Phase II Research Proposal

A.	PROJECT TITLE	4.2 Options for policy and legislative change to enable EBM across scales
	"SHORT" TITLE	Policy and legislation for EBM
B.	THEME / PROGRAMME	Theme 4: Enhancing EBM practices.

C. PROJECT KEY RESEARCHERS

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D. CO-DEVELOPED WITH

Name	Role	Organisation / company / agency	Level of partnership
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E. ABSTRACT

Environment Aotearoa 2019 and *Our Marine Environment 2019* revealed that our marine management systems are not performing sufficiently well to prevent widespread, ongoing habitat degradation and loss, and alarming population declines of many species. In our dynamic and changing world, we now need an adaptive system of integrated law, policy, regulation, and practice across all levels of government (including iwi) and sectors of society in order to implement Ecosystem-Based Management (EBM) to ultimately and quickly improve our management and use of marine resources.

To underpin the responsiveness of such a system, we need quality research to evaluate options for practice, policy, and legislative change to help address these challenges. A core component of this project, therefore, is to identify and analyse options that would better enable EBM, whilst recognising that there are existing rights and interests that must be accommodated.

Mismatches in scale between physical systems, species movement and dispersal, and regulatory jurisdictions also pose significant challenges to effective EBM implementation. This requires a nuanced understanding of the multiple cross-scale interactions within and across marine social-ecological systems, as the risks posed by the effects of human activities across time and throughout the marine space need to be more fully understood.

The research findings from these two project components (and other Challenge research) will be consolidated to identify potential pathways for change, opportunities that could be maximised, and barriers that need to be addressed. The conclusion of this project will provide a clearer understanding of options for change and navigable courses to EBM.

F. RELEVANCE TO CHALLENGE OBJECTIVE

This project seeks to provide a robust research base to support policy makers, iwi, and stakeholders to navigate the legislative, policy and practice constraints surrounding EBM and any changes required to enable it. This research base will provide tools to enhance EBM, such as context, models and options to support integrated decision-making processes and frameworks.

Project 4.2 will make important contributions to addressing some of the fundamental challenges involved in transitioning to EBM. Our focus addresses institutional fragmentation and jurisdictional complexity as well as managing the effects of activities, especially cumulative effects, across different scales (e.g. temporal, geographical, social-ecological, and organisational).

Our co-development partners have emphasised the importance of, and need for, careful management of marine ecosystems to support social-ecological resilience and ecological integrity. This is reflected in the success measures of the Challenge set out for Phase II - for the Environment, Māori, wider communities, businesses, managers and policy makers.

We will approach our research from a first principles approach, building on Phase I outputs, to evaluate existing and alternative options to promote more effective marine management. This is necessary to contribute to the transformative vision of the Challenge in supporting implementation of EBM in Aotearoa New Zealand.

G. OUTPUTS	This project will produce the following Outputs (numbering follows Section S):	Linked to which Theory of Change Outputs:	Explain briefly your plan to ensure uptake by iwi and stakeholders:
	1, 4, 5: Underlying needs and requirements to build cross-scale partnerships (from national strategies down to local interests) for managing species and impacts important for society are demonstrated. **2, 9**: Tools (for example principles and guidelines for effective collaboration across multiple stakeholder groups) are provided for EBM-enabling governance arrangements that support	**c.** Effective partnership models for an EBM approach to decision-making and management developed, evaluated, and demonstrated.	• We will co-develop the research with iwi and identified stakeholders including government representatives and technical (legal and policy) experts (SAB). Along with targeted engagement, it will include regular hui with agency partners at 4-6 monthly intervals. • We will engage with cross theme/challenge projects. • We will engage in case studies that trial use and application of EBM.

	collaborative decision-making.		
	3, 8: Socio-ecological models that allow exploration of temporally dynamic spatial management strategies are identified. **7, 9**: Likely risks associated with management at scales that differ from dominant ecological scales are assessed.	**e**. Scales of management and place-based strategies that reduce environmental risks are identified and demonstrated.	• We will develop case studies with partners that allow exploration of the effect of different management scales on both governance and environmental risks.
	6, 10, 11: A range of practice, policy and legislative options for better enabling EBM is identified, developed and evaluated.	**g**. Governance and policy practices that support EBM identified, evaluated and packaged for targeted decision-makers.	• We will test options and feasibility analysis with iwi and co-development partners in co-development hui and with technical (legal and policy) experts (SAB). • We will work closely with other Challenge programmes and projects to uptake, synthesise and integrate their research. • We will prepare accessible publications including policy briefings and peer-reviewed journal articles and reports.

