA2)]; C --&gt; D[Seaweed Sector Framework]</pre>

E. RELEVANCE TO CHALLENGE OBJECTIVE
<p>The specific aims of the project are to:</p> <ul style="list-style-type: none"><li>Iteratively develop a NZ seaweed sector framework, incorporating EBM principles.</li></ul>

- Test the framework using case studies to understand how it can effectively operate across different scales (e.g. local, regional, national and small to large businesses).

The Sustainable Seas’ objective “to enhance utilisation of our marine resources within environmental and biological constraints” underpins the project’s research aims. This objective will be reinforced by employing Blue Economy (BE) and Ecosystem Based Management (EBM) principles (Figure 1) to help answer specific research questions under each research aim. The EBM principles in Figure 1 below will be incorporated into the draft framework and tested through the Case Studies to ensure alignment with EBM.

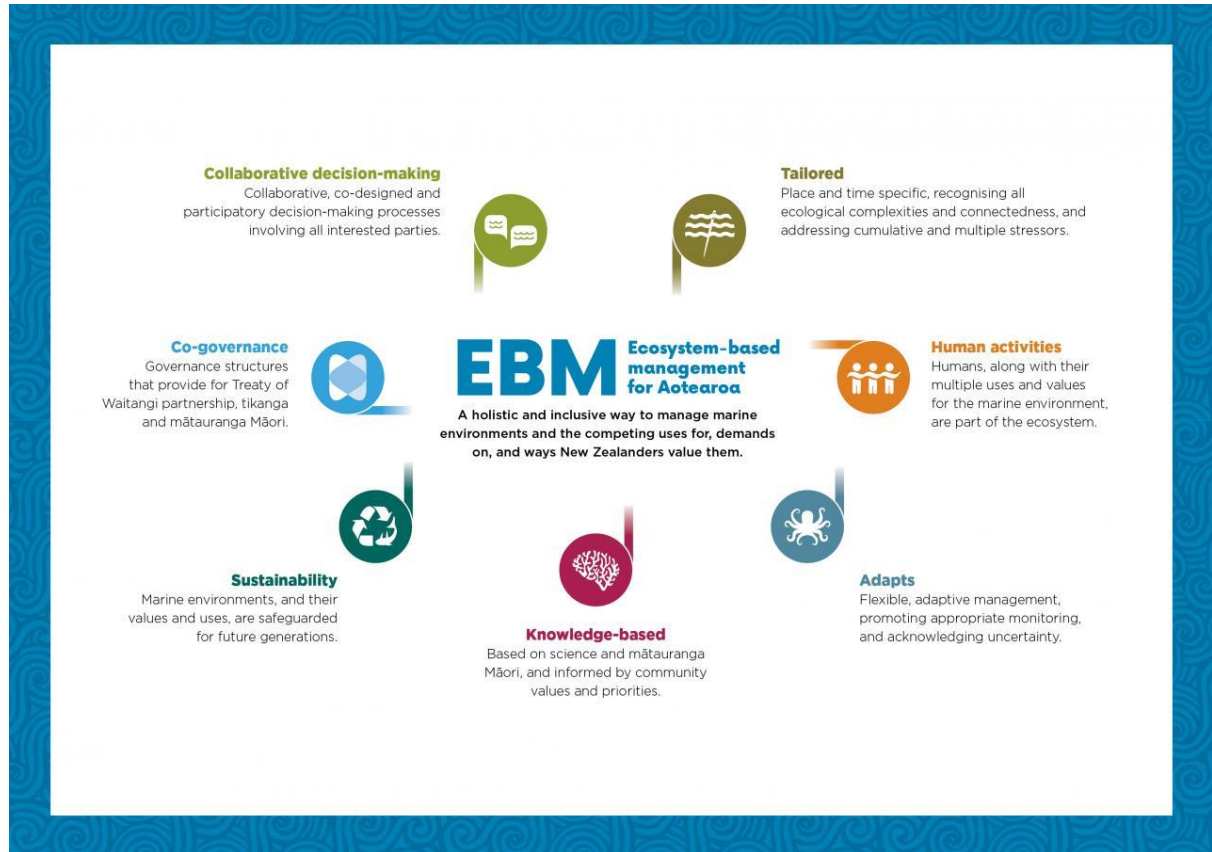


Figure 1: Ecosystem Based Management Principles as defined by the Sustainable Seas National Science Challenge

Consideration of the economic, social, cultural and environmental benefits that a thriving seaweed sector can provide and a framework that takes all of these aspects into consideration will ensure that it establishes the foundations for a sector that is grounded in EBM, and that contributes to the health of marine ecosystems and provides value for every New Zealander.

F. OUTPUTS	This project will produce the following Outputs:	Linked to which Theory of Change Outputs:	Explain briefly your plan to ensure uptake by iwi and stakeholders:
	<p><b>Seaweed Sector Review</b> This output will review the current state (nationally and internationally), and articulate future needs for the seaweed sector. It will characterise the current sector including relevant treaty settlement assets,</p>	<p>D. Decision making processes I. Guidelines developed L. Knowledge gaps identified.</p>	<p>Uptake will be driven by engagement and co-development with iwi and stakeholders throughout the project (consistent with an EBM approach). A range of current and potential future direct participants in the seaweed sector will be engaged (by way of semi-structured interviews and semi-structured focus groups, wananga etc) using participatory and research and snowballing methods to provide input to the review and to development of the framework. These will include representatives from across</p>

