Ministry for Primary Industries
Manatū Ahu Matua

Te Ao Tūroa
Primary Sector Science Roadmap
Strengthening New Zealand's Bioeconomy for Future Generations

Ian Ferguson

www.mpi.govt.nz

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Determining future science needs and opportunities may not be the hardest part of thinking into the future.

The hardest part might be “how” we can ensure we benefit from science - how it can be enacted; how it can be acceptable

Purpose of the Project

- The primary industries have been identified by government agencies, industry bodies, and the Prime Minister's Chief Science Advisor as being in need of an integrated, longer term view of science and research needs.

- The targets set out in the Business Growth Agenda will need science and innovation.

- Need an integrated whole of sector view of science and technology needs and opportunities.

- Strategic guidance and priorities for science investment

Purpose of the Project

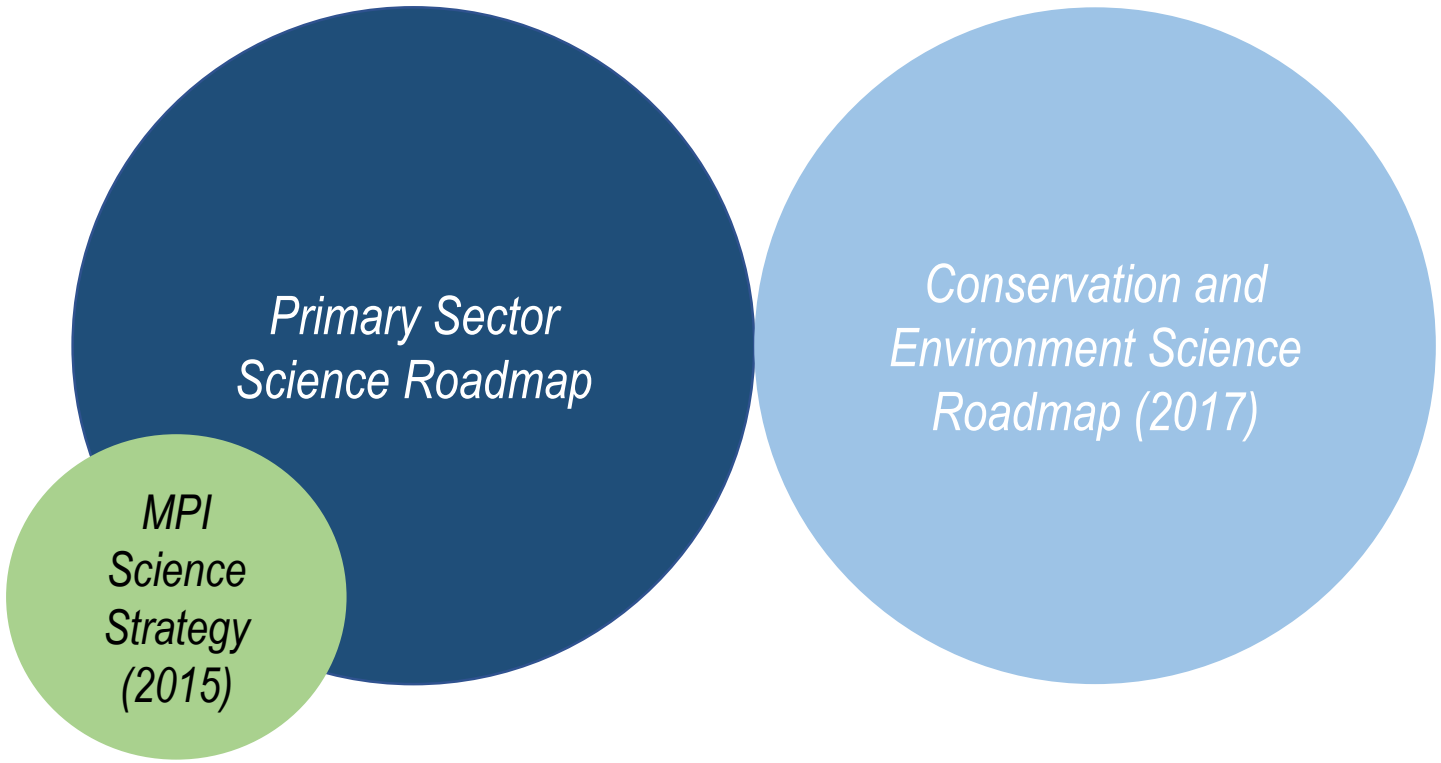
- The Roadmap aims to provide a long-term view (10-20 years) of primary sector science and technology needs
- It will provide guidance on key priorities for all those investing in R&D related to the primary industries in New Zealand
- It covers all of New Zealand's primary industries across the whole of the value chain, including food and fibre, and land and water-based production systems.
- The Roadmap is co-sponsored by Minister Guy (Minister for Primary Industries)and Sir Peter Gluckman (Prime Minister's Chief Science Advisor)