H. OUTCOMES	This project will contribute to the following Theory of Change Outcomes:
	2 Decision-making practices that are more inclusive, multi-sectorial and account for the effects from cumulative and multiple activities are adopted
	4 The complementarity of local expressions of Kaitiakitanga and EBM are well understood and enabled
	5 Decision-making processes explicitly identify and address both risk and knowledge uncertainty in a way that reduces risks to ecological, social, cultural and economic wellbeing
	6 EBM practices are understood and accepted as a viable approach by decision makers, stakeholders and iwi
	7 Māori rights, interests and values are supported through the application of EBM
	8 Researchers and iwi and stakeholders involved during the life of the Challenge continue to actively promote, research in, and use knowledge from the Challenge

I. INTRODUCTION

Applying an Ecosystem-Based Management (EBM) approach to our marine environment will require institutional and regulatory arrangements tailored specifically to the Aotearoa New Zealand context. It will also require a widespread understanding of what EBM involves, and adoption of EBM-supportive practices. Ultimately, the Challenge's research findings will need to be adapted, or taken up and actioned, by multiple organisations at different scales and for different purposes.

During the co-development phase, the proposed Project 4.2 *Options for policy and legislative change to enable EBM* was amalgamated with 4.5 *Enhancing EBM at different scales*. This has brought the critical question of scale to the forefront of determining options for enabling EBM. This is because different species inhabit the marine environment at a range of scales. Scale is also inherent in the way different institutions and businesses utilise or manage activities within our seas, and different sectors of society have varying aspirations for the marine environment, often associated with equally varying spatial and temporal scales. Designing a flexible and adaptable legal and policy framework that can accommodate the dynamics and processes of human activities interacting with nature across these scales is seen as one of the key management challenges and there are a range of rights and interests involved.

This project will be collectively informed by research from Phase I and findings generated within Phase II of the Challenge, as well as international and national literature and practice. Taken together, the research will identify tools and strategies for ensuring that EBM is widely understood and implemented, and is adaptive to social and ecological changes, including changes in the types of activities undertaken in the marine domain.

Our research comprises three interconnected aims designed to achieve the goal of providing a clearer understanding of options for change and potential navigable courses to EBM. An abridged description of the those aims follows (more detail is provided through sections J and K):

Aim 1 seeks to identify legal, governance and practice change options for EBM.
Aim 1 is concerned with the legislation, institutional arrangements, policies and practices necessary to support EBM. This includes finding ways to incorporate scientific knowledge and Mātauranga Māori, societal values and worldviews, and rights and responsibilities into law, policy and management frameworks. We aim to identify and analyse a range of options that hold promise for enabling both progressive and transformative change, and to articulate the likely implications of these for current practice, policy, and legislation.

Aim 2 seeks to identify options for management of risk at different scales.
Aim 2 focuses on the spatial and temporal scales at which: society uses and values the environment; ecological systems function and key species interact with habitats; and management initiatives and practices are undertaken.

Latest research and participatory decision-making processes highlight that management efforts are undermined by scale mismatches between physical systems and jurisdictions, institutional fragmentation, and scale effects of activities (spatially and temporally). Effective EBM therefore requires a robust understanding of the multiple cross-scalar interactions within marine social-ecological systems. Importantly, it requires approaches that can either integrate these different scales and requirements or explore the implications of them.

Aim 3 seeks to evaluate and recommend specific actions to support implementation of EBM.
It is important to recommend specific actions needed to support the implementation of EBM by multiple organisations at multiple scales, because the implementation of an EBM approach will look different depending on context, scale and place. We will identify barriers to, and opportunities for, EBM in specific contexts; along with potential mechanisms for transitioning from existing regulatory arrangements to those necessary for successful EBM.

We anticipate a high-level of engagement in this Aim, as the co-development workshops undertaken to form the basis of the Phase II strategy revealed that many organisations were either involved or planned on becoming involved in applying an EBM approach and would welcome engagement with the Challenge. This could facilitate pathways and partnerships for realising an effective and widespread EBM approach for marine management in the long term.

J. AIMS

The project includes three iterative and interrelated aims, which will be conducted (generally concurrently) by collaborative and interdisciplinary research teams, providing input and feedback to each other throughout the project.

Aim 1: To identify and analyse a range of legal and policy options to enable both progressive and transformative change, and the practice, policy, and legislative implications involved in transition to EBM.

Aim 2: To understand and articulate the risk of different management options and scales in an EBM context; and create adaptive management options appropriate to fluid spatial and temporal scales.

Aim 3: To identify what opportunities exist for EBM implementation and determine what needs to change to support successful implementation of EBM in Aotearoa New Zealand.

K. PROPOSED RESEARCH

The project includes three iterative and interrelated aims, which will be conducted (generally concurrently) by collaborative and interdisciplinary research teams, providing input and feedback to each other throughout the project. Taking an interdisciplinary approach means that we consider law and policy in their scientific, social, cultural, historical and political context.

To ensure we can deliver the project aims we have assembled a strong team of researchers with a broad range of disciplinary expertise including: domestic, comparative and international law, policy (coastal, marine and fisheries), governance, ecology, socio-ecological modelling, scientific management, environmental management, natural resource management, Māori and Indigenous resource management. To foster capability, we will also identify and appoint an early career Māori legal expert to complement our research team and provide a tikanga and kaupapa Māori research perspective (milestone 1.4). Our researchers are confident working with a range of research methods and have local, national and international government policy and practice experience.