	<p>identify the most promising market opportunities for NZ, regulatory, environmental and societal limitations and risks, and compile profiles for the most promising seaweed attributes with species examples and knowledge gaps identified.</p> <p>Output components include:</p> <ul style="list-style-type: none"> <li>• State of seaweed market globally</li> <li>• Characterisation of the NZ seaweed sector</li> <li>• Market opportunities for a NZ seaweed sector</li> <li>• Regulation and legislative barriers and opportunities</li> <li>• Te Tiriti o Waitangi considerations</li> <li>• Seaweed attributes and species profiling</li> <li>• Environmental Interactions</li> <li>• State of seaweed research in NZ and relevant overseas research</li> </ul>		<p>the seaweed supply chain and from government. Māori input will include Māori owned businesses and interested Iwi, hāpu with a particular focus on Māori Blue Economy plans, projects and Māori Aquaculture Settlement.</p> <p>The review will be in a form that is able to be used by existing and future sector participants.</p>
	<p><b>Seaweed Sector Framework</b> This output will provide an adaptive framework that is multiscale and employs principles, concepts, and tools from EBM, BE, and the Te Taiao framework, and incorporates a four Pou multi-criteria analysis framework. The framework will be adaptive to market specific factors for a</p>	<p>H. Frameworks for decision making that consider multiple values</p>	<p>Semi-structured interviews and thematic focus groups / wananga with a smaller group of participants will contribute to the development of an initial sector framework. These will include Maori representatives, and at least one representative from each of the main groups that are essential to developing a seaweed sector.</p> <p>The Project Advisory Group will provide input to early structure of the framework, help select case studies, and formally review the draft as well as final framework.</p> <p>Once developed, the draft framework will be</p>

	<p>sustainable and high-value seaweed sector to test through case studies.</p> <p>Output components include:</p> <ul style="list-style-type: none"> <li>• Draft Seaweed Sector Framework identifying most likely value proposition(s) for new sector development and holistic farming systems</li> <li>• Identification of legislative and regulatory barriers and pathways forward (including implications for wild harvesting, farming of invasive species, decision making, &amp; co-governance the)</li> <li>• Markets</li> <li>• Assessment against EBM principles</li> <li>• Considerations for carbon sequestration</li> <li>• Considerations for farming invasive species</li> <li>• Risk assessment of wild harvest</li> </ul> <p>It will be presented to stakeholders and interested iwi and then finalised as a report.</p>		<p>circulated to all initial research interviewees for their feedback to ensure considerations of EBM are adequately addressed by the framework. A revised seaweed sector framework will then be produced.</p>
	<p><b>Seaweed Case Studies</b> This output will test the draft Framework against thematic and location profiles to identify any required adaptations, regulatory changes and specific priorities for NZ.</p>	<p>D. Decision making processes trialled.</p> <p>I. Remaining knowledge gaps identified.</p>	<p>The case study(ies) will be chosen to represent locational, thematic, species and market profiles. Potential case study participants will be identified and approached early in the project to help finalise the scope and approach. Māori participation will include Māori owned and/or Iwi led business and local Iwi input and feedback where interested. Co-development will inform appropriate tikanga, and kawa and wānanga practices used in all Māori engagements.</p>

	<p>Output components include:</p> <ul style="list-style-type: none"> <li>• The value creation potential and key constraints estimated for specific enterprises tested against the Framework</li> <li>• Refined Seaweed Sector Framework 'NZ Inc.' priorities</li> <li>• A graphic schematic of a future seaweed industry targeted at iwi, regulators and industry stakeholders to increase uptake.</li> </ul>		<p>The case study(ies) chosen will be those that have a mix of willing and engaged participants, and efforts sufficiently advanced that the project team consider will allow a fulsome assessment against the draft Framework. We will also seek variation (in scale, location, species, participant mix etc) to enable the Framework and associated principles to be fully tested through the case studies.</p>
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<p>H. OUTCOMES</p>	<p>This project will contribute to the following Theory of Change Outcomes:</p> <ul style="list-style-type: none"> <li>• The value of BE business models is recognised and adopted by Aotearoa NZ businesses.</li> <li>• Decision-making practices are adopted that are inclusive, multi sectoral and account for the effects of cumulative and multiple activities.</li> <li>• EBM practices are understood and accepted as a viable approach by decision makers, stakeholders and iwi.</li> </ul>
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<p>G. INTRODUCTION</p>
<p>A BE consists of a range of marine activities that generate economic value and contribute positively to social, cultural, and ecological wellbeing<sup>2</sup>. This concept has been widely discussed in NZ and abroad, however there are no practical examples that fully achieve this goal at sectoral level <sup>3</sup>.</p> <p>Seaweed aquaculture is an emerging sector in NZ with potential to achieve NZ's strategic BE goals and realise economic gain through high value end uses<sup>4</sup>. Aquaculture (both seaweed and bivalve) also provides beneficial ecosystem services that promote healthy ecosystems such as improving biodiversity, carbon sequestration and nutrient absorption for mitigation, remediation and restoration<sup>5</sup>. Consequently, multiple parties with a range of visions and interests are pushing to kick start the seaweed sector in NZ<sup>6</sup>. However, this uncoordinated and non-inclusive approach risks economic loss and failed investment, low-value products, misaligned and overlapping support from Government funding agencies as well as potential negative environmental effects all leading to significant opportunity cost to the BE. This sector has a unique opportunity for global differentiation through leadership, trust and transparency.</p> <p>Successful seaweed sectors overseas have hatcheries, large- and small-scale farming operations, processing capability and established seaweed-based products being supplied to established markets<sup>7</sup>. These activities are assisted by on-going R&amp;D and workforce support. In the NZ sector today, there are important gaps halting progress and growth:</p> <ul style="list-style-type: none"> <li>• There are no commercial seaweed <b>hatcheries</b> so there is no reliable supply for potential seaweed farmers (Figure 2).</li> <li>• There are no commercial seaweed <b>farms</b> operating in NZ so there is also no <b>workforce</b> development support.</li> <li>• There are several lower tech <b>processing and manufacturing</b> facilities in NZ. However, these rely on beach cast, mussel line bycatch, imported or wild harvest product so are supply constrained in their ability to grow.</li> </ul>

- There isn't a market internationally for the **environmental services** provided by seaweed but there is significant work underway globally, and also commercial interest, in high quality 'blue carbon' and/or nitrogen offsets.
- Regulatory barriers are significant for new water space and for farming of many seaweed species.