Business Growth Agenda: Innovation; Natural Resources

National Statement of Science Investment 2015-2025 (MBIE)

"A highly dynamic science system that enriches New Zealand, making a more visible, measurable contribution to our productivity and wellbeing through excellent science."

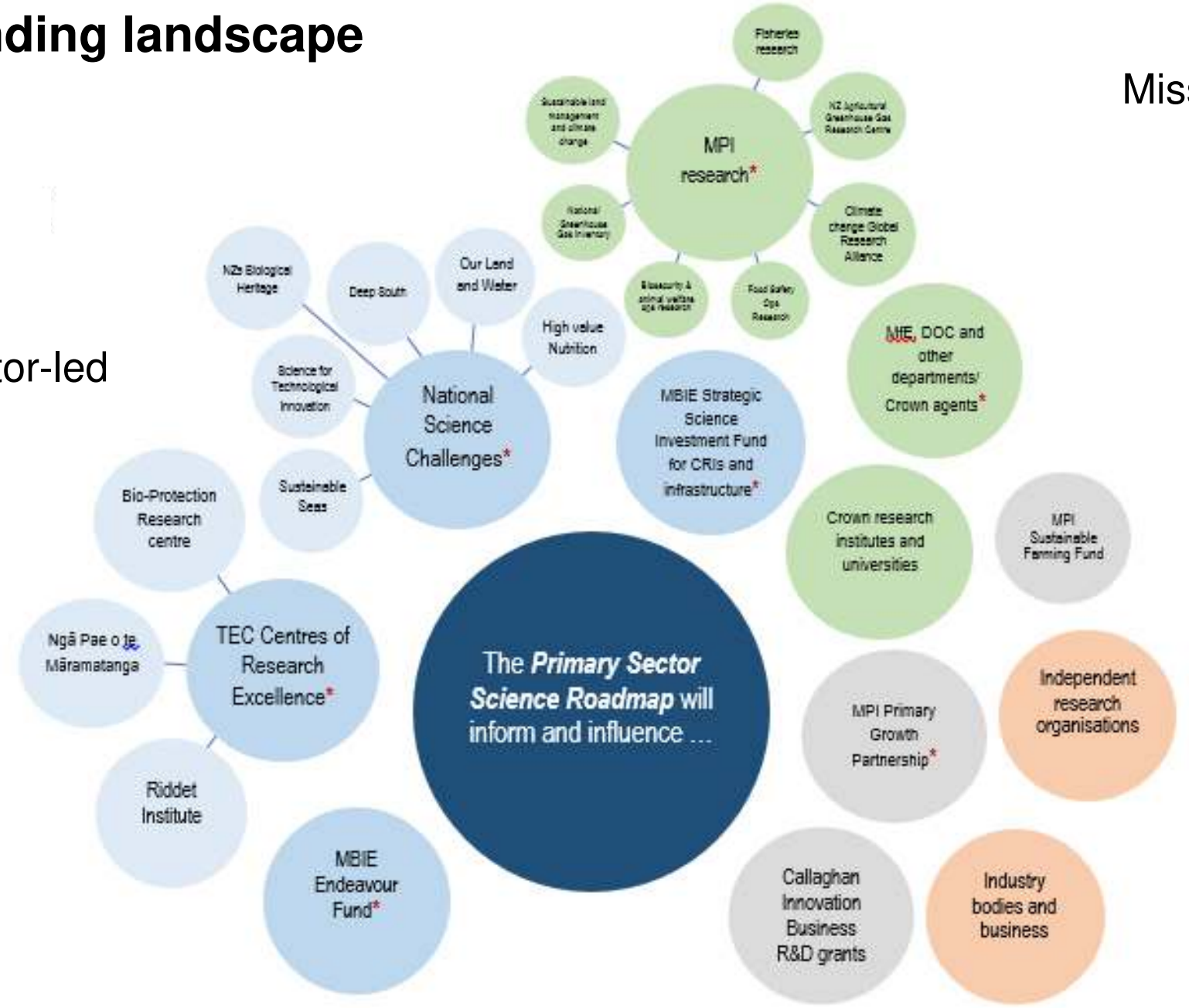
IMPACT & EXCELLENCE