Our investigations will include case studies selected according to the following initial criteria:

- Complements, extends, or enriches other Sustainable Seas case studies.
- Builds off existing initiatives at various stages of development (e.g. Hauraki Gulf, Ōhiwa Harbour).

- Involves multiple regulatory frameworks and institutions across multiple scales.
- Involves multiple and often conflicting social, cultural and community interests and uses.
- Builds to and is relevant for the New Zealand experience.

Not all case studies will necessarily exhibit or satisfy all applicable criteria, and studies may have varying size, depth and scope, and include a range of research methods. We are exploring as possible case studies: Sea Change, Marlborough Sounds, Ōhiwa Harbour, Kaipara Harbour, Motiti Island, Inshore Finfish Management Plan, habitats of significance, resource extraction (TTR, Chatham Rise), resource management reform, marine mammal protection, marine aquaculture expansion, and comparative international studies. We will finalise case study selection in conjunction with co-development partners.

Aim 1: To identify and analyse a range of legal and policy options to enable both progressive and transformative change, and the practice, policy, and legislative implications involved in transition to EBM.

Q1.1. What policy and legislative options exist or are possible to better enable EBM in NZ and recognise existing rights and interests? (Aim 1)

To achieve Aim 1 we will build on research conducted in Phase I, which investigated existing practices, policies and legislation, to identify and analyse a range of existing and novel options to enable progressive and transformative change around how we manage and use marine areas. We propose to take a comparative, interdisciplinary, and science-led approach to evaluate the likely effectiveness of different options.

We have undertaken preliminary investigations around synthesising Phase I outputs and scoping comparative international case studies and are following a number of significant marine developments that have occurred in recent months (e.g. Motiti Court of Appeal decision, Inshore Finfish Management Plan, TTR appeal).

The research activities will lead to a number of co-authored outputs with targeted input from co-development partners on particular components and through joint hui every 4 to 6 months. The SAB (see **O** below) will provide targeted quality assurance.

RA 1.1 - A Comparative Study of Domestic and International Experience of EBM in Law and Policy
We will explore domestic and international examples that show the potential for EBM to be provided for (to varying degrees) within comparative legal and policy frameworks. We will investigate the context, legal nature and institutional arrangements for these examples, and draw positive and negative lessons from their implementation. We will measure the success of comparative examples against the EBM framework provisionally settled at Phase I (Hewitt et al. 2018 Resource Management Journal).

This activity will involve primarily desktop analysis (although there may be some qualitative empirical analysis of case studies) and be led by EM and HR with involvement from other team members (SU, JH, JY) and liaison from other projects within the theme (Project 4.1 Treaty and EBM (Hikuroa) and 4.3 Kaitiakitanga and EBM (LT)).

Q1.2. Recognising that management and policy priorities and strategies are actioned at different scales, how can they best be accommodated/integrated in an EBM framework? (Aim 1)

We are interested in how management agencies determine priorities and how well these are integrated with other agency strategies at a range of scales. A key question is determining how the implementation of EBM may change as management scales increase. For example, how pragmatically possible is it to reconcile EBM at a rohe or catchment scale with management at much greater scales, such that cumulative effects are managed much more effectively than they are currently in many places.

We will take a place-based case study approach to address these questions by examining existing and proposed management strategies and policies. The research will potentially be more insightful if it aligns with other Challenge research in the Understanding Degradation and Recovery theme, other Enabling EBM theme projects, Tangaroa and/or Innovation and Opportunities Fund place-based research.

RA 1.2 - Characterising the regulatory seascape
We will test the often-voiced assumption that management occurs at different scales. To do this we will explore why managers choose to do what they do, how they connect with each other, and what opportunities exist to manage effectively across scales. The outcome of this research will feed into Q2 and Q3. The research will be a combination of desktop and survey and will be led by HR and contributed to by JH, JY, EJ, SU, and EM. It will be centred around a place(s), where the different scales are easily cognitively recognised, and where there is a polycentricity of management agencies and iwi. The Marlborough Sounds is one possible location, the Hauraki Gulf and the Kaipara Harbour are also potential areas. Co-development will need to be ongoing in the location(s) selected.

Q1.3. What EBM aligned governance arrangements are appropriate to different socio-cultural and ecological scales? (Aim 1)

Governance of natural resources within New Zealand is moving into a new phase, driven by Treaty settlements and partnerships and a recognition from the Environmental Reporting Act series of reports that heavily centralised systems may not lead to optimal environmental outcomes. A shift in governance approaches is also evident in the draft Inshore Finfish Fisheries Plan and the involvement of the EPA in marine decision-making. Communities are also asking for more devolved and collaborative governance in marine management, with marine guardians established in Fiordland, Kaikōura and suggested for the Marlborough Sounds. The Sea Change process in Hauraki Gulf has focused attention on how agencies, iwi and the wider community, with objectives and responsibilities at different scales, can work effectively to protect and restore an iconic and heavily contested space.