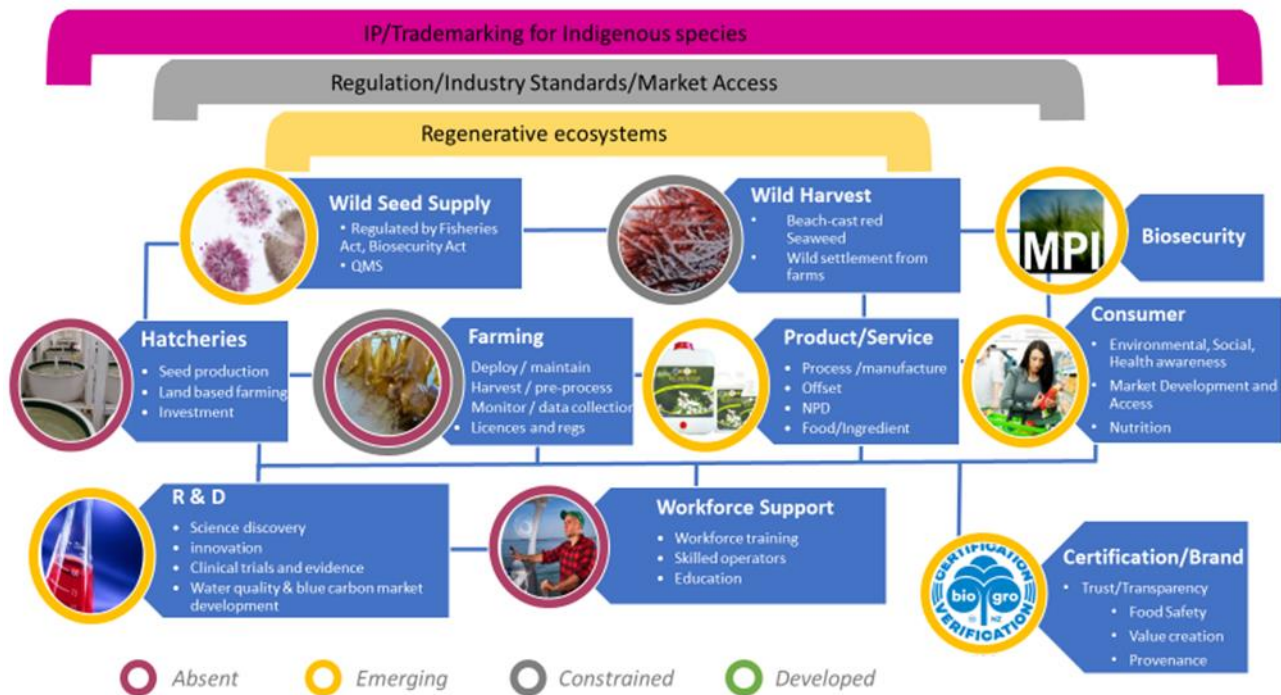


Figure 2: Current Maturity of NZ Seaweed Sector

NZ's seaweed sector needs a framework to guide development towards a collective vision for a sustainable and high value future. To inform this, there needs to be a clear understanding of NZ's value proposition, current industry and regulatory barriers, and a pathway forward to eliminating these barriers. For the framework to have a meaningful impact in guiding coordinated change, it is important that it is co-developed with the iwi, stakeholders, industry, researchers, and government agencies that currently or plan to operate in the sector and consider the wider community. Therefore, the research employs participatory research methods.

To achieve the full BE potential of seaweed for NZ, it's important that the framework is developed with explicit consideration of EBM principles. This will encourage a development pathway for the seaweed sector that generates multiple co-benefits at different scales for communities, flourishing regions and sector participants. It will also display leadership towards a regenerative future for Aotearoa.

#### H. AIMS

Research aims (RA1 & RA2) and supporting questions are:

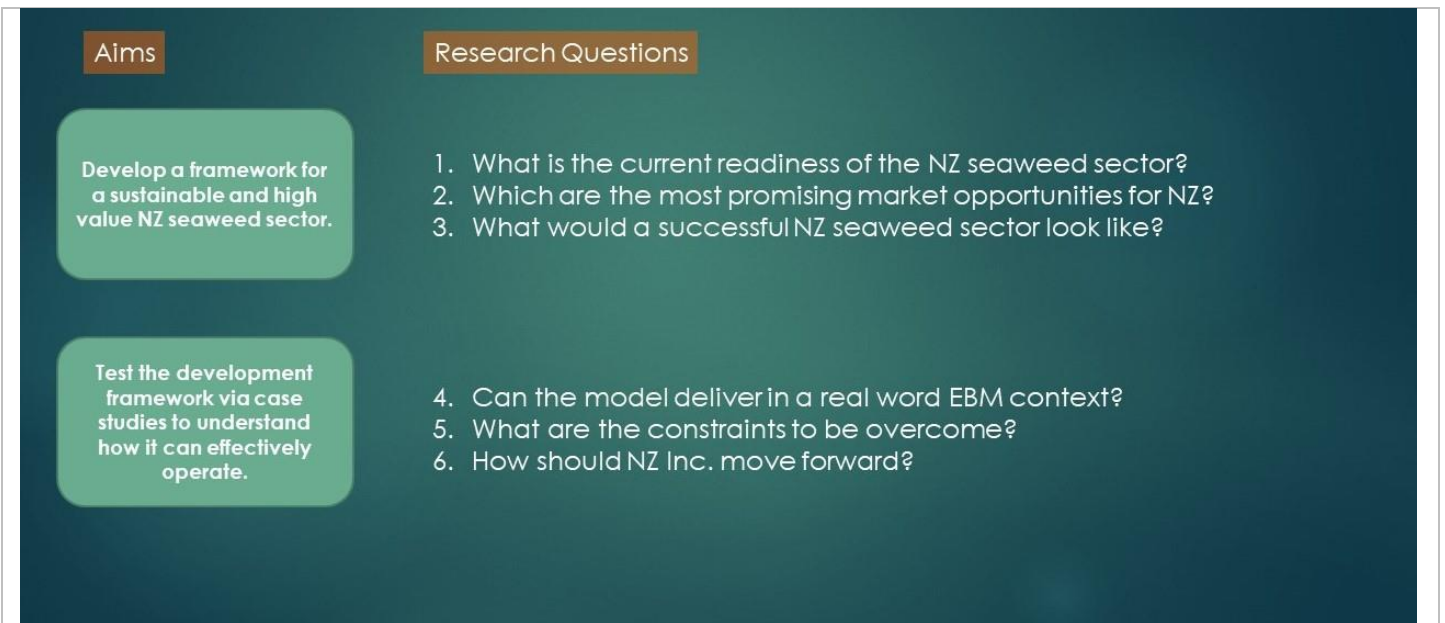


Figure 3: Research Aims and Questions

**RA1: Develop a framework for a sustainable and high value NZ seaweed sector** is focused on identifying a future for the NZ sector based on EBM principles. This includes identifying variations for different markets. EBM principles (see Figure 1) particularly relevant to elements of the Framework are identified in parentheses. We note that the “Human activities” aspect of EBM (which acknowledges a range of human values) is fundamental to the conception of this project, and could reasonably be applied to most elements below.

Important elements of the Framework:

- International trends and promising market opportunities for NZ. (Knowledge-based, Tailored)
- R&D gaps in seaweed science. (Knowledge-based, Adapts)
- Aquaculture potential for promising NZ species. (Tailored, Adapts)
- Readiness of the NZ sector to realise its BE potential. (Tailored, Collaborative decision making)
- Barriers and solutions to sector development. (Adapts, Sustainability)
- Regulatory, Te Tiriti o Waitangi aquaculture settlements and WAI262 considerations (Co-governance, Collaborative decision-making)

**RA2: Test the development framework via case studies to understand how it can effectively operate.** RA2 applies the framework to real-world settings via case stud(y)ies to understand how it can be used, and where it needs modification. This includes testing locations, species, markets, and participants. Aspects of EBM particularly relevant to project elements are identified in parentheses.

Important elements:

- Case study partners that are current (or intended future) direct seaweed sector participants, including Māori. (Tailored, Human activities)
- Clear scope parameters for each case study that test the framework are co-developed in a meaningful way.
- Identification of financial, cultural, environmental, social and other drivers for sector participants. (Human activities, Collaborative decision-making/Co-governance, Sustainability)
- Understanding the potential economic, environmental, social and cultural impacts within the case study using a ‘four pou’ assessment approach. (Human activities, Collaborative decision-making, Sustainability)
- Identifying key constraints (Human activities, Tailored, Adapts)

## I. PROPOSED RESEARCH

### The Four Pou Framework

The Four Pou / Oranga Tonutanga framework will be incorporated into case study impact assessment<sup>8</sup>. The framework provides a method for multi-criteria analysis and has been used previously to assess the potential impact of Iwi aquaculture development opportunities<sup>9</sup>. The framework aligns with the principles of EBM by identifying a range of values and potentially competing interests relevant to the management of marine environments. One of its strengths is that it allows for the expected impact of different proposals to be compared against the status quo. Specific criteria to be assessed will be co-developed with iwi and stakeholders early in the case studies, and assessment will be undertaken through a mix of hui and semi-structured discussions. An example of the types of criteria to be adopted is shown in Figure 4.

