



Sustainable Seas

Ko ngā moana whakauka

National Science Challenge



- **Overview** – Julie Hall
- **Ecosystem Based Management** – Simon Thrush
- **Our Seas** – Simon Thrush
- **Valuable Seas** – Joanne Ellis
- **Tangaroa me Māori** – Anne-Marie Jackson
- **Dynamic Seas** – Dave Schiel
- **Managed Seas** – Carolyn Lundquist
- **Progress to date** – Julie Hall
- **Questions**

Challenge Objective

Enhance utilisation of our marine resources within environmental and biological constraints.

Key steps to achieving this

- Realise that there are substantial resources of great value, both for present marine-based industries, society and nature – now and into the future.
- Realise that potential marine industries need societal approval
- Partnership with Maori
- Framework that allows decisions about different uses, from extraction to conservation, to be balanced against all of our values (environment, culture, economy).

Social licence to operate (SLO)

- Is the ability of an organisation to carry on its business because society has confidence that it will behave in a legitimate, accountable and socially and environmentally acceptable way.
- It is not a formal agreement or document.
- Is based on societal perceptions of the acceptability of a company and its projects at a moment in time
- Is often not given when values and existing rights are not addressed early enough in the consenting process.
- Is dynamic and can even be revoked because societal perceptions can change over time for different reasons

What is needed to obtain SLO

- Informed and participatory decision making frameworks that identify and integrate the values and existing rights of all sectors of society.
- Processes that accommodate many activities and potential conflicting uses.
- Pathways for communicating to society what is, and isn't, known.
- Processes that account for cumulative and multiple stressors.
- Frameworks to assist Māori and stakeholders to navigate conflicting uses (including trade-offs, mitigations and negotiated accommodations).

How do we achieve this?

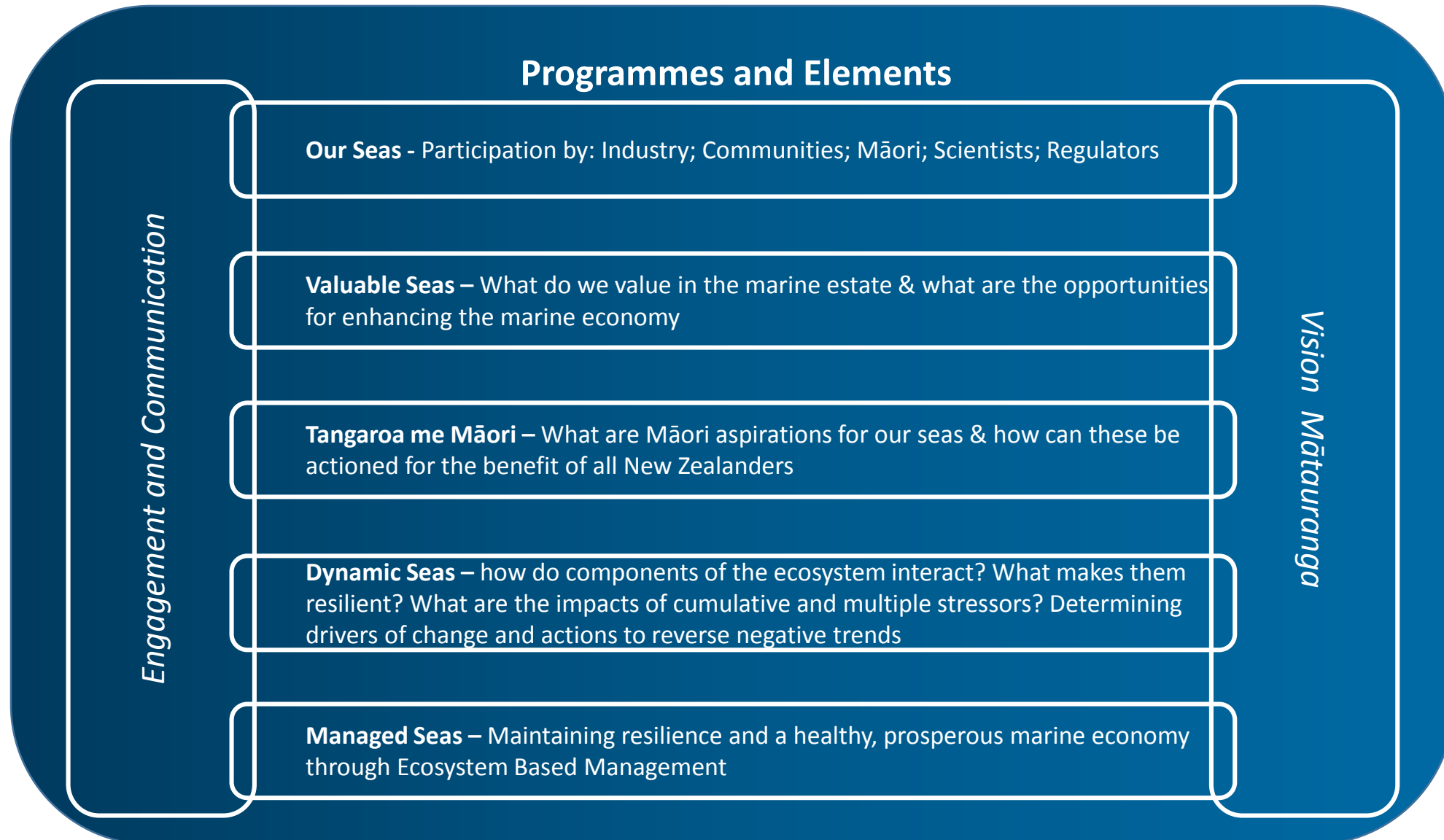
The Challenge objective will be met by developing strategy and tools for the integrated management of the sea and its resources that recognizes the full array of interactions, including human, within the marine ecosystem and promotes conservation and sustainable use in an equitable way.

Ecosystem Based Management (EBM)

Sustainable Seas will

- Work in partnership with Māori and embed Vision Mātauranga throughout the Challenge
- Be participatory, with different levels and forms of involvement resulting in co-production and co-learning throughout.
- Develop frameworks to identify and integrate the values, aspirations and bottom lines of all sectors of society.
- Develop tools for balancing good environmental stewardship, the enhancement of existing uses and the development of new profitable marine resource uses, while meeting the aspirations and rights of society including Māori.
- Develop tools for assessing risks and uncertainty in a changing world.
- Develop a tool box of Ecosystem Based Management approaches for managing activities in our marine estate as one approach will not fit all situations.
- Undertake innovative science that is focused on the objective.
- Be open to creativity and innovation to ensure success.