RA 1.3 - From embayment to ecosystem – marine governance at different scales
We will consider a range of governance models and evaluate these with respect to the findings from research outlined above and results from Q2. Insights and learnings from other concurrent Phase II research (particularly projects 1.1 and 1.2) will also inform the analysis of different governance models and implementation experiences, and emphasis will be placed on how ecosystem-based management at local scales can function within a wider framework. The research will be a combination of desktop and survey, led by KF with support from SU, HR and Project 4.1 Treaty and EBM (Hikuroa) and 4.3 Kaitiakitanga and EBM (Taylor).

Aim 2: To understand and articulate the risk of different management options and scales in an EBM context; and create adaptive management options appropriate to fluid spatial and temporal scales.

Q2. What are the risks of marine management at scales larger (or smaller) than those at which key species interact with the environment? (Aim 2)

RA 2 - This question has a strong emphasis on social-ecological modelling and biogeographical understanding of how important species utilise our marine environment. It recognises the mobility of species and their interactions with their environment varies with time. Overlain are the different scales that different management organisations and businesses operate over and that iwi, hapū and communities want to either manage, or see results, over. Do these different scales of management impose (or mitigate) different risks on the environment and, from there, on society? We seek to understand the risks of different management options and scales and create management appropriate to fluid spatial and temporal scales and adaptive in an EBM context. We are also interested in when agencies manage at often vastly different scales, and what particular management organisations and governing groups understand to be the risks to ecological resilience.

These understandings will be gained by investing in modeling topics that will help identify generalities for Q1b and Q1c and are identified by Challenge project leads and this project's co-development partners as being most effective and relevant. It is likely that only two topics will be able to be undertaken and at present there are four possibilities.

(i)   Management of mobile marine mammals. Currently there are few management guidelines for developing temporally dynamic management of such species, yet these species are increasingly being affected by shipping activities, noise, fishing, aquaculture, tourism and land-based activities. These are likely to be compounded by climate change affecting temperature, productivity and turbidity. Already some tourism operators are observing changes in where and when they can find mammals to observe. A case study related to understanding how different management scenarios would create social or species-specific risks would rely on already collated data from the Bay of Islands, Hauraki Gulf and Marlborough Sounds and would also seek to collate longer-term mātauranga. It would interact with Projects 1.2 and 4.3.

(ii)   Fisheries of mobile species are managed at large management scales around New Zealand, based on stock connectivity, although this has not prevented localised depletion. This large management scale also does not match the aspirations and needs of small-scale family fishers or of iwi or hapū seeking to manage their rohe. A case study would focus on the potential for mis-matches in scale to cause unexpected outcomes, to determine contexts when smaller management areas would provide better outcomes and investigate whether nested scales of management would be effective. It would interact with Project T2 and an opportunities project with MPI.

(iii)   There is a present push for aquaculture expansion around New Zealand with a focus on increasing sizes of farms and adaptive management. Adaptive management requires some estimation of when action needs to be taken together with what the action should be, particularly in light of climate change. Whether farms are all increased/decreased in size, or whether spatially contiguous or separated blocks are targeted, all have social and ecological implications. As well as aquaculture impacting other uses, other uses of both the land and water can impact on aquaculture success and these interactions often occur across management boundaries. A co-developed case study could focus on the implications of increasing aquaculture, the pros and cons of adaptive management at different scales and how this

adaptive management fits into the spatial management landscape. At present there are no projects with which this would interact, however, there are likely to be Theme 2 (Blue Economy) projects developed that this would link with.

(iv)   Unexpected local effects from other species management. Project T1 is working in Ōhiwa, where there are problems with shellfish disappearing, apparently as a result of predation by starfish. This case study would investigate whether large-scale habitat disturbance in the coastal zone that benefits predator/scavengers has created a situation where the starfish move into the harbour to find food. It would then seek to find management scenarios that would prevent this happening in the future and would lead to successful restoration outcomes for shellfish in Ōhiwa Harbour. It would work closely with Projects T1 and 1.1.

The first section of work under this question would therefore be to prioritise the topics in terms of value to other Challenge projects and the Challenge outcomes, and likely success. We would then work with our co-development partners to create a detailed work plan for those selected topics. Two types of models are likely to be utilised depending on the topic. Agent-based models would be used for (i) and (iii), whereas system dynamic models are more likely to be used for (ii) and (iv). Specific researchers, beyond those specified in the project team, would be bought into the modelling dependent on the topic (e.g., Associate Professor Rochelle Constantine would be involved if topic (i) were to be chosen). Models would be developed by researchers and co-development partners in workshops and hui. Implications of the findings to management and governance structures would be determined by co-development partners and in workshops and hui- especially for case studies strongly grounded in locations.

Results from this question supports other research questions within 4.2 and will also be passed to Projects 1.2, 3.2 and 4.3 as they became available.

Aim 3: To identify what opportunities exist for EBM implementation and determine what needs to change to support successful implementation of EBM in Aotearoa New Zealand.

Q3. What opportunities and barriers for governance or practice changes are needed to implement EBM at different scales? (Aim 3)

To achieve Aim 3, we will conduct an iterative and reflexive process to apply findings to identify the opportunities and barriers to EBM implementation in law, practice and policy. We will ask: what opportunities exist for EBM implementation? What needs to change (and why) to overcome barriers to implementation? These questions are critical to implementing effective and fit-for-purpose practice, policy and/or legislative change to enable EBM.