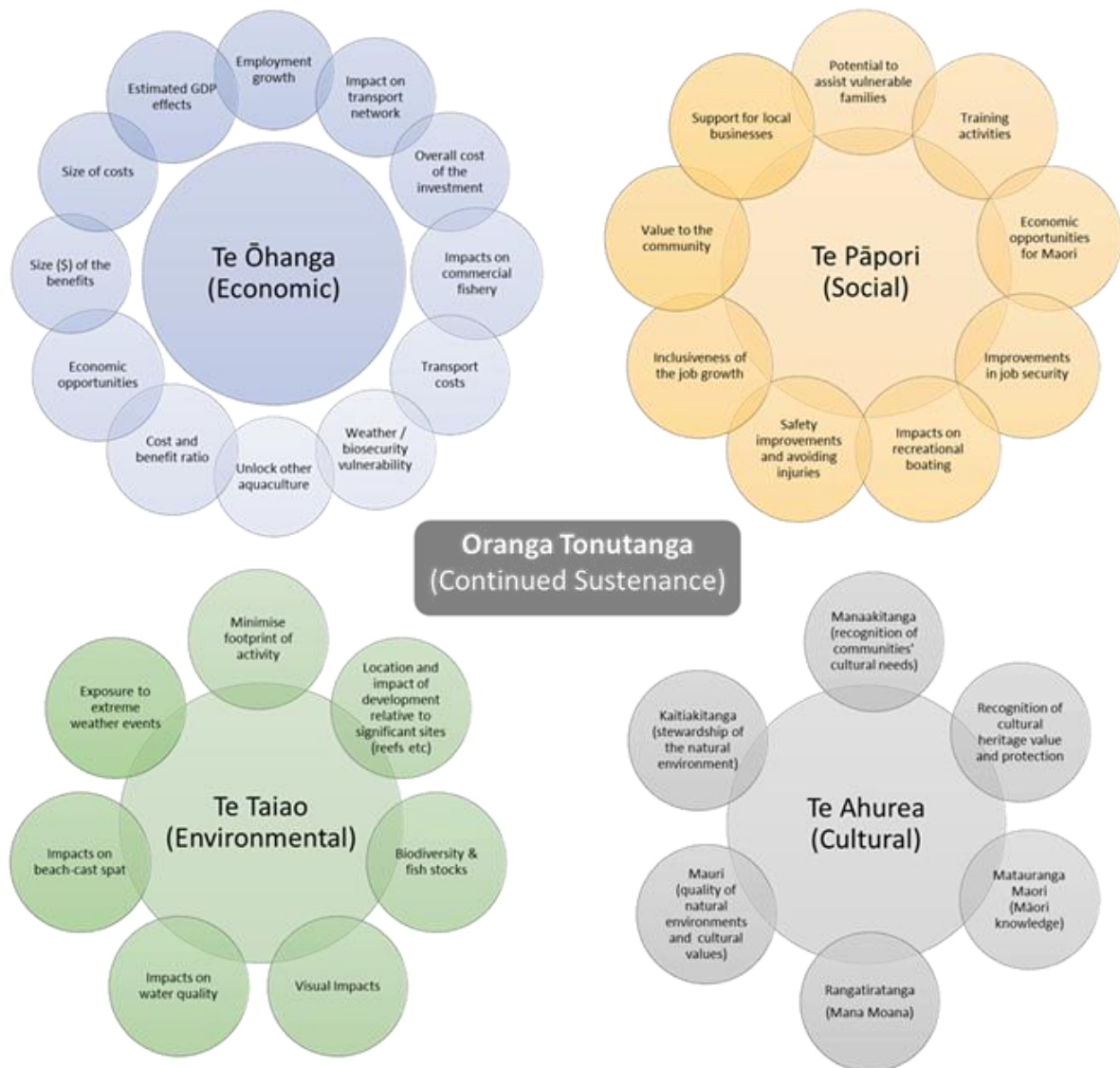


Figure 4: The Four Pou / Oranga Tonutanga Framework

### Seaweed Sector Research

The main components and milestones for the Seaweed Sector Research output are shown below and are cross-referenced back to the research questions that they will help answer.



Questions						Components	Milestones
1	2	3	4	5	6		
X						<b>Seaweed sector stocktake</b>	<ul style="list-style-type: none"> <li>Supply chain profile</li> <li>Research &amp; projects summary</li> </ul>
	X					<b>Market opportunities for NZ</b>	<ul style="list-style-type: none"> <li>Priority markets / services identified</li> <li>Priority market profiles</li> </ul>
		X				<b>Seaweed species profile</b>	<ul style="list-style-type: none"> <li>Priority species identified</li> <li>Priority species aquaculture profiles</li> </ul>
			X			<b>Environmental effects</b>	<ul style="list-style-type: none"> <li>Ecosystem effects of wild harvest and aquaculture</li> <li>Opportunities and implications of polyculture</li> <li>Knowledge gaps identified</li> </ul>

Currently, the seaweed industry in NZ is made up of disparate groups with different aspirations for the sector. We will review current activities and collate perceptions as to the barriers and enablers affecting the sector in NZ. The review will be conducted through interviews, desktop research and focus groups to investigate:

- **Current participants and their markets** including biostimulants and animal feed, human food, nutraceuticals
- **Status of the supply chain**, including investment needs and constraints, hatchery supply, farming, processing and transport
- **Current support mechanisms**, what R&D is underway, regulations and planning processes, workforce development, market development and funding opportunities
- **Current impact of the sector:** Te Ōhanga (Economic), Te Ahurea (cultural), Te Taiao (environmental), and Te Pāpori (social).
- **Growth paths:** Aspirations for the sector and constraints on potential growth. This could include the need for a 'national seaweed sector body', and/or nationally consistent certification and branding for NZ grown seaweed.

In parallel with the review of the sector, we will investigate **market opportunities** for NZ seaweed based on current **international trends** and potential pathways to market. We will leverage other research and initiatives (e.g. NZTE study into offshore demand for *Undaria*) to investigate **opportunities and requirements** for NZ to be able to participate in these target markets (recognising different opportunities will occur at different scales and locations for different parties). By identifying potential markets and future direction for the NZ seaweed sector, we will be able to understand implications of these on development of the sector and the pathway forward, as well as constraints on growth that need to be overcome for the sector to be successful.

One current limitation on the sector in NZ is a lack of direction in what species to invest in and the technology required to grow these species<sup>2</sup>. We will address this gap using the previous market analysis to identify **desirable attributes of seaweed** and shortlist species with the highest potential. For the shortlisted species, we will build **profiles** focused on the valuable properties, understanding of their lifecycles, method of seeding, preferred growing conditions, and overall suitability for aquaculture. This will enable a **decision matrix** to be built to help investors and regulators make informed decisions about potential species (and methods for growing) they can grow in their areas. We are aware that some discussions may have commercial sensitivities and will develop a protocol to ensure participants in the process are able to freely and actively participate without risk of confidential information being divulged.