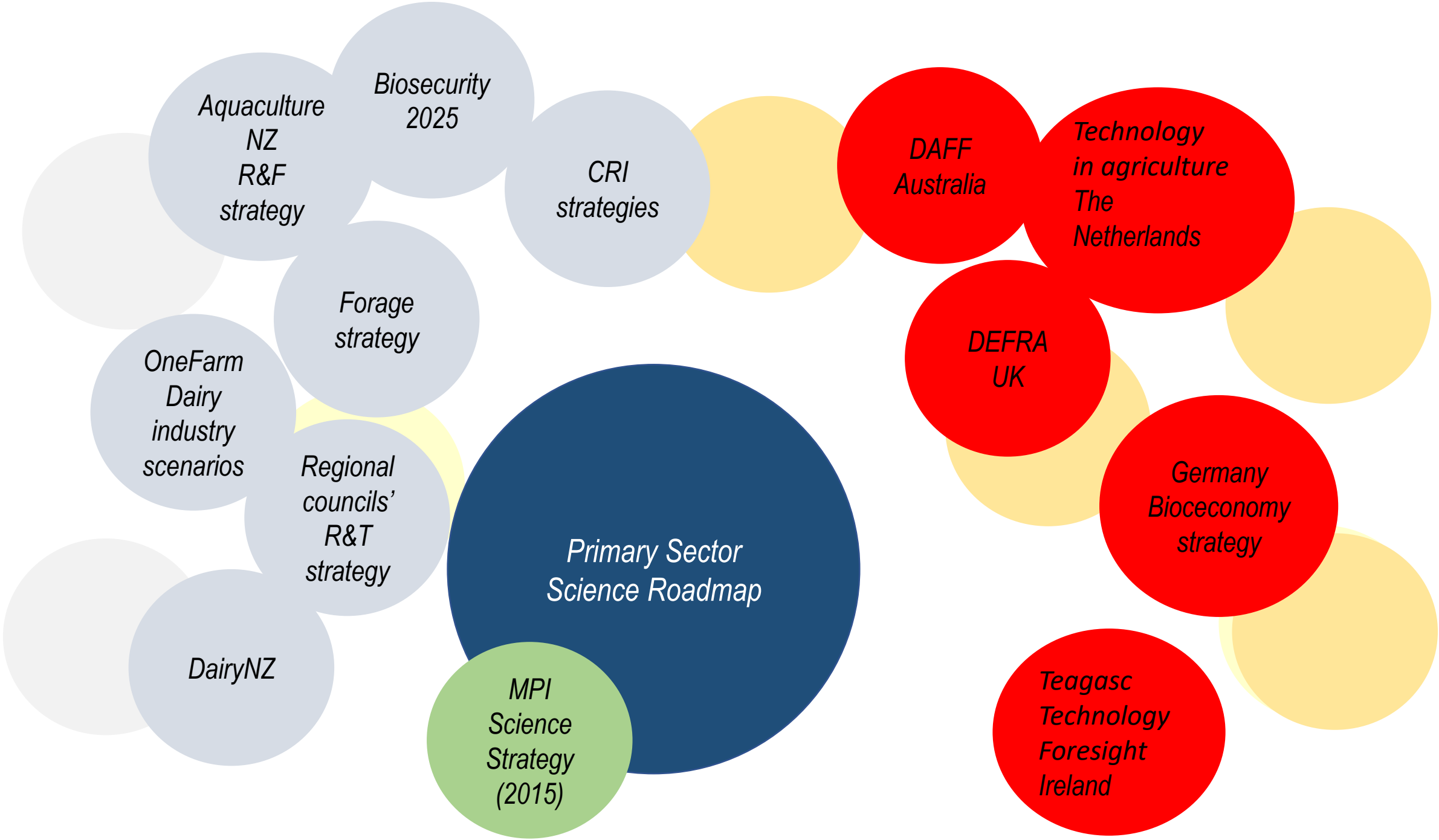
The funding landscape

Mission-led

Investigator-led



Industry-led

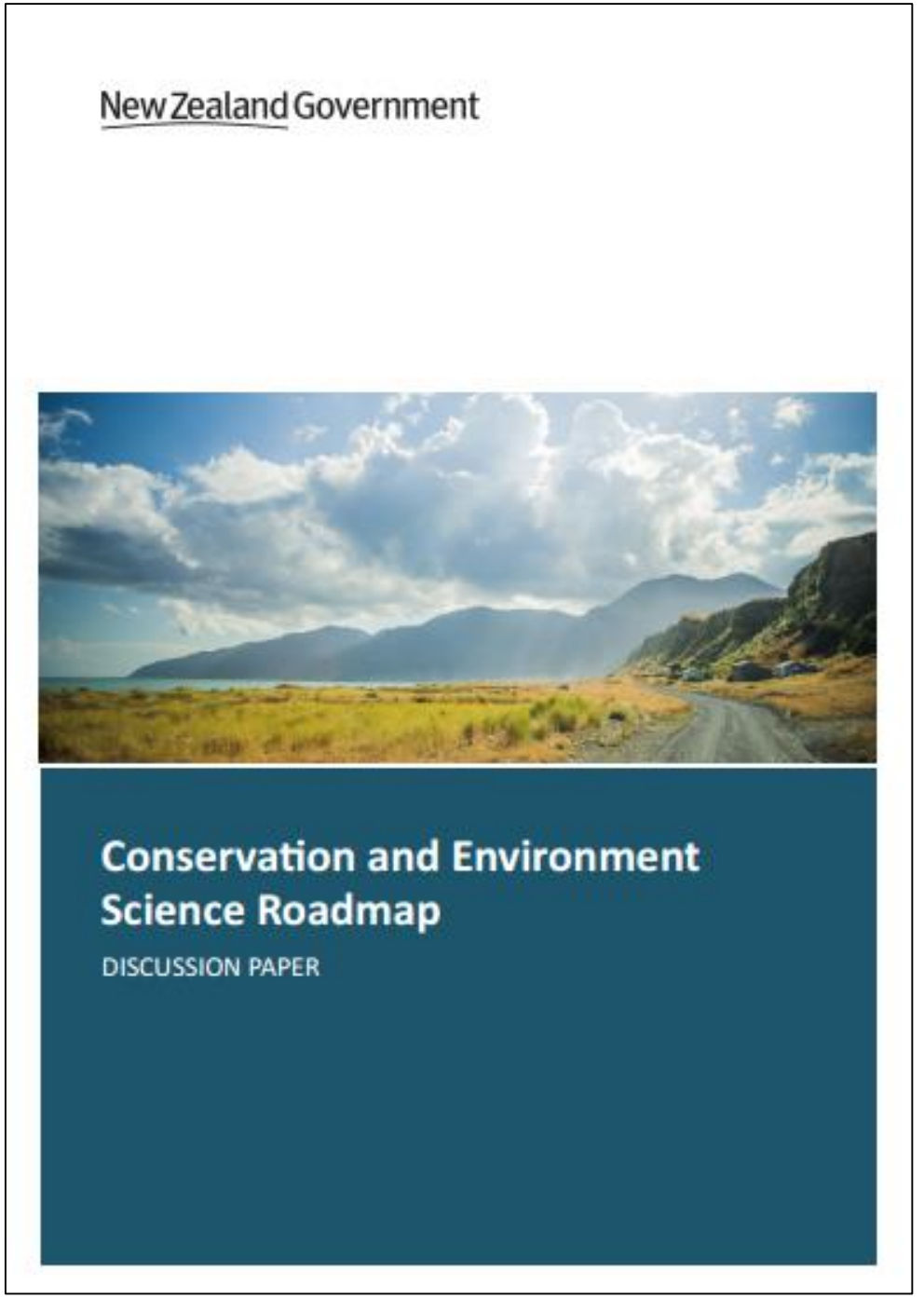

Aquaculture NZ R&F strategy
Biosecurity 2025
CRI strategies
Forage strategy
OneFarm Dairy industry scenarios
Regional councils' R&T strategy
DairyNZ
Primary Sector Science Roadmap