Throughout the course of this project we will integrate our findings with those of other projects to test and evaluate the options we have generated to address the barriers to EBM. The methods and analysis used to achieve Aim 3 will depend to large extent on the case studies adopted, however, the research will ultimately involve testing legal, policy and practice options for enabling EBM against the Challenge's EBM principles and efficacy of implementation.

RA 3.1 - Implementing EBM in New Zealand Marine Law and Policy – Pathways to Reform
In this research activity we will explore in greater detail the pathways to and implications of law, policy and practice identified as useful to enabling EBM in Aotearoa New Zealand. This research will focus on implementation and will draw together and consolidate findings from Phase I, together with Phase II research within and outside this project, to detail options for legal and policy reform. We will measure the success of comparative examples against the EBM principles articulated in Phase I. This activity will involve desktop analysis and be led by EM and HR with involvement from other team members (JH, JY) and liaison from other projects within the theme (Project 4.1 Treaty and EBM (Hikuroa) and 4.3 Kaitiakitanga and EBM (LT)).

RA 3.2 - Role of Just Transitions in EBM Design and Implementation
In this research activity we will consider how just transitions can be made in marine practice, policy and legal reform, in order to fairly distribute cost, respect existing rights and interests, and considering intergenerational equity. This will be primarily desktop research but may include limited empirical investigations in collaboration with Iwi and/or stakeholders. This activity will be led by SU and KF and involve other members of the project team. We will look to make connections with other research activities within the Project, Theme and broader Challenge.

L.   LINKS TO PHASE I RESEARCH
- Davies et al. 2018. Navigating collaborative networks and cumulative effects for Sustainable Seas. Environmental Science and Policy 83: 22-32.
- Jackson et al. 2018. Hui-te-ana-nui: Understanding kaitiakitanga in our marine environment. University of Otago for Ngā Moana Whakauka – Sustainable Seas National Science Challenge.

- Joseph 2019. Whaia te mana Māori Whakahaere Tōtika ki Tangaroa – in pursuit of Māori governance jurisdiction models over marine resources. In. Severinsen & Peart 2018. Reform of the resource management system: the next generation. Working Paper 3. Environmental Defence Society. Auckland.
- Joseph et al 2019. The Treaty, tikanga Māori, ecosystem-based management, mainstream law and power sharing for environmental integrity in Aotearoa New Zealand – possible ways forward. Sustainable Seas National Science Challenge.
- Le Heron et al. 2019. It's not a recipe… but there are ingredients. Navigating negotiated changes through participatory processes in marine spaces. *Planning Quarterly* 213, 32-37.
- Le Heron et al. 2019. Diversity, contestation, participation in Aotearoa New Zealand's multi-use/user marine spaces. *Marine Policy* 106: 103536 DOI: 10.1016/j.marpol.2019.103536.Rout et al. 2018. Māori marine economy. Funded through the Whai Rawa, Whai Mana, Whai Oranga project, Sustainable Seas National Science Challenge.
- Peart et al. 2018. Enabling marine ecosystem-based management: is New Zealand's legal framework up to the task? Unpublished report.
- Rout M et al. 2018. *Māori marine economy: a review of literature concerning the historical and contemporary structure of the Māori marine econom*y. Sustainable Seas National Science Challenge.
- Sustainable Seas National Science Challenge 2018. *Advancing ecosystem based management in Aotearoa New Zealand through current governance arrangements.* Sustainable Seas National Science Challenge Discussion Paper. In Review.
- Taylor L et al. 2018. *How current legislative frameworks enable customary management & ecosystem-based management in Aotearoa New Zealand-the contemporary practice of rāhui*. Sustainable Seas National Science Challenge Discussion Paper.
- Tiakiwai S-J, et al. 2016. *Sustainable Seas Project VM2.1 Output 3: Final report and recommendations*. Waikato-Tainui College for Research and Development report for Sustainable Seas National Science Challenge.

M.   LINKS TO & INTERDEPENDENCIES WITH PHASE II RESEARCH PROJECTS

Meetings will be held with other projects to make best use of case studies as projects progress. For example, projects 4.1, 1.1 and 4.3 all propose to work in the Hauraki Gulf.

Project 4.1 Treaty relationships and EBM. Ensuring the effective implementation of EBM in a manner that gives effect to Treaty obligations requires understanding the different ways in which rights and interests of iwi, hapū and whanau are provided for in domestic, international and customary law. Research that distinguishes different institutional mechanisms and arrangements available can inform policy and regulatory reform to support EBM while strengthening Treaty relationships. We intend to work closely with project 4.1 given the importance of this project for legal and policy frameworks to enable EBM across scales. We have held a number of Theme meetings (KF) with the project lead for project 4.1 (Hikuroa) in developing our proposal.