Seaweed farming creates habitats and products that provide ecosystem services including the potential for carbon sequestration and nutrient removal<sup>10,11</sup>. These characteristics are particularly relevant to the sustainability principle of EBM and the Blue Economy more broadly. However, without an understanding of the real-world environmental benefits and risks (i.e. a robust knowledge-based and tailored approach), the opportunity to achieve BE outcomes could be

wrongly assessed, or potentially missed. We will review information about ecosystem effects of seaweed wild harvest and aquaculture, and assess the importance of those effects in the marine environment in Aotearoa. Ecosystem services that may be provided by seaweed aquaculture as well as biosecurity implications and interactions with marine mammals and seabirds will be identified (ensuring that sustainability, a key principle of EBM, will be considered). Likely environmental effects of different farming and harvest approaches will identify where the benefits or risks vary. Opportunities for and implications of polyculture will also be considered. Knowledge gaps regarding environmental impacts will be identified, as will how these gaps could be addressed.

### Seaweed Sector Framework

Main components and milestones for the Framework output are shown below and are cross-referenced back to the research questions that they will answer.

Questions						Components	Milestones
1	2	3	4	5	6		
	X					<b>Basic Sector Framework</b>	<ul style="list-style-type: none"> <li>• Framework components identified</li> <li>• Basic future state framework complete</li> </ul>
	X					<b>Market / Service Models</b>	<ul style="list-style-type: none"> <li>• Variations complete for priority markets</li> </ul>
		X				<b>EBM Assessment</b>	<ul style="list-style-type: none"> <li>• EBM components identified</li> <li>• Seaweed EBM assessment complete</li> </ul>

This research will build from the aspirations and barriers identified in the seaweed sector research review. The Framework will be adaptively developed to guide development of a seaweed industry that is consistent with EBM. A strategic project advisory group (PAG) that represents the diverse values and interests of stakeholders will be formed to assist with rapid identification of considerations and aspects of the framework that may be contentious and important in decision matrices (e.g. invasive species farming, Wai262 considerations) and early testing of the draft framework. To successfully create a useable framework for the seaweed sector, we will identify the **components**, identify how different market models (such as mixed ownership of different elements of the supply chain and structures including non-profit and collectives, or public-private partnerships rather than just private sector initiatives) will drive **framework variations**, and assess how we can **integrate and implement EBM** into the framework using the following research approach.

**Components** identified from the vision for the future state identified in RA1 will include:

- Future supply chain and infrastructure required to support the vision
- Research and development that would support the sector
- Planning and regulatory environment
- Market models that align with a regenerative and high value sector
- Community partnerships necessary for collaborative decision-making and co-governance
- Workforce requirements and support to develop this

By understanding these components and how they fit together we can then identify enablers (science, regulatory, funding, partnerships etc.) that would transition the sector from its current path to the ideal future state. These enablers will be assessed by experts in these fields (e.g. science, government, finance) to develop an action plan for how they can be implemented, and the risks and uncertainty associated with each of them. Through articulating this vision and how to implement the enablers, this framework will provide the sector with a pathway forward and the ability to coordinate efforts.

**Market / service models** will be developed for priority markets to provide more specific guidance on what is needed to realise specific opportunities. To achieve this, the framework will be expanded upon with different future states, enablers

and pathways. This will help to highlight which enablers will have the highest impact for the sector and should therefore be given precedence in implementation.

**EBM Assessment:** Through understanding the implementation pathways for a seaweed sector, we can assess how each pathway meets the expected EBM principles within the different models - applying the Four Pou framework to case studies and the overall Framework.

How these impactful EBM principles can be integrated into the framework will be guided by previous and ongoing research from the SS-NSC including:

- Valuation frameworks (BE Project 2.2)
- Regenerative aquaculture (BE project 2.2)
- Use of marine spatial planning processes to bring together stakeholders and identify opportunities
- Kaitiaki based business models and understanding of the Māori Marine Economy

By leveraging this previous research, we will ensure alignment with the Challenge objectives and identify outcomes that will contribute to the BE.

### Seaweed Case Studies

Main components and milestones for the Seaweed Case Studies output are shown below and are cross-referenced back to the research questions that they will help answer.

Questions						Components	Milestones
1	2	3	4	5	6		
		X				<b>Case Studies</b>	<ul style="list-style-type: none"> <li>• Case study parameters confirmed</li> <li>• Case study details developed</li> </ul>
	X		X			<b>Framework Adaptation</b>	<ul style="list-style-type: none"> <li>• Learnings &amp; challenges documented</li> <li>• Future state framework updated.</li> </ul>
				X		<b>NZ Inc. Priorities</b>	<ul style="list-style-type: none"> <li>• Major challenges &amp; opportunities</li> <li>• Sector wide development priorities</li> </ul>

Opportunities for growing seaweed focused businesses in NZ will be identified with sector input and at least one case study will be co-developed with local participants. Case study(ies) will test the draft framework and profiles described above, including:

- Development parameters (scale, location, species, products etc.)
- Desired vision and future state for the operation.
- Market model(s) that align with the profile described above.
- Expected impact if development was successful.
- Major barriers and challenges and required enablers to help achieve the future state.

The case study research format will ground truth key learnings identified in the previous stage and provide clear benefits for the project and sector as:

- It allows for the seaweed framework / market variation to be tested before being finalised.
- It helps advance planning of the opportunity for local participants.
- It provides a model for a specific type of development that other entrepreneurs can adapt.
- It provides visibility of an opportunity and issues for supporting groups (e.g. regulators and funders).

The shortlisted case study candidate(s) will be tested and confirmed with the (PAG) early in the project before detailed work commences.