Sustainable Seas structure



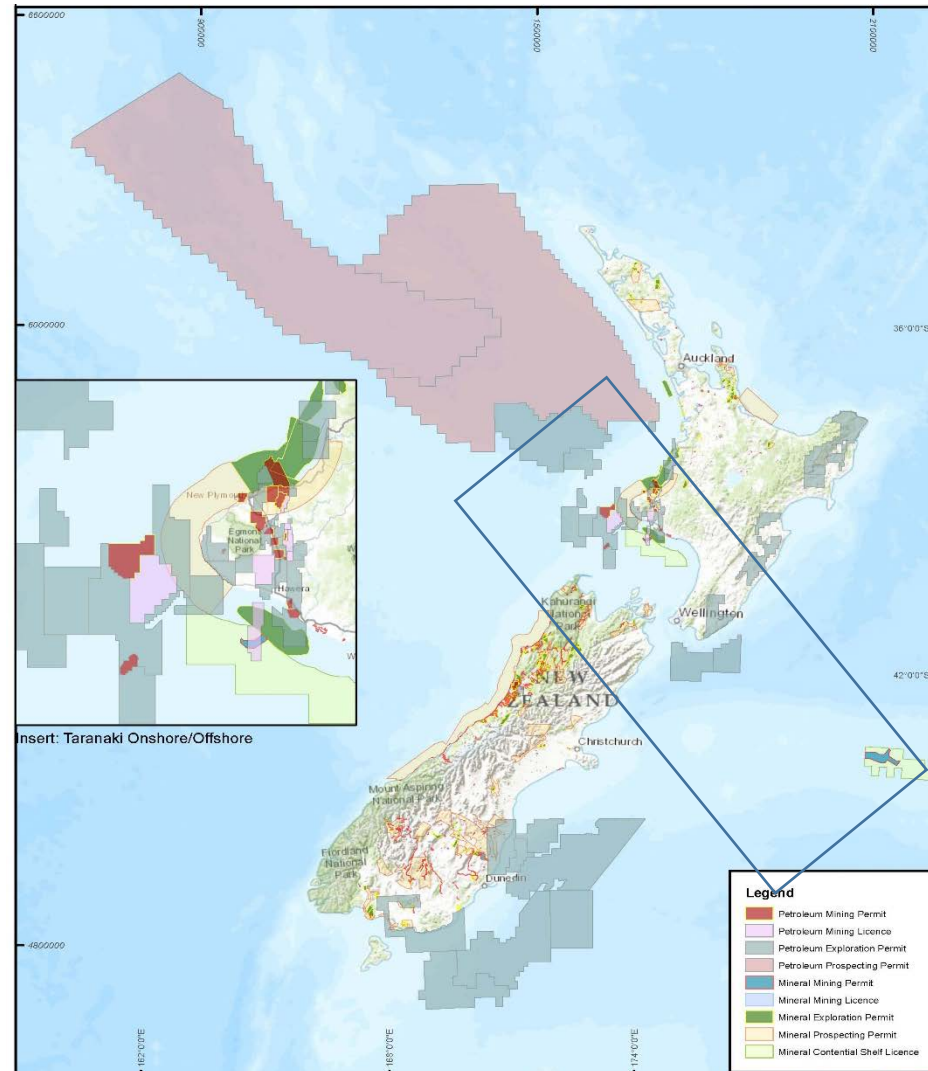
Engagement and Communication

- Within Challenge communication
- External communication
- Outreach and education
- Participation
- Links with other Challenges
- Other elements of the science contribution beyond this challenge
- Links to other challenges and international activities e.g., TEEB

Vision Mātauranga & strategic elements

- MBIE policy framework mission to *“unlock the innovation potential of Māori knowledge, resources and people to assist New Zealanders to create a better future”*
- Tiriti o Waitangi/ Treaty of Waitangi
- Governance
- Kaupapa Māori research principles
- Capacity and leadership
- Research capability
- Transformative context and future focused research

Case study region



Science in the Anthropocene

Key challenges involve societal-ecosystem interactions



**Biodiversity and ecosystem
processes, trends**



**Societal values, preferences
and trends**



**Management targets, goals
and outcomes**



What is Ecosystem Based Management?



- Recognition of the need to manage, steward, and use our ecosystems differently.
- A uniquely NZ opportunity to partner in ownership of solution with Māori.
- Multiple use and value-based assessment and decision-making.
- A participatory process – we are all in it together.
- Dynamic and lived relationships and models of stewardship.
- Future focus.
- Dependent on context (social, economic, ecosystem).
- An experiment.
- A framework for solutions focused science – based on EBM principles.

Ecosystem-Based Management -

Integrative concept representing multiple values

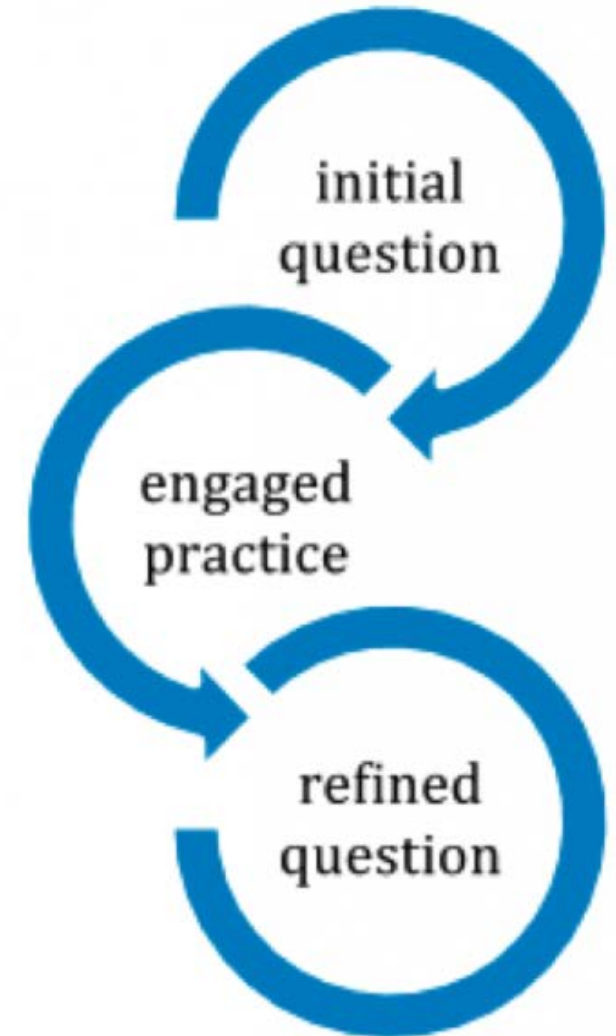
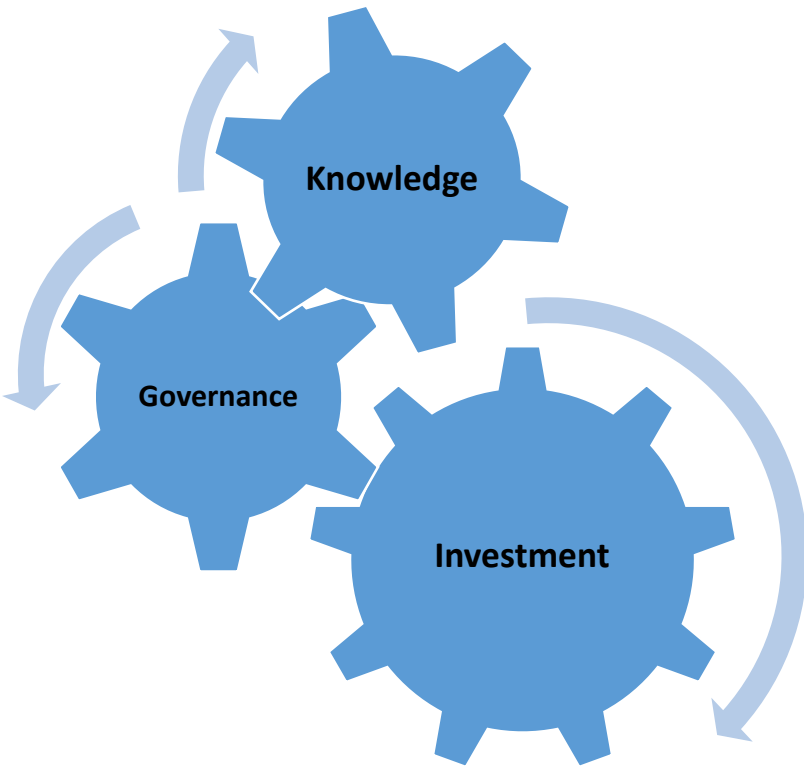
- Long-term sustainability as a fundamental value.
- Clear objectives.
- Sound ecological models and understanding of complexity and interconnectedness.
- Recognition of the dynamic character of ecosystems.
- Attention to context and scale.
- Acknowledgment of humans as ecosystem components.
- A commitment to adaptability and accountability.