Project 4.3 EBM and Kaitiakitanga, Mātauranga and Science. Implementing EBM in Aotearoa New Zealand requires decision-making processes that enable and support the application of kaitiakitanga. This, in turn, requires research that demonstrates the synergies, complementarities and divergences between EBM and kaitiakitanga. We intend to work closely with project 4.3 given the importance of this theme for legal and policy frameworks to enable EBM across scales. We have held a number of Theme meetings (KF) with project lead for project4.3 (Taylor) in developing the proposal.

Theme 1 Understanding degradation and recovery. One of the key knowledge gaps for managers is recognising and understanding the cumulative causes of hysteresis across stressor gradients, and what actions can be taken to induce recovery at different scales. Project 1.1 will provide information on the types and scales of management actions needed to deal with cumulative effects and provide for recovery- our project will take up this information and determine options for how they might be put into practice (addressing the legal-ecological mismatch). Project 1.2 (*Tools for incorporating ecological responses to cumulative effects into management actions*) will provide tools for management action scenario testing and will take up information generated by Aim 2 of our project.

Theme 2 Creating value from a blue economy. Securing and enhancing the ecological health of New Zealand's oceans requires a marine economy that is committed to ecologically sustainable practices. This links directly back to the Challenge's Objective. We hope to have a high level of engagement with Theme 2 and have developed a proposal for a post-doctoral researcher to work across Themes 2 and 4 together with Iwi (awaiting Challenge response).

Theme 3 Perceptions of risk and uncertainty. The ability to estimate risks associated with actions is necessary for any management regime. This is particularly true for EBM in the marine environment as uncertainty levels of direct responses to stressors are often very high, mainly due to difficulties in collecting knowledge of what is out there, and in understanding how ecological functioning responds to stressors against a background of environmental variability and climate change. Information on how people perceive risks to different parts of the socio-ecological system from Project 3.1 will be used in Aim 2 models and information from the

management-ecological models will be fed into the tools generated by Project 3.2. As a project member (JH) is the leader of Theme 3 we will have strong links into Theme 3 and collaboration and engagement will be continuous.

Tangaroa Theme. T1 is involved in co-management of Ōhiwa Harbour. This makes an excellent study that we can analyse to identify options for effective practices that occur in place at a local scale.

N.   VISION MĀTAURANGA (VM)

Coastal Māori express grave concerns regarding the degradation of marine environments and depleting kaimoana (fish, shellfish, kelp), mahinga kai (harvesting areas), and want action to prevent further degradation and to allow recovery in multi-use marine ecosystems. Damage to the marine environment transgresses the basic concepts of a Māori worldview in ways that undermine cultural and individual identity. The degradation of marine ecosystems has a significant detrimental effect on the relationship of Māori with their rohe moana (traditional marine environments) (Ministry for the Environment & Stats NZ 2019).

This project will have ongoing kōrero with Theme 4.1 (Hikuroa) and Theme 4.3 (Taylor), as well as the Challenge's Tangaroa programme. It will also seek to engage with any Challenge projects at a local or case study level. Consistent with Vision Mātauranga policy, this will assist this project in seeking to critically address ways in which more effective management can occur in a post-settlement environment, where rights and interests are safeguarded and mātauranga Māori given expression. Maximising the combined knowledge systems to assist marine management and decision-making gives effect to Vision Mātauranga policy; and is also essential for significantly improving the ecological resilience of our marine ecosystems.

We continue to seek guidance from the Challenge leadership (Manahautū), Tangaroa programme, and Kaiārahi Māori research advisors at our institutions about appropriate engagement with Māori. We sought advice from Challenge leadership about how best to go about engagement with iwi given the relevance of project 4.2 to all of Aotearoa New Zealand and it was agreed that it would be appropriate as a starting point for us to engage with local iwi where the project leads are based. We have engaged with Ngāi Tahu Research Centre via letter, phone call and face to face meetings, and they have expressed a willingness to continue to work with us in relation to the project. In particular, NTRC were interested in being involved with a post-doctoral researcher opportunity to be located with NTRC. We intend to engage meaningfully and appropriately with local iwi in relation to any place-based research, and for this reason have set aside a portion of the budget to support this engagement. We otherwise intend to work with the other projects in Theme 4 and across the challenge (see **Q** below) to ensure the perspectives and interests of local iwi are given due emphasis.

Partnerships:	
P1	We have had initial discussions with Ngāi Tahu Research Centre, we intend to leverage Māori engagement via our collaborations with other projects in theme 4, and we plan to leverage information exchange with Tangaroa Theme (T1).
Distinctive Contribution:	
D1	At least one of our case studies will be place-based and will be co-developed with local iwi, hapū and/or Māori entities meaning that mātauranga Māori will contribute to the design and testing of project outputs.
Meaningful Outcomes:	
M1	The project will ensure that recognised Māori rights and interests in the management of the marine environment have been provided for and protected in outputs.

O.   ENGAGEMENT REQUIRED WITH IWI AND STAKEHOLDERS

We are committed to ongoing co-development and engagement with iwi and stakeholders for the duration of the project, in order to produce research of the highest potential quality and impact.

Proposal co-development

To develop the proposal, we engaged with stakeholders from regional and local government, legal and policy subject matter experts. We also engaged with iwi/hapū partners where the project leads are based.