### Co-development Process

The case study(ies) will be co-developed with local participants based on the following process:

1. Identify candidate opportunities and initial shortlisting with PAG
2. Initial engagement with local participants including identifying high-level development parameters
3. Final shortlisting and selection of case study(ies)
4. Develop a conceptual model (what, why, where, how etc.) using the framework as a guide
5. Identify a supporting business model (high-level)
6. Assess the expected impact using the four pou framework
7. Identify major development barriers and enablers
8. Assess framework / market variation's utility for this type of opportunity.

Broader stakeholders to involve in the case study(ies) include council, government, and community groups. This will help identify regulatory barriers (e.g. legislation, regulations, and local plans), and local perceptions of aquaculture along with views on the nature and progression of the seaweed sector (i.e. social licence to operate).

#### *Integration of EBM and te Ao Māori*

A place-based, holistic view of the social and ecological system will be adopted for the case study(ies) following the EBM principles in Figure One. This type of holistic viewpoint helps bring resource management systems closer in line with a te Ao Māori worldview<sup>12</sup>. Additionally, a collaborative co-development approach encompassing tikanga and mātauranga Māori will be followed involving iwi groups, industry partners and community stakeholders.

It will also be important to understand how Treaty rights, interests, existing settlements and ongoing negotiations (e.g. WAI262) may impact development of an indigenous seaweed sector. This includes whether it is developed within or alongside the existing Māori commercial seafood sector. This will be achieved by co-developing the case study(ies) with Māori enterprises and/or local iwi and/or Te Ohu Kaimoana.

#### *Finalise Framework*

The challenges and learnings from the case study(ies) will be used to **finalise the seaweed sector framework**. This will help improve utility of the framework for the sector and its alignment with EBM principles. This will include confirming significant barriers to development that exist for industry and recommendations for how these can be overcome.

The final result from the research will be recommendations and priorities for NZ Inc. to grow the country's seaweed sector. These **priorities** are expected to cover but not be limited to the following areas:

- Market development.
- Supply chain development.
- Additional support.
- Regulatory and Policy.
- Alignment with EBM principles.

## J. LINKS TO PHASE I RESEARCH

The need and scope for this research was identified in the "Transition to a Blue Economy: Scoping & Horizon Scanning" project following interviews with multiple people involved in the Aotearoa NZ Blue Economy.

This project identified that numerous new initiatives and businesses are targeting seaweed as a novel primary resource for the BE. However, there is no over-arching vision for a seaweed sector to guide regulatory frameworks, ecological sensitivities, climate change, relationship to protected areas, inclusivity, and systems implications of un-coordinated economic development. The opportunity is to create space for niche, regenerative, high-value BE enterprises, whilst also encouraging larger operations to develop high-value BE approaches from the outset so as to avoid creating yet another primary sector commodity trap.

## K. LINKS TO & INTERDEPENDENCIES WITH PHASE II RESEARCH PROJECTS (200 words)

Links to other Sustainable Seas BE work:

2.2 Restorative economies - This project aims to help create an enabling environment for restorative economies to emerge and grow by developing confidence, knowledge and decision making tools for translating restoration opportunities and needs into investment propositions that leverage public and private sector investor interests with

respect to markets, standards, prices, regulations and consents. This includes understanding the interface between monetary and non-monetary economies, and developing frameworks to capture multi-benefits, measure impact and uncertainty and provide assurance, disclosure and EBM infrastructure for investor confidence. Case studies for 2.2 will include a focus on seaweed in recognition of the vital ecosystem services seaweed provide in the marine environment. Explicit links with this project include members of the project team also being directly involved in 2.2 (including the co-lead).

2.3 Indigenising the BE – This project is looking primarily at the key institutional structures needed to support a Māori Marine Economy. It is concerned with a range of property and governing structures pertaining to market and non-market customary activities, alongside issues such as supply chain collaboration, tracing, and optimisation.

Within Sustainable Seas (beyond BE):

3.2 Risks and Uncertainty; 1.1 Assessment of ecological footprints, understanding Cumulative Effects; 1.2 Tools for Spatial Planning and Maintaining Systems Capacities; and 4.3 An applied example of EBM and kaitiakitanga.

#### L. VISION MĀTAURANGA (VM) (400 words)

Post colonisation, the extent of connection between Māori and 'Rimurimu' (macro and micro algae) is not yet fully understood. Furthermore, the nuances and contexts of Mātauranga that relate to 'rimurimu' are essential in the co-design of a seaweed industry in areas such as Banks Peninsula, the Bay of Plenty (BOP) and the wider implications of treaty partnership on its co-management.

This case study approach will open significant opportunity to understand the enabling mechanisms Māori will need at the start of the formation of this new national seaweed industry. This stretches to areas of holistic Māori impact areas within the industry that include Treaty Partnership, cultural integrity, intellectual property, customary Kaitiakitanga etc.

This project steps into new meaningful research territory by working to identify at a high-level the aquaculture capability, capacity and impacts that will be needed to support Māori treaty rights and obligations, and to industry-based research partnership that supports the Treaty principles and Wai262. These are New Zealand specific principles and values that other established primary industries are still struggling to achieve.

This project is a combination of research aims that involve Māori researchers and Māori-centred research design aiming to give effect to Vision Mātauranga through reciprocal contribution to/from iwi organisations, and Māori knowledge, resources and people. The project will, through partnerships and relationships among Māori enterprises, scientists, and iwi groups, realise all 4 themes of the Vision Mātauranga policy.