MPI Science Strategy (2015)
DAFF Australia
Technology in agriculture The Netherlands
DEFRA UK
Germany Bioceconomy strategy
Teagasc Technology Foresight Ireland

Conservation and Environment Roadmap

A Conservation and Environment Roadmap was developed in parallel with this Primary Sector Roadmap.

Released February 2017

The teams involved in each of the two documents have been working closely to align and manage areas of overlap.



Processes

- Working Group – to produce a draft consultation document.

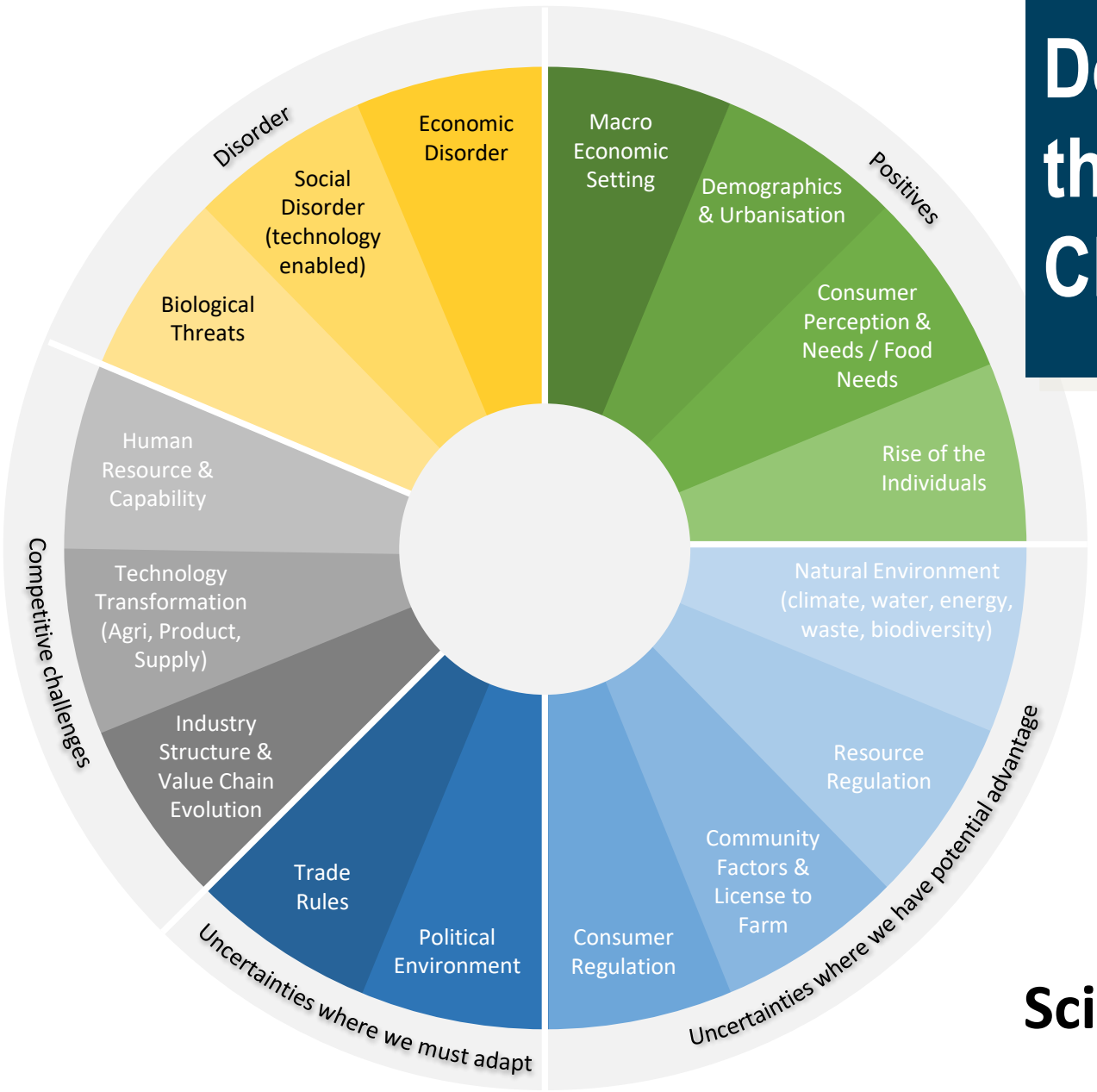
- Strategic Advisory Group - will provide strategic guidance, oversee progress and keep the project within scope and meeting its purpose.