We engaged first via email with all regional and local government agencies who expressed an interest in being involved in co-development and invited them to participate in email correspondence, telephone discussions and in person meetings. Those who expressed a desire to do so were contacted via their preferred method. On 18 September we held a co-development hui at NIWA offices in Wellington with representatives of MPI Fisheries, MFE, EPA, and DOC who expressed a desire to meet in person. We took the feedback of all participants into account when drafting the proposal.

Given the highly technical legal analysis required for this project, we contacted specialist marine law practitioners and academics to provide voluntary strategic guidance and review (listed above at **D** and denoted with *). We plan to include them in a reference

group/advisory group of experts (Strategic Advisory Board ('**SAB**')). These are a range of marine law and policy experts (practitioners and researchers) on fisheries law, environmental law and conservation, transport and fishing, international marine regulation, resource extraction, biosecurity, and customary title and includes a number of Māori lawyers or experts on Māori marine issues. We have sought advice from Challenge leadership as to a Māori marine policy expert to add to the panel and invited this person to join the SAB.

We engaged separately via email, phone and face to face meetings (as preferred by the participant) with these legal and policy experts. The discussions covered the nature of each participant's involvement over the course of the research project and the participants' key concerns about marine law and policy in New Zealand. Again, the participants' feedback informed the preparation of the proposal.

We continue to seek guidance from the Challenge leadership (Manahautū), Tangaroa programme, and Kaiārahi Māori research advisors at our institutions about appropriate engagement with Māori. We sought advice from Challenge leadership about how best to go about engagement with iwi given the relevance of project 4.2 to all of Aotearoa New Zealand and it was agreed that it would be appropriate as a starting point for us to engage with local iwi where the project leads are based. We have engaged with Ngāi Tahu Research Centre via letter, phone call and face to face meetings, and they have expressed a willingness to continue to work with us in relation to the project. In particular, NTRC were interested in being involved with a post-doctoral researcher opportunity to be located with NTRC. We also engaged kanohi ki te kanohi (in person) with the Chair of Ngāi Tūahuriri Rūnanga, Arapata Reuben, and invited Ngāi Tūahuriri's involvement and participation.

We emailed a draft of the proposal to all government stakeholders, legal and policy experts, and iwi contacts for comment in October. Any written or verbal feedback was taken into account in finalising the proposal.

Ongoing project co-development

We will continue to co-develop the preparation and execution of specific research projects and outputs within the overarching project programme with iwi, agency co-development partners and stakeholders, and the SAB.

Government agency and regional council representatives have indicated a willingness to provide ongoing collaboration on the research, and updates on relevant policy and operational developments in their respective organisations and cross-agency activities, including via email and phone communications and meetings at 4 to 6 monthly intervals. We will continue to engage with our legal and policy SAB and local and place-based iwi to ensure the results of the research are fit for purpose and that any tools developed are user tested.

The SAB will play a very important function as a 'critical friend' of the Project, providing targeted review and feedback where appropriate. Our list of prospective SAB members (marked with an asterisk at **D** above) is extensive to cover the breadth of legal and policy issues and specialisations involved. The list is also extensive because, although all members have expressed a willingness to be involved in the SAB, we recognise that the members of the SAB have competing commitments and their availability to comment on specific research may be variable.

We continue to seek guidance from the Challenge leadership (Manahautū), Tangaroa programme, and Kaiārahi Māori research advisors at our institutions about appropriate engagement with Māori. We intend to engage meaningfully and appropriately with local iwi in relation to any place-based research, and for this reason have set aside a portion of the budget to support this engagement. We otherwise intend to work with the other projects in Theme 4 and across the challenge (see **M** above) to ensure the perspectives and interests of local iwi are given due emphasis.

P.   PROJECT COMMUNICATIONS

Our project ethos is to build and maintain effective relationships with iwi, agency co-development partners and stakeholders through-out the life of the project. All research will be undertaken and published in a manner that will provide for 'no surprises' to end-users. As noted above, we are committed to ongoing co-development and engagement with iwi and stakeholders for the duration of the project.

The project will produce a range of academic writing (peer reviewed journal articles), reports, policy briefings and accessible communications. We are committed to disseminating our research to Māori and stakeholders and end-users in appropriate and useful ways, and we will use co-development workshops and hui to seek guidance and feedback on the appropriate form and scope of our research dissemination efforts.

For every manuscript of research produced we will seek to publish one piece of academic writing and one accessible piece of writing to be published as an opinion piece, blog post, podcast or other accessible media focused for Māori and stakeholders (cross-posted on the Challenge website).

We will use social media such as Linkedin and Twitter to communicate project developments and findings. We will also use the Challenge's communications team. We are committed to minimising the environmental impact of this project, so online methods of research dissemination and communications will be used.

Q.	RISK & MITIGATION

We will mitigate risks involved in the project via detailed and responsive project planning, frequent and ongoing communication with Challenge leadership, and effective and regular engagement with iwi and stakeholders. We believe that most risks can be managed by taking a proactive and adaptable approach to planning and communications. We will listen to iwi and stakeholders and work carefully on building enduring relationships that are responsive and adaptable to unforeseen events.