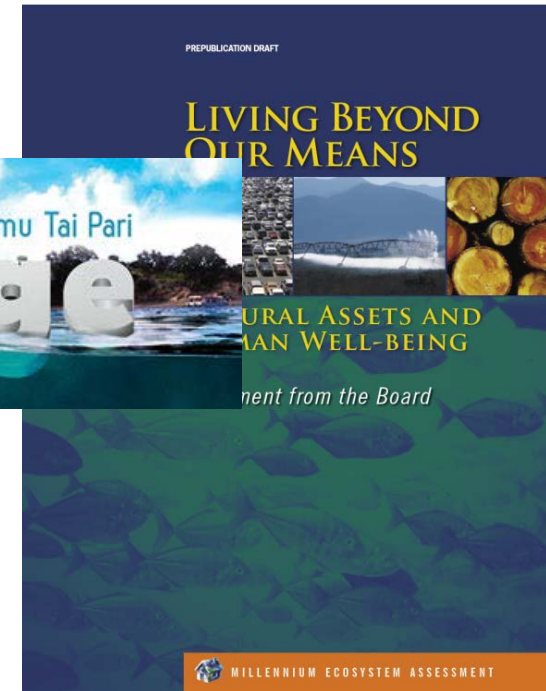
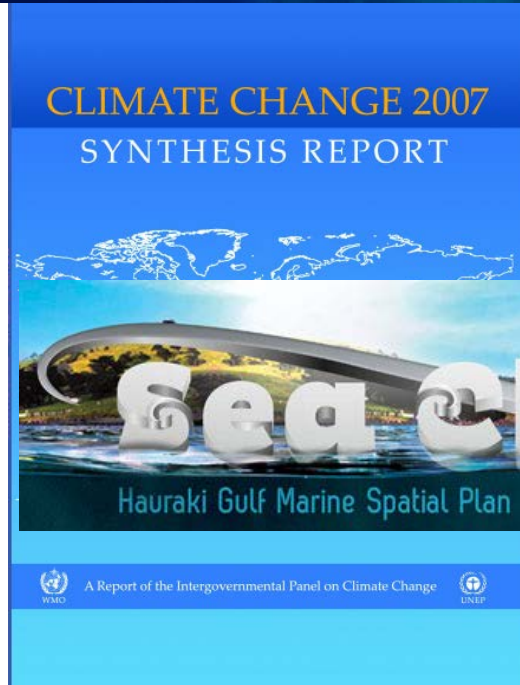
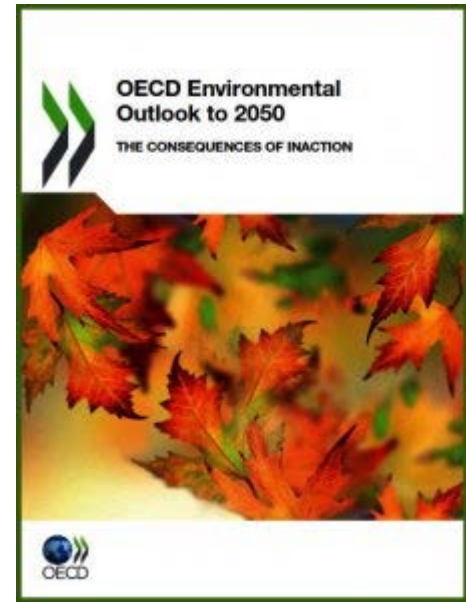
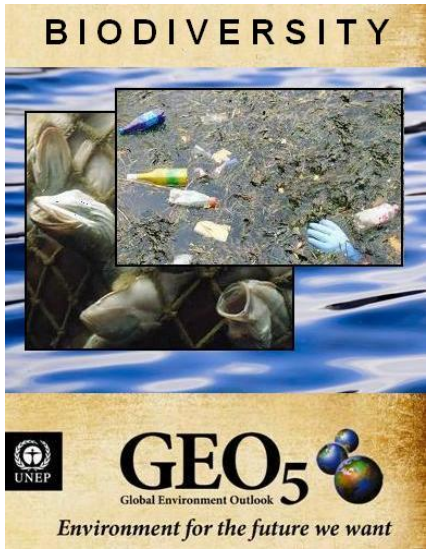


People, connections, commitment...



Science mandate
Solution focus
Problem ownership





Navigating the future



Our Seas

Our Seas

Transformational projects involving Science to Society; socio-ecological engagement to bed in EBM

How do we...

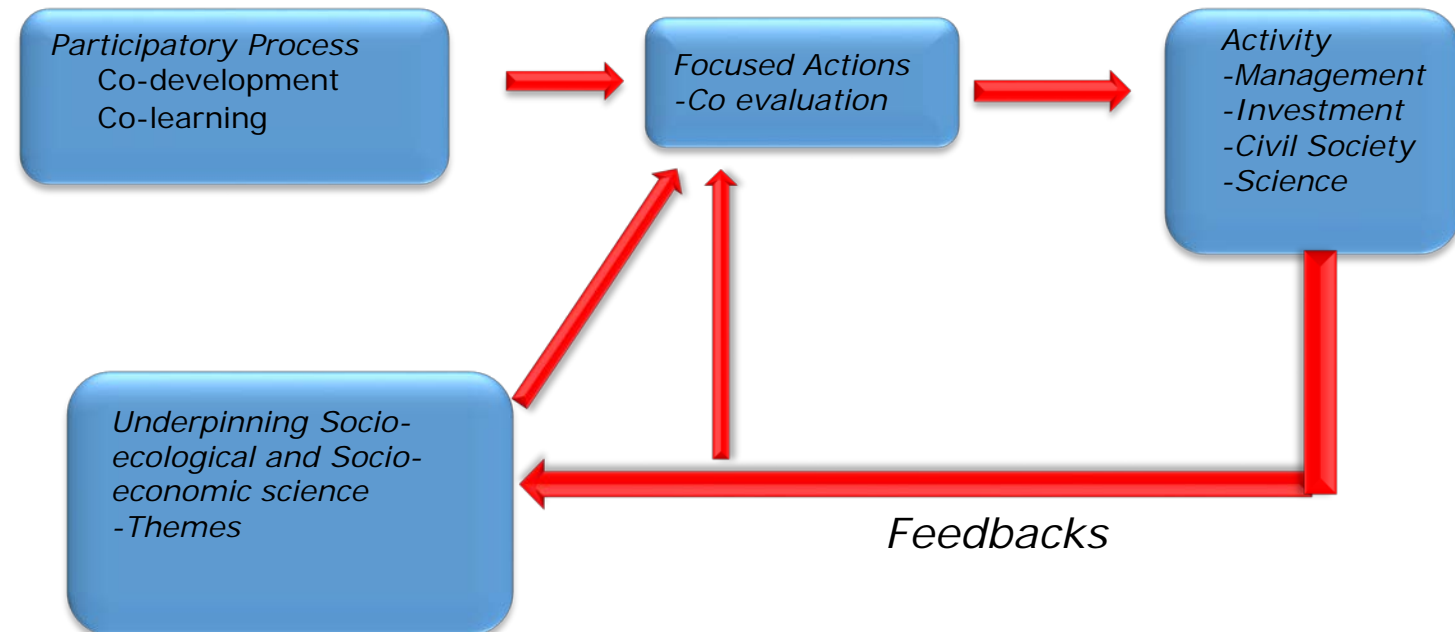
- rationalize different values and world views?
- make science do work in society?
- develop effective participatory processes?
- define the future(s) we want?
- develop and adapt governance structures?
- build trust in science and new knowledge?



Our Seas

- Transdisciplinary science to co-produce, co-learn and co-develop solutions.
- Integration and emergence across the Challenge.

Capacity building



Research foundations for Our Seas

- Learning how science can do work in our society; working with multiple stakeholders; linking values to ecosystem services
- **Marine Futures** – Looking to our futures; making models for people; developing new ways of developing and navigating scenarios; dealing with surprises; sustainability as pathway or target
- **Biological Economies** – Investment and stewardship in resource based economies addressing multi-use complexities, conflicts and constraints, cross-scale effects, and international networks
- **Values Monitoring and Outcomes** - research on values and collaborative governance in freshwater
- Public outreach and citizen science programs (especially UoO and UoA)

Marine Futures, Short duration project

- Considering the socio-economic dimensions allowed us to make rapid progress
- We opened up discussion to reduce sectarianism
- We accepted multiple world views and used different types of knowledge
- We built new models (snapper) and developed new insights (climate change) – putting science to use in new ways



BY 2031
AUCKLAND POPULATION
WILL REACH
2 MILLION

THIS IS **60%**
OF NZ'S
PROJECTED POPULATION
GROWTH BETWEEN
2011-2031

400,000
NEW DWELLINGS
WILL BE NEEDED BY 2040



THIS IS EQUIVALENT TO **13,000**
NEW HOUSES EACH YEAR
IN THE YEAR 2012
4,260 WERE APPROVED

PUTTING PRESSURE ON
INFRASTRUCTURE

AUCKLAND COMPRISES:
2% OF NZ'S LANDMASS,
BUT
1/3 OF NZ'S
ECONOMY AND
POPULATION

AUCKLAND'S
ECOLOGICAL FOOTPRINT
IS
4.8 TIMES
OUR LAND AREA

HIGHEST
PER CAPITA
BOAT
OWNERSHIP
IN THE
WORLD
1 in 3
HOUSEHOLDS OWN A BOAT

96% LIVE WITHIN
OF THE **5 KM**
COAST
70%
OF THE
AUCKLAND AREA IS
COASTAL
WATER

This project is funded by Ministry of Business, Innovation and Employment Research Contract CD1X1227 (Marine Futures). Contact: Katie Cartwright@resourcenz
This poster was compiled by Katie Cartwright (NIWA).