We will select case study(ies) working with motivated iwi organisations that:

- Are post-settlement (or have sufficient clarity around details of their respective settlement that allow them to participate)
- Have access (or likely access) to water space
- Have commercial aquaculture interests that might include expansion to seaweed
- Have capacity to be involved in this research

We have two potentially strong case study locations (Onuku, on Banks Peninsula, and BOP) that have arisen through existing relationships developed through Phase 1 work on the BE and through other existing research programmes. A first step in the research will be to connect with the key iwi organisations at these case study locations, test enthusiasm and alignment, and if appropriate finalise an agreed partnership approach to the research, in a manner that ensures the outcomes of the research are usable and add value back to their partner communities.

Project budget has been allocated to facilitate iwi involvement (e.g. wānanga, hui, and resourcing for cultural expertise and labour). It is anticipated that iwi will have access, via the project team and research outputs, to expertise, knowledge, technologies, and networks that will be beneficial to iwi.

#### Vision Mātauranga Deliverables

**Partnerships:**

VM P1. *Evidence of newly established, or effectively leveraged existing partnerships and/or relationships with iwi, hapū and/or Māori entities.* We are fully committed to developing research that positively contributes to treaty partnership. Thus, we have spent considerable time prior to this proposal developing meaningful long-term relationships with Te Rūnaka o Onuku and Ngā Iwi o te rohe o te Waiāriki. This collective includes Te Arawa, Tūwharetoa, Te Whānau a Apanui and Te Whakatōhea among others.

**Distinctive Contribution:**

VM D1. *A clear programme for the delivery of activities and/or outputs specifically for Māori partners and/or end users (through approach, capability and/or resource allocation).* This project will engage this collective at iwi, hapū and marae level, and will employ a co-developed wānanga process that enable rich knowledge sharing of science and Mātauranga to explore the co-development of localised Seaweed aquaculture through the eyes of Treaty partnership with collectives such as Ngā iwi o Te Waiāriki and Te Rūnaka o Ngai Tahu.

**Meaningful Outcomes:**

VM M1. *Evidence of alignment to the long-term aspirations of Māori partners and/or end users.*  
Our engagement and wānanga processes will enable this research collective to co-develop the strategies of implementation and execution of Māori impact in this research where kōrero tuku iho, Mātauranga, and Tikanga and Kawa of respected iwi and hapū can be interwoven into the research practices. Furthermore, the benefits of this research will accurately reflect the mana and rangatiratanga of each iwi in the long term, and ensure the co-development of the benefits that this project will deliver to their iwi and hapū communities.

**M. ENGAGEMENT REQUIRED WITH IWI AND STAKEHOLDERS**

Multiple stakeholders including iwi have been involved in developing this proposal, and many contributed to the Phase 1 BE research.

This research will be based on sustained collaboration and engagement with iwi and stakeholders by the core project team. Iwi and stakeholder input and consultation will start with gathering perspectives and views during RA1, and continue with articulating needs, co-designing and providing input and feedback during RA1 & RA2, and extend with testing of tools and frameworks in RA2.

There will be significant engagement with commercial participants, and the team will develop protocols to ensure organisations and individuals are willing and able to discuss matters (and/or provide written material) without divulging commercially confidential information. We will develop a protocol to reduce any risks regarding use of material deemed confidential by participants.

Engagement with iwi will include free, prior and informed consent of the hapū and if appropriate, remuneration for time required to participate in the project. Appropriate IP protection for any mātauranga Māori used (e.g., during verification processes) will be sought. Co-authorships on papers, and clarity on what mātauranga/knowledge is and is not controlled by Māori involved in the research, will be part of the dissemination processes.

**N. PROJECT COMMUNICATIONS**

The project provides for specific communication and outreach opportunities, and the outputs and activities are designed with the express purpose of facilitating outreach towards iwi and specific targeted stakeholders as well as to a broader stakeholder group and more general audience. We have allocated funds specifically for communication and aim to use different methods of communication and tools including webinars and other online platforms to inform iwi and stakeholders about decision support tools such as the four pou multi-criteria analysis. Significant focus will be placed on presentations and in person or web briefings to specific networks and events and we intend to leverage existing communications platforms that Sustainable Seas provides.

**O. RISK & MITIGATION**

Risk	Mitigation
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The framework and case studies are “overtaken” by the rapidly-evolving sector, providing less meaningful outcomes.	On-going co-development and communication of the research with industry, government and iwi and relatively rapid execution of the project.
Stakeholders are unwilling to contribute, or share commercially sensitive material.	Long standing relationships with key stakeholders, co-development of the proposal and regular feedback, as well as protocols on the handling of confidential information.
COVID-19 impacts the ability to hold workshops, wananga and hui.	Long standing relationships with key stakeholders and iwi mean that the mahi can still take place via online meetings.
The framework turns out to be so complex that the team can’t develop it with the available resources; and even if it can be developed it will be too complex to be practically useful.	The project team will maintain a tight focus and work with stakeholders to ensure it can be delivered.

<p>P. <a href="#">CONSENTS &amp; APPROVAL required to undertake research</a></p>	<p>This project will adhere to Cawthron’s policy for research with human participants. Specifically:</p> <ul style="list-style-type: none"> <li>• Participants will be provided with information about the purpose of the research, participant involvement, and intended use of the results within a Participant Consent Form.</li> <li>• Participants will be given the option to have their name and/or organisation remain confidential; this recognises that the research may identify commercially confidential matters and challenges that may expose certain managers to public scrutiny.</li> <li>• Researchers will hold participant information confidential. Any data from participants will not be given to third parties. Data will be securely stored and destroyed (deleted no more than 12 months after conclusion of the project).</li> <li>• Findings will be presented in a way that is non-traceable to individuals unless permission is given on the Consent Form.</li> </ul>
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