R. CONSENTS & APPROVAL required to undertake research	• We will apply for approval from our respective institutions as required for Human Ethics.

S.   BIBLIOGRAPHY WITH RECENT SELECTED PROJECT TEAM MEMBER PUBLICATIONS

Akhtar-Khavari A, Macpherson EJ, et al. 2019. Why do Australia's environmental laws fail to save our species from extinction? *World Commission on Environmental Law*.

Bulmer RH, Stephenson F, Lohrer AM, Hewitt JE. 2019. Exploring the impact of multiple stressors on estuarine ecosystems using a Bayesian Network model. Prepared for Parliamentary Commissioner for the Environment.

Davies K, Fisher K, Foley M, Greenaway A, Hewitt J, et al. 2018. Navigating collaborative networks and cumulative effects for Sustainable Seas. *Environmental Science and Policy* 83: 22-32.

Davies KK, Fisher KT, Couzens G, Allison A, van Putten EI, Dambacher JM, Foley M, Lundquist CJ. 2020 Trans-Tasman Cumulative Effects Management: A Comparative Study. *Frontiers in Marine Science*, 7:25. doi: 10.3389/fmars.2020.00025.

De Juan S, Hewitt J, Subidac MD, Thrush S. 2018. Translating Ecological Integrity terms into operational language to inform societies. *Journal of Environmental Management* 228:319-327.

Hewitt J, Faulkner L, Greenaway A, Lundquist C. 2018. Proposed ecosystem-based management principles for New Zealand. *Resource Management Journal* November 2018: 10-13.

Hewitt JE, Thrush SF, Lundquist C. 2017. Scale-Dependence in Ecological Systems *Encyclopaedia of Life Sciences*.

Lohrer AM, Thrush SF, Hewitt JE, Kraan C. 2015. The up-scaling of ecosystem functions in a heterogeneous world. *Scientific Reports* 5:10349.

Macpherson EJ. 2019. *Indigenous Water Rights in Law and Regulation: Lessons from Comparative Experience*. Cambridge University Press.

O'Donnell E. and Macpherson EJ. 2018. Voice, power and legitimacy: the role of the legal person in river management in New Zealand, Chile and Australia. *Australasian Journal of Water Resources 1*: 1-10.

Rennie HG. 2018 (December). The seduction of fast track recovery legislation – the Mangamaunu surf break saga. *Planning Quarterly*, Issue 211: 21-27

Rennie HG. 2017 The wreck of the MV Rena – culture, risk and resilience in impact assessment *Impact Connector (4)* https://www.nzaia.org.nz/the-wreck-of-the-mv-rena.html. Republished by International Association for Impact Assessment (Dec 2017) *http://www.iaia.org/news-details.php?ID=63*

Rennie H. and Outram A 2018. Section 33 Transfers — Implications for co-management and kaitiakitanga (17 May 2018 Update) *DSL Environmental Handbook.* Thomson Reuters Westlaw NZ: Wellington. P.39 (online).

Stephenson F, Bulmer RH, Meredyth-Young M, Meysick L, Hewitt JE, Lundquist CJ. 2019. Effects of benthic protection extent on recovery dynamics of a conceptual seafloor community. *Frontiers in Marine Science* 6:607.

Thrush SF, Hewitt JE et al. 2013. When small changes matter: the role of cross-scale interactions between habitat and ecological connectivity in recovery. *Ecological Applications* 23:226-238.

Thrush SF, Hewitt JE et al. 2014. Experimenting with ecosystem interaction networks in search of threshold potentials in real-world marine ecosystems. *Ecology* 95:1451-1457.

Thrush S, Lewis N, Le Heron R, Fisher K, Lundquist C, Hewitt J. 2016. Addressing surprise and uncertain futures in marine science, marine governance, and society. *Ecology and Society, 21*(2), 44.

Urlich S, Fearn D, McConaghey B, Dickson H, Hemingway S, Wills H, Pillans J, Wilkey S, McClelland-Petersen O, Bentley M. 2019. Marine Guardians – a novel solution to improving our marine environment, *Resource Management Journal* of the NZ Resource Management Law Association. April: 19-24.

Urlich S, Thrush S, Hewitt J, Jorgensen E. 2018. The Earth Summit 25 years on: why is biodiversity continuing to decline? *Resource Management Journal* of the NZ Resource Management Law Association. April: 19-24.

Urlich S, Thrush S, Hewitt J, Jorgensen E. 2018 What it means to "maintain" biodiversity in our coastal marine environment. *Resource Management Journal* of the NZ Resource Management Law Association. April: 19-24.

Yletyinen J. *et al.* (2019) 'Understanding and Managing Social–Ecological Tipping Points in Primary Industries', *BioScience*, 69(5), pp. 335–347. doi: 10.1093/biosci/biz031.

Yletyinen J. *et al.* (2018) 'Fishing strategy diversification and fishers' ecological dependency', *Ecology & Society*, 23(3), p. 28