DOUBLE EXPORT TARGET

- Doubling primary sector exports by 2025
- Increase exports from **30% to 40%** of GDP

DAIRY

Contributes **2.8%** of GDP (**\$5 billion**),
and creates employment for c.45,000

AQUACULTURE TARGET

Industry goal to increase sales
to **\$1 billion** by 2025

ENERGY TARGET

90% of electricity
generation from
renewable sources by
2025

TOURISM

Largest export industry
\$18.6 billion to the
economy each year (9%
of GDP)

PETROLEUM & MINERALS

- Most productive sector in NZ economy
- **2.5%** of GDP and **6.2%** of exports in 2013
- Workers paid on average **>\$100,000**

NZ is **third** in the world for percent
renewables in primary energy supply

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This poster was compiled by Katie Cartwright (NIWA).

BY 2050
THE GLOBAL POPULATION WILL EXCEED
9 BILLION



70% OF PEOPLE WILL LIVE IN
CITIES

PUTTING PRESSURE ON



INFRASTRUCTURE

2 BILLION
WILL BE
OVER 60



AND
WE MAY BE
MORE
CONNECTED
THAN EVER

PER CAPITA INCOMES ARE SET TO
MULTIPLY



AND BY 2040 THE GLOBAL
MIDDLE CLASS
WILL INCREASE BY **180%**

LIFTING MILLIONS
OUT OF
POVERTY



PROJECTED GROWTH FOR THE
WORLD ECONOMY
>3%
PER ANNUM

ECONOMIC AND POPULATION
GROWTH WILL INCREASE
DEMAND FOR
RESOURCES

BETWEEN 2005 AND 2050

FOOD
PRODUCTION
MUST INCREASE BY **70%**



SOME ESTIMATES SUGGEST THAT
GLOBAL FISH STOCKS
COULD **COLLAPSE** BY 2048

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This poster was compiled by Gemma Webb (University of Auckland), Katie Cartwright (NIWA).

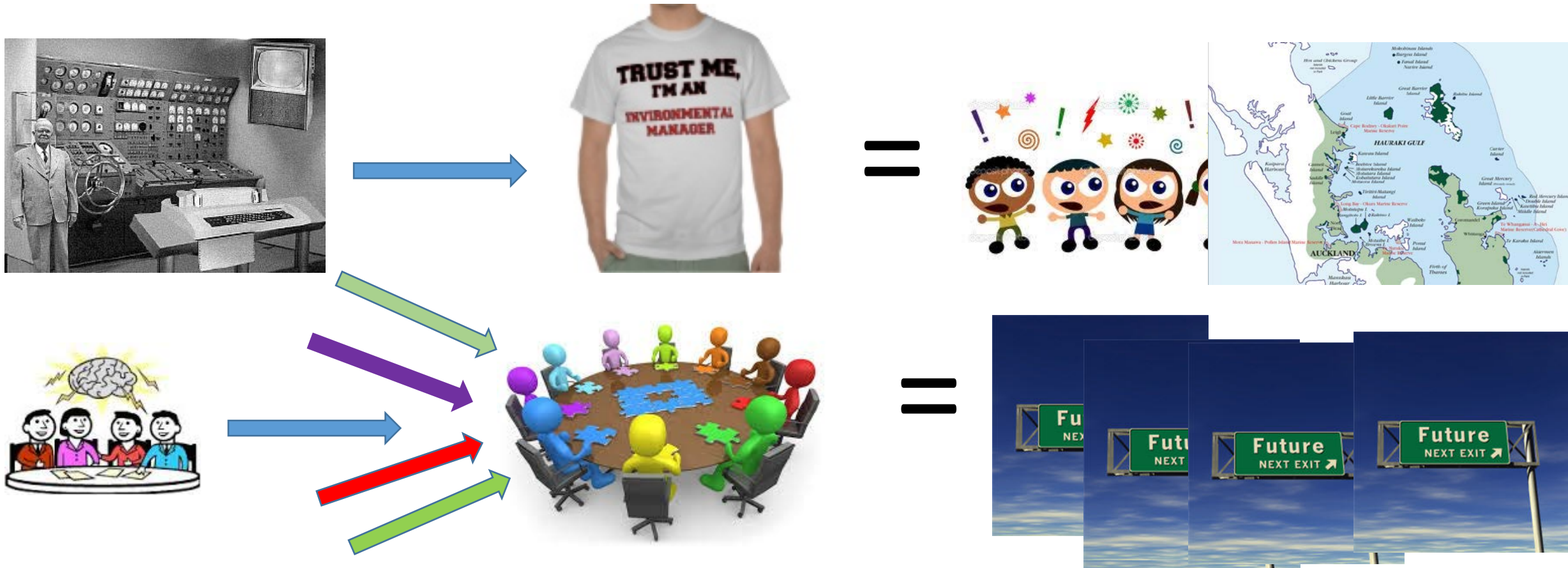
“The most livable city” – Mayor Brown
“Where talent wants to live” – Sir Paul Callaghan

Visioning marine futures

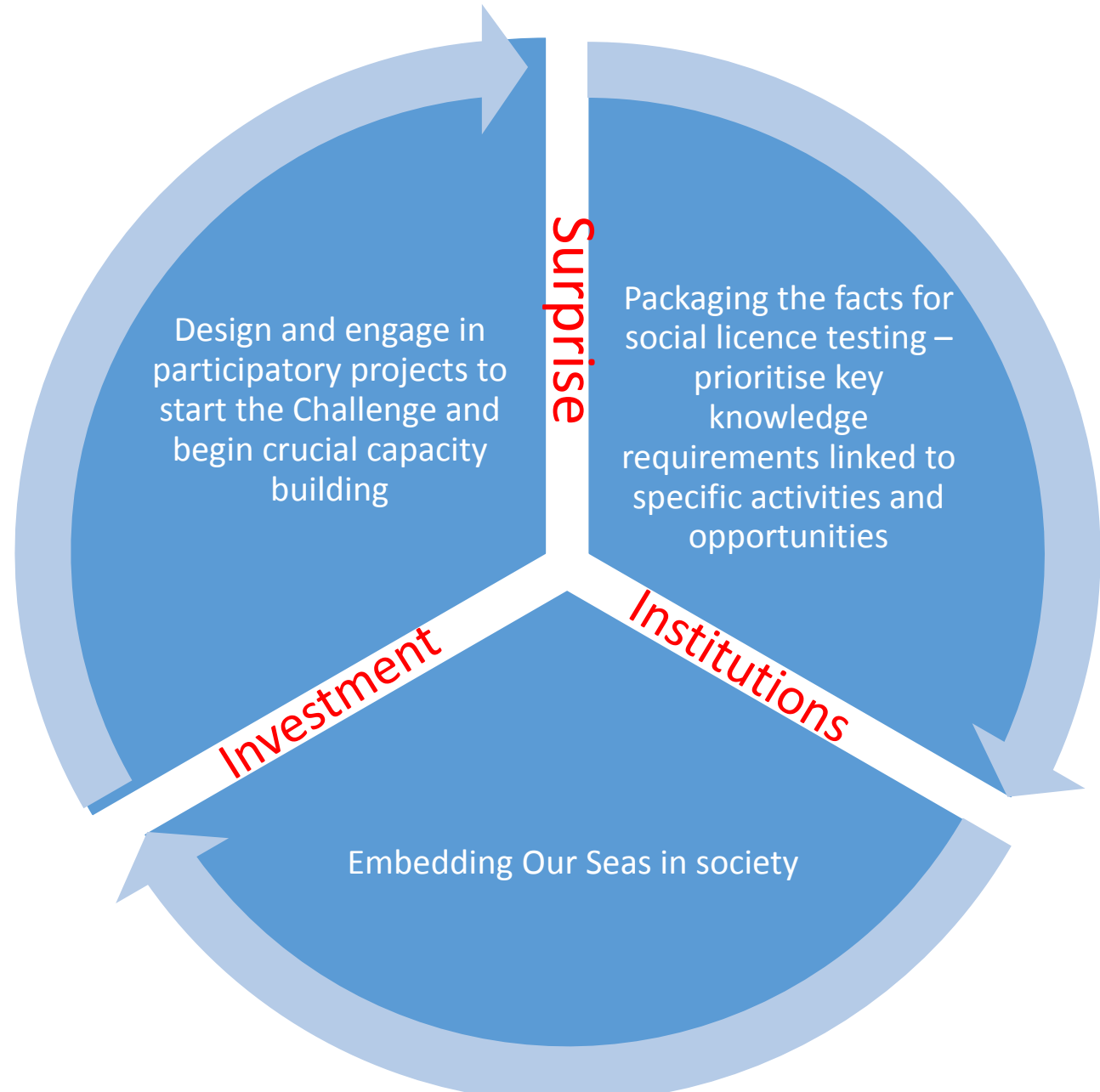
- Diverse, multi-use, productive, enjoyable, accessible, resilient...
- How do we get there from here?
 - ★ Societal involvement – engagement and responsibility
 - ★ Developing a framework
 - ★ Setting objectives – and knowledge needs
 - ★ Action
 - ★ Adaptation
- There is a clear role for biophysical science – but we are not in this alone!