- Consultation across the sector, industries, science providers, government

Timeline

- 8 March – Targeted engagement begins
- 15 March - BGA Innovation – Update on progress and direction of Roadmap
- 20-31 March – Targeted engagement
- 7 April – Targeted engagement closes
- 8 May – Final Roadmap to the Minister
- 24 May – EGI
- 29 May – Cabinet
- 14 June – Fieldays launch

Demand for Science in the Primary Industries is Changing



Science in an uncertain world

Demand for Science in the Primary Industries is Changing

The Roadmap identifies 4 key areas of changing demands for science:

1. **Sustaining, protecting and adapting**: measuring, monitoring and managing our natural resources

2. **Unlocking productivity:** generating more from less in more precise ways to drive productivity growth within environmental constraints

3. **Shifting the balance to high value:** creating consumer-driven high value, more diversified products

4. **Integrating people, values and production systems:** the primary sector as physical, biological, and importantly social ecosystems

Science Needs

Science needs and opportunities (themes):

1. Adding value to a consumer driven supply chain
2. Achieving a data-driven supply chain
3. Innovating with advanced technology
4. Protecting and sustaining resources for sector growth
5. Innovating through genetics
6. Enhancing productivity with complex systems and the biome
7. Tikanga and Mātauranga Māori
8. Integrating people, production systems and social engagement

Section 4.1

A vision for science and technology in New Zealand's primary sector in 10-20 years

Science and technology accelerates innovation, growth, and intergenerational sustainability of the primary sector leading to increased well-being for all New Zealanders.

Section 4.3

Four outcomes science needs to support

Sustaining, protecting and adapting – effectively managing our natural resources

Unlocking productivity – enabling growth within environmental constraints

High-value products for consumers

Integrating primary production systems, people, and values

Section 5

The science we need

1. Adding value for consumers
2. Harnessing the value and power of data
3. Innovating with advanced technology
4. Innovating through genetics
5. Protecting and sustaining resources
6. Deriving value from complex systems
7. Innovating through kaupapa Māori
8. Integrating people and values

Section 6

Capability needs for primary sector science

Critical science expertise • Infrastructure • International partners • Science capability in industry

Theme 1. Adding value for consumers

Science in this theme needs to support the primary sector to achieve greater returns profitability across the supply chain from high-value products in international markets. This will be driven by consumer and market insights and preferences, co-innovation and a greater diversity of products and services.

e.g.