Society is demanding new things of science and governance



Our Seas - Research themes



Our Seas Aims to...

- Develop science on the basis of advances in research on participation processes
- Develop participation processes that lead to focus and action
- Meaningful and active Maori engagement, co-developing processes
- Building trust while enhancing rigour
- Reflecting future changes in size and diversity of society
- Understanding the links between values positions and imagined means to identified outcomes
- Developing a governance structure for social licence – exploration and testing
- Participatory processes will enable the multiple components of the presently ‘submerged’ blue economy to be revealed

Example project: People, participation and progress

Essential research:

- (i) partnering mātauranga Māori, society, and Treaty partnership commitments
- (ii) engaging in socio-ecological experiments
- (iii) defining how social impact can be meaningfully measured and demonstrated.
- (iv) communicating science to maximise social impacts

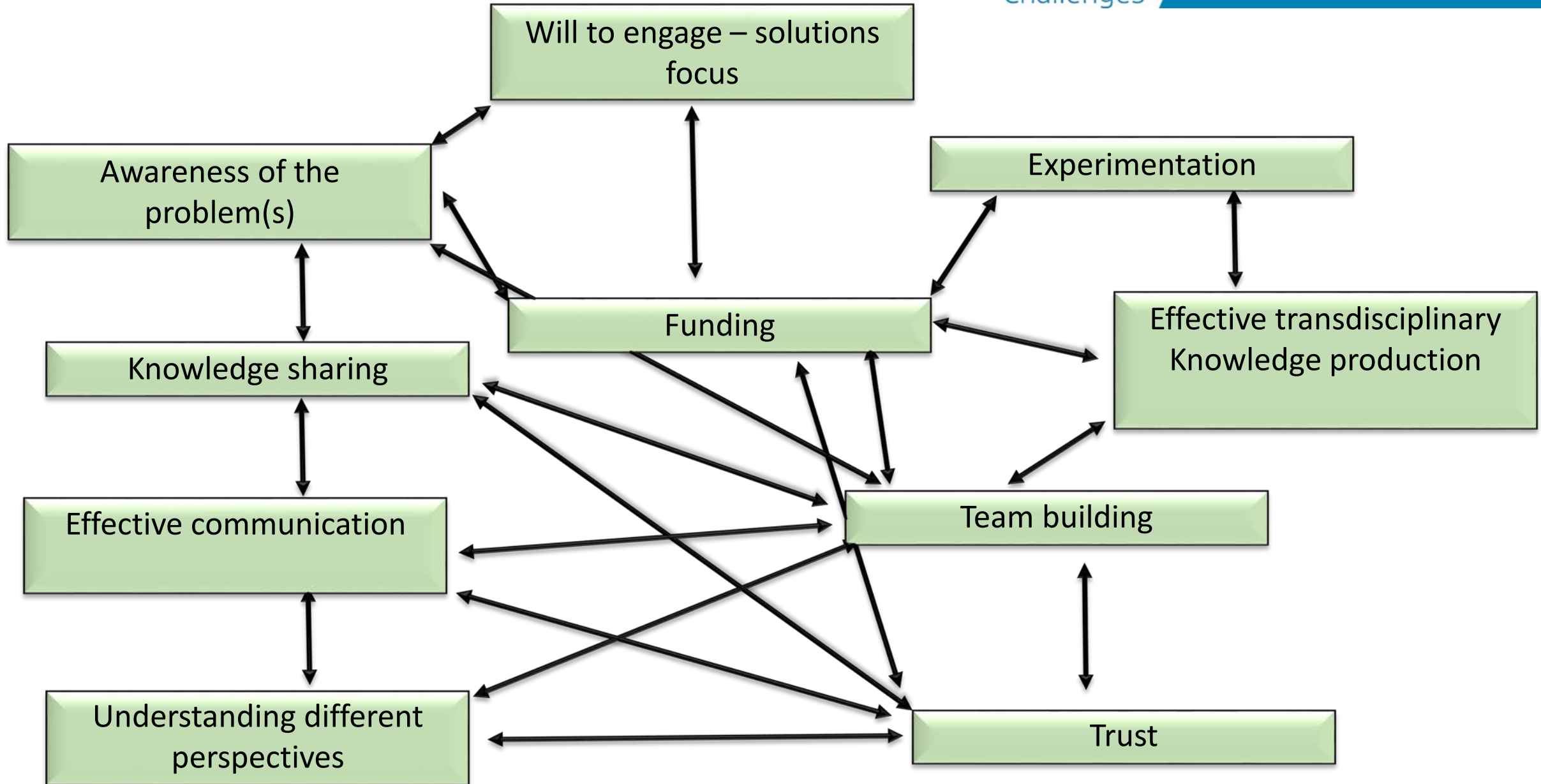
Example project: People, participation and progress

- The project is all about doing engagement better, more innovatively and more generatively.
- The project will upskill researchers and develop new models for understanding and practising science communication.
- This will
 - ✓ (i) underpin EBM
 - ✓ (ii) enhance the social impacts and contributions of science;
 - ✓ (iii) help establish kaupapa to guide processes of public science with tangata whenua
 - ✓ (iv) develop a more profound social licence - governance framework for marine science-based decision making.

Example project: People, participation and progress

- Social participation is a starting point for EBM, as will be kaupapa for science-iwi relations. Implementing EBM is predicated on trust, fostering respect for science, putting science to the service of society, and securing a new and long-term social contract for science as basis for a prosperous knowledge society.
- **Critical initial project steps**
- Document and map science communication practices and judge against criteria from international best practice
- Establish kaupapa and model best practice in science-iwi relations for marine environments
- Refine non-linear model of science-society relations and develop principles/lessons
- Monitor and document science communication in relation to Sustainable Seas
- Develop and test models for evaluating social impact of Sustainable Seas science
- Evaluate and report on social impact of Sustainable Seas and developing strategies to advance engagement and build trust

It's not a linear process...



Scientific factors

- Ignored relationships
- Unknown relationships
- Use of average response to determine relationships

Environmental factors

- Rare “natural” events, e.g., cyclones, earth quakes, eruptions
- Increased likelihood of rare anthropogenic changes, e.g., oil spills, invasive species



Surprise!

Social factors

- Social changes, e.g., economic crises, changes in energy sources, changes in values
- Increased reliance on “techno fixes” rather than reduction of drivers
- Decreases in number of strategies

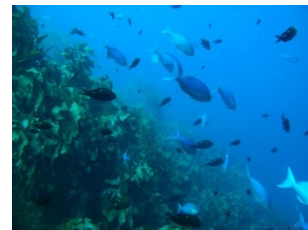
Monitoring Information

- Changes in temporal variability of monitored responses
- Decreases in response diversity-
Increases in spatial homogeneity of habitats

Valuable Seas

Valuable Seas

1. Obtain a better understanding of the way that society values our marine estate, and the relative economic, social, environmental and cultural values we place on its components.
2. Add value to current and future productive activities.



Social, cultural and economic values

Past work

- Valuation
 - Economic
 - Maori
 - Social/cultural
- Ecosystem services
 - Why ecosystem services?

Dymond, J. (ed.) (2013). Ecosystem Services in New Zealand – Condition and Trends. Manaaki Whenua Press, New Zealand.

Social, cultural and economic values

Past work

- Valuation
 - Economic
 - Maori
 - Social/cultural
- Ecosystem services
 - Why ecosystem services?
 - MBIE project

QUANTIFYING,
MAPPING AND
VALUING MARINE
AND COASTAL
ECOSYSTEM
SERVICES IN
NELSON BAYS



MASSEY UNIVERSITY



Tiakina te Taiao

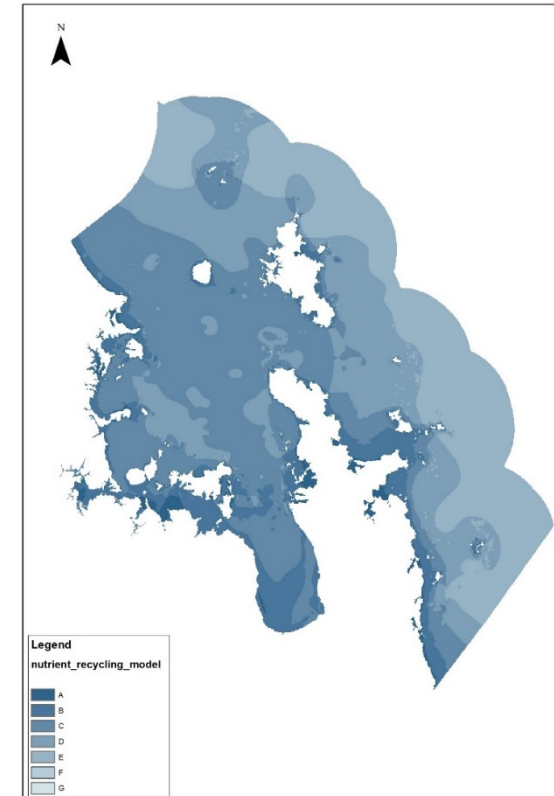


Social, cultural and economic values

Past work

- Valuation
 - Economic
 - Maori
 - Social/cultural
- Ecosystem services
 - Why ecosystem services?
 - MBIE project
 - Ecosystem Principles Approach for mapping

Townsend, M.; Thrush, S.; Carbines, M. (2011). Simplifying the complex: an ecosystem principles approach to goods and services management in marine coastal systems. *Marine Ecology Progress Series 434*: 291-301.



Social, cultural and economic values

New

- Gathering value information for the marine estate
- Linking values to the ecosystem services that underlie them
- Developing methods for comparing non-equivalent measures
- Values and services as dynamic rather than static measures
- Translating impacts on services to values

Social, cultural and economic values

Example project

- Able to be directly used in EBM
- Strong linkages between this programme and Maori and the Sea
- Highly collaborative between institutions and disciplines
 - Mapping and risk assessment techniques for Ecosystem Services
 - Defining social, cultural and economic values over time
 - Marginal valuation approaches

Adding value

- Developing models for the blue economy
 - What don't we measure
- Understanding and developing methods for social license to operate
- The green tick (ecological sustainability rating)
- Increasing diversification in marine economies
- Analysing barriers to economic development
- Identifying broken or incomplete value chains

Tangaroa me Māori

Tangaroa me Māori - Outcome statement

- Marine-based sectors, systems and groups of Māori society (whānau, hapū, iwi authorities, Māori business) within the focal areas are thriving culturally and economically and are underpinned by kaitiakitanga practices that are inherently connected with appropriate ecosystem-based management (EBM) science and tools

Research building blocks

- To set overarching Vision Mātauranga foundation for the Challenge to understand:
 - Lore/principles – cultural values (cultural, economic, environmental, social), knowledge and practice e.g. Te Mana o te Moana and application thereof are specific to place not generic
 - Identify the range of Treaty Partnership models e.g. negotiated through various settlements and those via legislation
 - Identify the range of approaches and tools to support the maintenance and enhancement of Lore/principles within a marine context

Themes

- Theme 1: Exploring kaitiakitanga, science and Mātauranga
- Theme 2: Kaitiakitanga framework and positioning of economic development
- Theme 3: Māori approaches to lore, policy, law and management

Research themes confirmed (25 & 30 June workshops)

Example Project

- Identify Māori perspectives and interests within the case study area which may include:
 - Kaitiakitanga
 - Mātauranga including: mōteatea, waiata, pūrākau, sites of significance, fishing grounds, place names, archaeological sites
 - Marine economic initiatives and activities
 - Lore, legislation and policies
 - Identify/refine or develop EBM tools and approaches within a Kaitiakitanga framework

Dynamic Seas

Dynamic Seas

underpinning biophysical science to support, inform and augment EBM and the Challenge; helping to create an 'environment for winning'

focus - *the science to:*

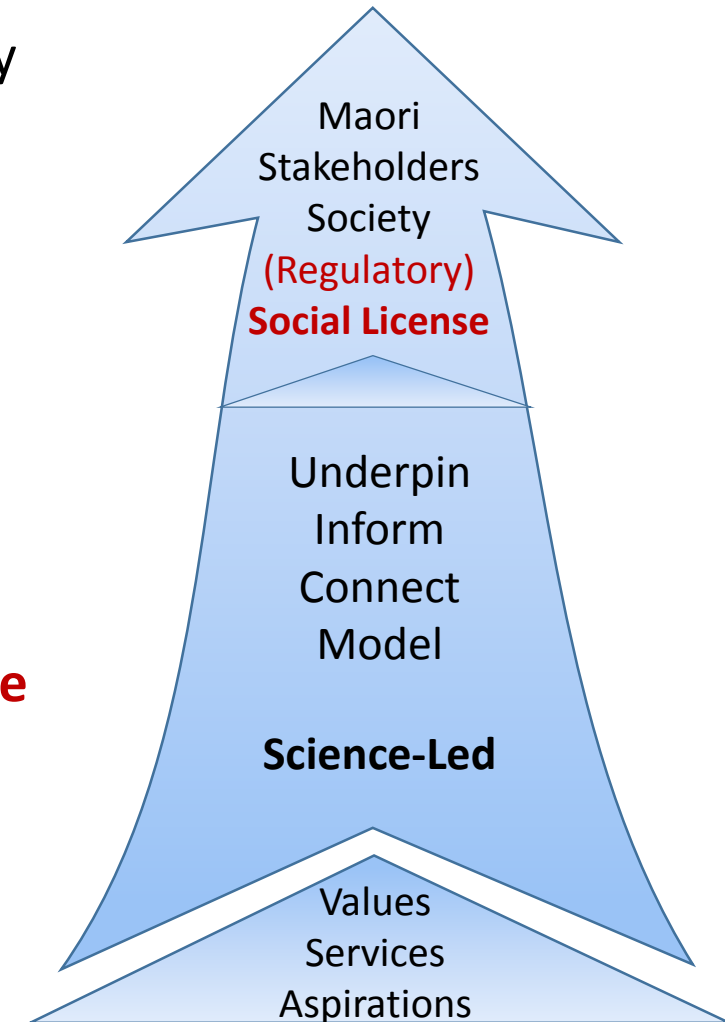
- understand critical ecosystem functions and processes;
- determine effects on ecosystems interacting with and affected by human activities;
- underpin Vision Mātauranga and the values, aspirations and management tools in Sustainable Seas;
- take account of key interdependencies among components of the ecosystem and a changing climate.



Outcomes, goals

- New Zealand has a **solid base of science** for increasingly effective, collective, sustainable management by **understanding the ecological consequences of marine resource use**.
- Creating an **'environment for winning'** (rather than 'picking winners') in the marine economy.
- Understanding of **ecosystem connectivity and resilience** linking activities to **ecological footprints and consequences** across their spatial and temporal scales

Sustainable Marine Economy



Dynamic Seas: Building on....

- Māori perspectives (Vision Mātauranga); capability and capacity
- Core and other programmes across multiple institutions
- Ideas, capabilities of the science community
- Initiatives across management agencies (e.g., MPI, DOC, Regional Councils)
- Stakeholder and Māori groups (including industry, citizen groups)



Dynamic Seas: what we will do (cross-eco)



Dynamic Seas: Themes, Essential research

- *Ecosystem Function and Dynamics*. Understanding changes to ‘function’ (habitat quality, provision of ‘services’) of critical habitats
- *Connectivity*. Understanding ‘footprints’ of activities in marine economy and connectivity to wider ecosystem (including organic matter, onshore/offshore linkages connecting habitats)
- *Stressors and Impacts*. Gradient of impacts, tipping points, resilience, cumulative change in key ecosystem processes and processes (including CC)
- *Mitigation and Restoration*: selection of restoration aims, objectives and locations informed by the best research; highly targeted with clear objectives



Dynamic Seas: what we will do

- **Focal project to combine all EBM elements: across the 5 areas of SS**

(what is valuable, what services do we want, what 'footprints' do they have, how resilient is the ecosystem, how connected from directly impacted to wider effects, how can we co-manage better)

- **Cross-programme targeted projects ('low-hanging fruit':
Question/Hypothesis driven**