- Bioeconomy
- New food
- Value chain
- Blockchain technology
- Mātauranga and tikanga
- Consumer preferences/ digital technologies/ social media.
- Co-creation, participatory action and co-innovation
- High health food functionality
- Diversification

Theme 2. Harnessing the value and power of data

Science in this theme needs to lead to production systems that are more efficient, adaptable and have a more positive impact on the environment through harnessing the value and power of complex data. This will require major advances in collection of critical data, smart use of connected data sources for real-time data driven decision-making, and optimising advances in data handling, and management and governance.

e.g.

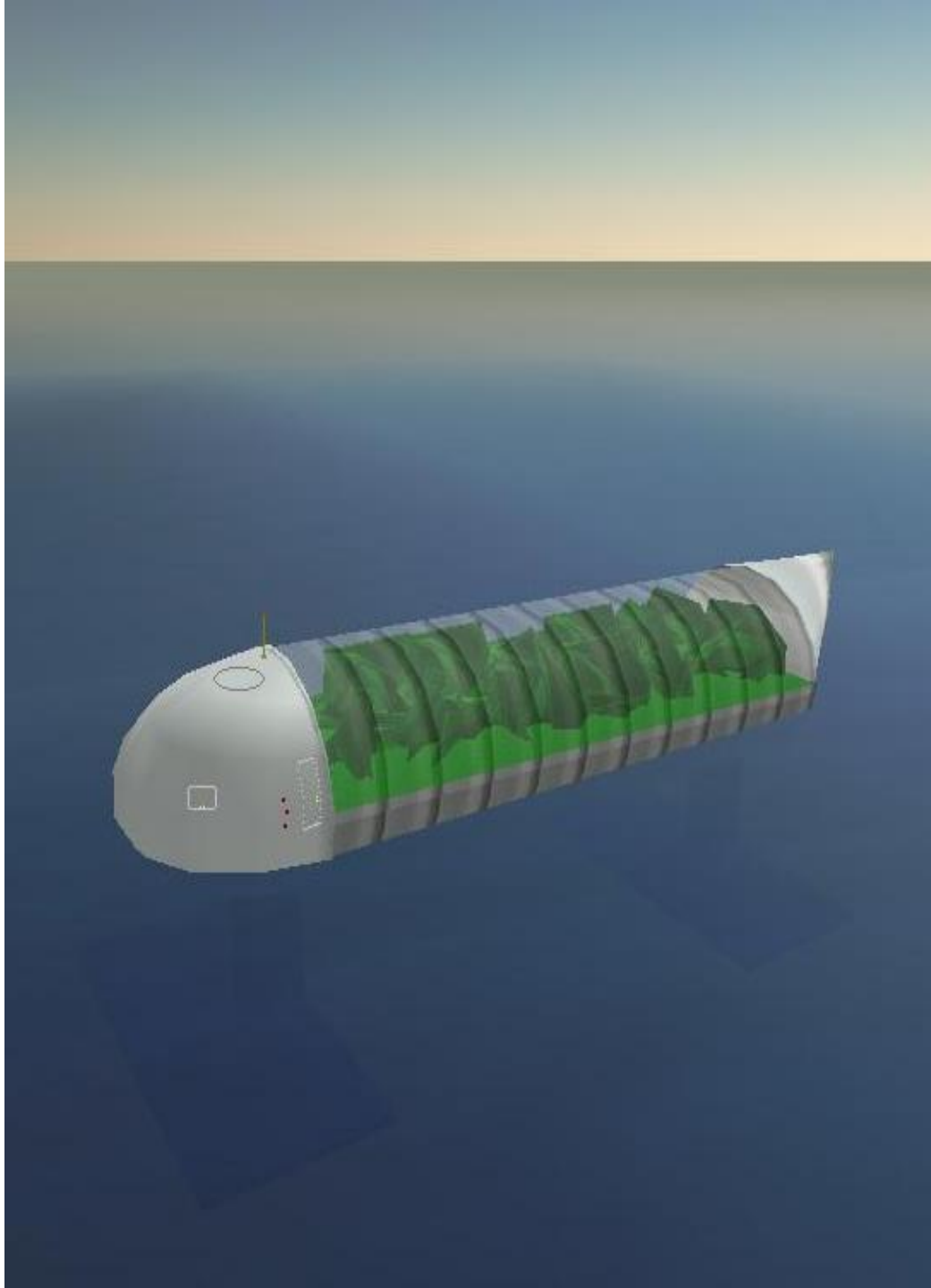
- Sensors/sensor network/data analytics
- Managing big data
- Complex networks
- Internet of Things
- Blockchain

Theme 3. Innovating with advanced technology

Development of innovative technologies, including advanced technologies (e.g. reproductive biotechnology, information and communications technology systems), disruptive technologies (e.g. synthetic biology, automation and robotics), and transformational technologies (e.g. ocean farming).

e.g.