(e.g., marine futures, coastal management areas, kai moana, new analyses fishing, aquaculture → getting value from existing data, new hypotheses relating to EBM; synthesis, evaluation, etc)

- **Other targeted research (within the context of EBM)**

(exploring new ideas, skills, perspectives, tools)

Dynamic Seas: the challenge within the Challenge

Integration with other programmes in SS:

- With **Our Seas** (through public engagement, aspirations, services);
- With **Valuable Seas** (mapping of values and services and identification of opportunities to increase economic value);
- With **Māori and the Sea** (through cross-linkages of important cultural and economic activities, and associated values and aspirations);
- With **Managed Seas** (through development and validation of EBM tools).
- Across SS with **Vision Mātauranga**

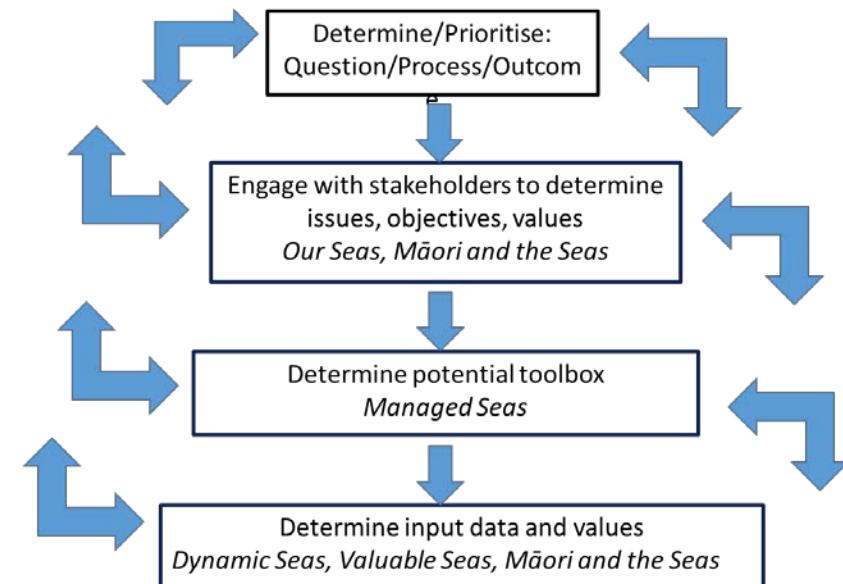


Managed Seas

Managed Seas Overview

Bring EBM components together into integrated decision support frameworks that meet Māori, societal and economic aspirations, and responsibility of ocean stewardship

- Develop tools to support governance and integrated management decision making
- Provide basis for economic development and environmental protection through facilitating risk and trade off (economic, cultural, social, environmental) assessment
- Repository for knowledge generated by other programmes



Managed Seas Builds on:

- EBM model development and application at a variety of scales and sector(s)
 - Complex ecosystem models
 - Risk assessment/uncertainty assessments
 - Spatial management tools
 - Models that facilitate stakeholder engagement and understanding
- History of EBM implementation in the marine environment
 - RMA and EEZ Act case studies



Prior funding via NIWA Coasts & Oceans, Fisheries core funding, MBIE Marine Futures, and modelling applications funded by central and regional government

Managed Seas will answer:

Primary research questions:

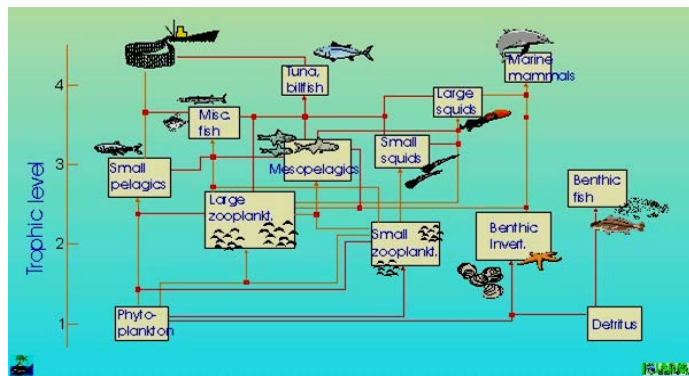
- *“What are the best EBM frameworks to maintain resilience and a healthy, prosperous marine economy in the context of social, economic, and environmental change?”*
- *“How do we incorporate risk and uncertainty into decision making?”*
- *“How do we ensure that industries work within the environmental capacity of our marine ecosystems but are not needlessly hindered or subjected to unfair risk assessment?”*
- *“What are the policy and legislative impediments to implementing EBD?”*
- *“What are key linkages between EBM and mātauranga Māori that provide opportunities for the exploration and development of a unique and innovative approach to EBM? How may the development of EBM that engages indigenous knowledge inform international understandings and practices within this approach?”*

P5 Example project: EBM Toolbox

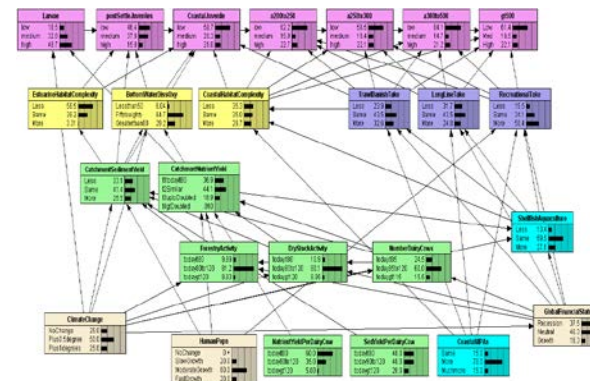
Maintaining ecosystem function in a complex multi-use environment

- Identify “fit for purpose” tools to suit different scales, for different issues / trade offs / levels of complexity
 - Not ‘one size fits all’
- Compare and validate range of EBM tools at one or more ‘case study’ locations

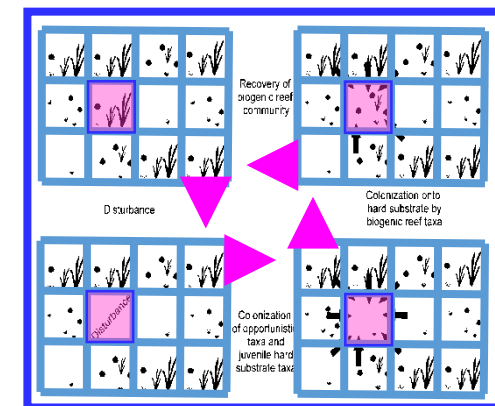
Trophic models (e.g. EwE)



Bayesian belief network



‘Cartoon’ models



P5 Example project: Spatial management

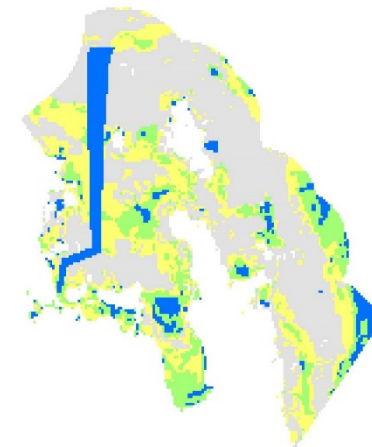
Ecosystem services models

Managing for multiple values and value systems

- Determining and mapping of values, discussing need for trade-offs (Valued Seas, Maori and the Seas, Our Seas)
- Impacts of environment and resource use on these values (Dynamic Seas)
- **Trade-off models (Managed Seas)**
- **Incorporation and evaluation of uncertainty (Managed Seas)**



Optimisation/trade-off models (e.g. Zonation, Marxan)



P5 Example project: Policy

Applying EBM in a New Zealand context

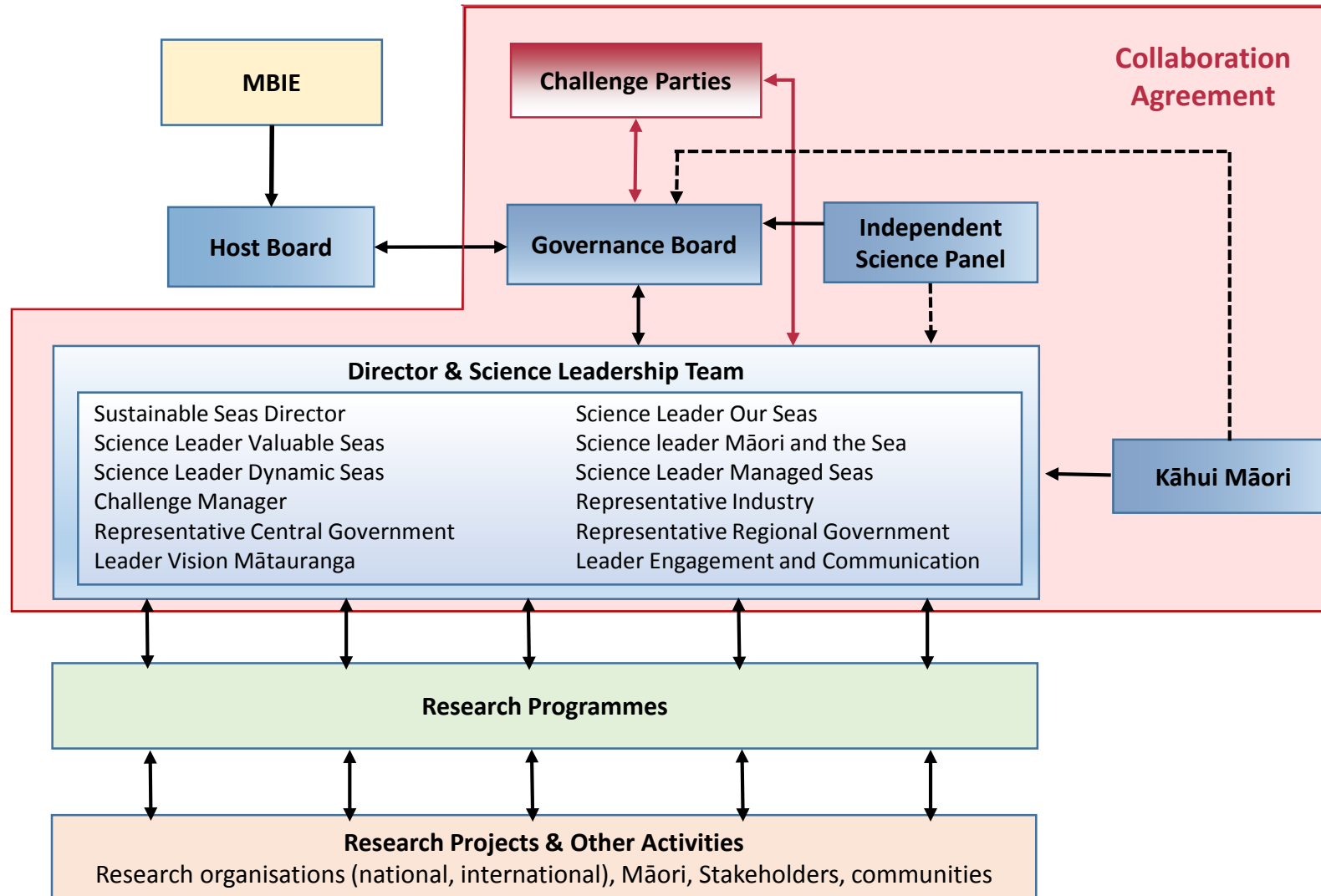
- National, regional, sub-regional frameworks, statutes, applications of EBM policy
- Case studies of how EBM is used in resource management processes and planning
- Identify key similarities and differences in application, contradictions in existing EBM framework

Key comparisons

- Use of uncertainty and precautionary principle
- Evidence required, 'best available information'
- Consistency between legislation and practice
- Incorporation of cumulative impacts, multiple uses
- Scale of application
- Stakeholder/public considerations, 'social licence to operate'
- Data collection, repositories, and accessibility

Where to from here

Sustainable Seas structure



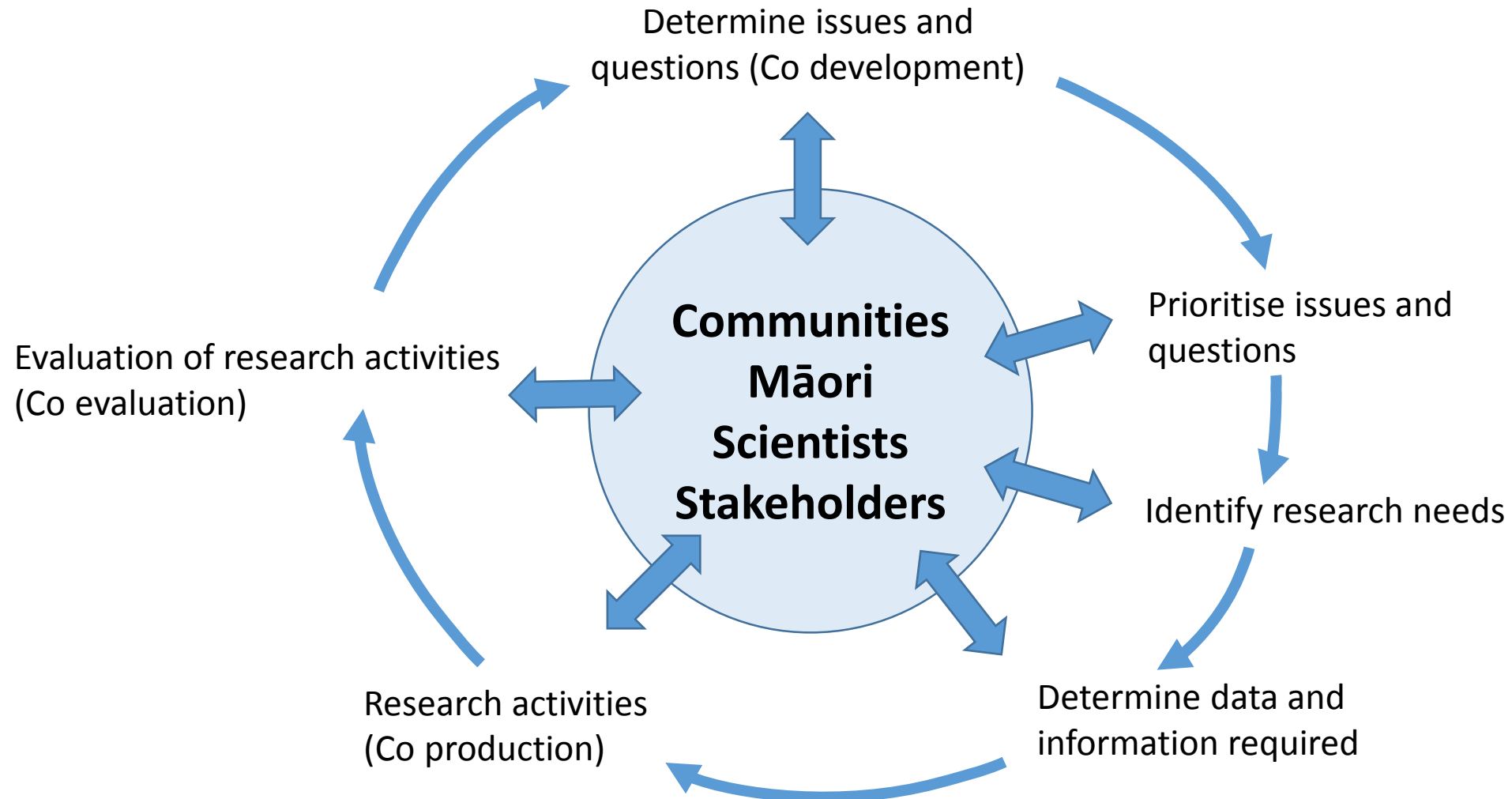
Science Leadership Team

- **Challenge Director – Julie Hall**
- **Challenge Manager –**
- **Science Programme Leader Our Seas –**
- **Science Programme Leader Valuable Seas –**
- **Science Programme Leader Tangaroa me Māori -**
- **Science Programme Leader Dynamic Seas –**
- **Science Programme Leader Managed Seas –**
- **Leader Vision Mātauranga –**
- **Leader Engagement and Communication –**

Development of Research and Business Plan

- Proposal
- Project proposals
- Māori and stakeholder workshops
- Draft July 20th
- Comments by July 29th
- Board and Independent Science Panel August 28th
- MBIE September 30th

Research and Business Plan



Challenge Funding

- \$31million over 5 years
- Two pots of funding
- Negotiated projects and Contestable projects

Negotiated projects

- Research and Business Plan
- “Best teams” approach
- Later this year for January 1st start
- Tangaroa me Māori programme will have a call for proposal with an RfP

Contestable funding

- New ideas, research and researchers
- \$1.5 million per year
- \$150k per annum for 2 years
- RfP late this year

Website:

<http://sustainableseaschallenge.co.nz>

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