- High-value products/ deepwater fishing/ocean seafood farming.
- Traceability
- Synthetic biology
- Artificial intelligence/self-learning decision support systems
- Machine learning.
- Barriers to uptake and implementation



Theme 4. Innovating through genetics

Science in this theme needs to lead to plant and animal production that is more efficient, safer and adaptable, with less negative environmental impact, allowing rapid development of new generations of food and non-food products.

e.g.

- Germplasm /breeding
- Gene editing
- Public, consumer and Māori acceptance.
- Molecular phenotyping/food/livestock
- Gene drive/biosecurity incursions
- Informatics
- Preservation and maintenance of genetic diversity.

Theme 5. Protecting and sustaining resources

Science in this theme needs to ensure that new and existing production systems are future-proofed so that terrestrial and aquatic resources, both physical and biological, are mapped, measured and monitored to protect the resources and support appropriately adaptive and multiple uses under rapidly changing conditions

e.g.

- Preservation/modification of landscapes/climate change
- Resilience Integrated modelling/ whole farm systems
- Ecosystem/catchment/farm levels
- Limits and sustainability of resources.
- Databases and collections

Theme 6. Deriving value from complex systems

Science in this theme needs to enhance sustainability of production systems and the development of novel products through an improved understanding, analysis and use of the concepts of complex biological and physical systems, feedbacks, networks and the microbiome.

e.g.

- Plant-microbial associations/production systems.
- Complex systems and networks
- E-genomics, sequencing and systematics
- Soil microbiome/diversity /environmental change
- Ruminant microbiota and/greenhouse gas emissions.
- Data/decision/artificial intelligence/machine learning
- Marine microbiome/microbial ecosytems/aquaculture/fisheries

Theme.7 Innovating through kaupapa Māori

Science and activities within this cross-cutting theme need to support the opportunity to acknowledge, incorporate and support tikanga and Mātauranga Māori in the primary sector context. From a position of mutual respect and awareness, Māori and non-Māori in New Zealand can co-operate and combine resources in the management of land and water and the development of innovative products and systems reflective of Māori values and objectives. .

e.g.

- Māori/science and innovation sector/effective partnerships.
- Co-creation of knowledge using Mātauranga Māori
- Māori values such as te ao tūroa (intergenerational sustainability) and kaitiakitanga/support business models.
- Co-development/co-delivery

Theme 8. Integrating people and values

Social science in this theme needs to support the development of future primary production systems that are publically and socially integrated, domestically and internationally.

e.g.

- Drivers/barriers/behaviour change
- Values from ecosystem services
- Intergenerational environmental benefits and costs/decision-making.
- Attitudes/values/diverse communities
- Consensus positions/transformational change.
- Knowledge/“licence to operate”/consumers.

Threads…..

- People, people, people
- Values
- Whole supply/value chain
- Ecosystem approaches
- Scale – farm, catchment
- Complex networks
- Integrated approaches
- Diversification
- Its not the technology – its how we can use it
- ……

Outcomes

- Future-proofing of the primary industries for predicted and over-the-horizon science and technology, including identification of science capability requirements

- Optimisation of resourcing of current and predicted gaps in science and technology in government and industry

Outcomes

- Better incorporation of Mātauranga Māori into primary sector science issues, and facilitated sharing of knowledge with Māori
- Greater efficiency and reduced duplication in R&D investment
- New opportunities for innovation in the primary sector in progressing towards sustainable growth objectives

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Ian Ferguson

MPI Departmental Science Advisor

ian.ferguson@mpi.govt.nz

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