

INCENTIVES, OPTIONS AND ENABLERS: INTEGRATIVE SCIENCE TO ACHIEVE THE OUR LAND AND WATER NATIONAL SCIENCE CHALLENGE MISSION

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Introduction

Between September 2012 and January 2013, the New Zealand government promoted a public discussion intended to elicit New Zealanders' views on the most important science based issues and opportunities facing New Zealanders¹. The national science challenge concept was developed following this engagement, with initially 10 national science challenges set up to address complex, long-term, national scale issues that matter to all New Zealanders. The essence of the challenges was that they were to be long-term investments, characterised by a cross-disciplinary approach. In other words they were to provide an opportunity for collaboration between researchers from universities and other academic institutions, Crown Research Institutes, businesses and non-government organisations to create sustainable and long-term research plans and activities. The challenges are mission led, and are defined by a number of characteristics, including “best teams”, research “additionality”, high levels of stakeholder engagement (including co-design), alignment of funding with other programmes in land and water research, transformational impact, and a strong narrative linkage or coherence across the various research strands within each challenge.

The challenge mission and transformative change

The Our Land and Water challenge mission is to *enhance primary sector production and productivity while maintaining and improving our land and water quality for future generations*².

The breadth of this mission in the context of challenge resourcing means that a focussed approach to research is required, with a particular emphasis on programmes that will deliver high impact results. Specifically, delivering on the mission requires science that is transformational. Drawing on concepts emerging from the new field of innovation science, the challenge has developed a perspective of its research niche on a change continuum, from

¹ <http://www.mbie.govt.nz/info-services/science-innovation/national-science-challenges/documents-image-library/key-documents/GNZSP-analysis-report.pdf>

² <http://www.ourlandandwater.nz/assets/Uploads/Addendum-to-the-Challenge-Strategy-July-2016.pdf>

improving efficiency through to systems resetting³. We define transformational science as science that will deliver a generational leap in impact, but at today's cost. Within the challenge this can, for example, be thought of as going beyond mitigations designed to retrofit existing farming operations within a catchment contaminant limit and jumping straight into either optimising the placement of farms within a catchment or a complete system reset and redesign to create profit and headroom. It is the role of the challenge to provide leadership in this area and to align additional science that fits this strategy, but also connects to near to short-term science needs (Figure 1).

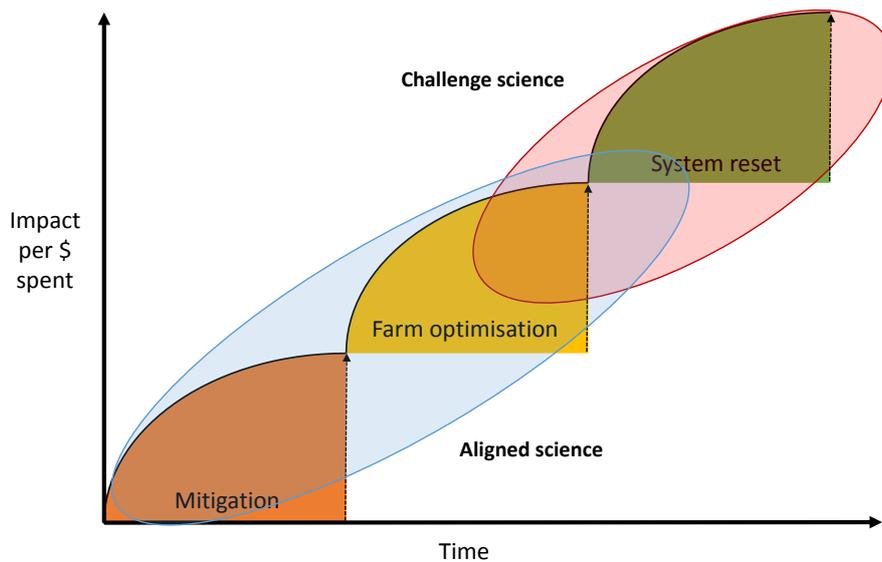


Figure 1. Conceptual diagram showing the focus and leadership role of challenge science

One of the risk factors facing the Our Land and Water Challenge is that the pre-conditions for transformative change are not yet well understood⁴. However, it is generally agreed that transformative change almost certainly requires major shifts in multiple parts of the system, accompanied by fundamentally different approaches to the way the knowledge needed to drive the shifts is generated and shared.

Positioning research as an agent of transformative change means a number of things in terms of both the subject of the research and the way it is delivered. At the heart of the challenge is the recognition that a broad mix of research components and disciplines – biophysical, social, Vision Mātauranga, and economic – are required. Given that the mission requires transformational change in the way New Zealanders manage and extract value from their productive landscapes, research across the full range of disciplines is critical.

Cross-disciplinary science represents both an opportunity and a challenge for researchers in the way they work with stakeholders across government agencies, industry, communities and

³ See, e.g. Rickards L and S. M. Howden, Transformational adaptation: agriculture and climate change. *Crop and Pasture Science* 63(3) 240-250

⁴ Turner, J.A., et al., Systemic problems affecting co-innovation in the New Zealand Agricultural Innovation System: Identification of blocking mechanisms and underlying institutional logics. *NJAS - Wageningen Journal of Life Sciences*, 2016. 76 : p. 99-112.

NGOs, and with Māori partners, to provide knowledge that underpins policy and behavioural changes in support of achieving the mission.

Underlying the challenge logic is the proposition that change that is anything more than incremental requires at least three elements to be in place: incentives, options and enablers. The interplay between these elements is reflected in the thematic structure of the challenge. Each theme emphasises one of the elements, while recognising their interdependence. All require a range of disciplines (including social and economic) to be brought in to play if their knowledge requirements are to be met.

Research themes

There are three interdependent themes, which taken together explore specific research questions, all focused on the challenge mission.

These interlocking themes, coalesce around a space, the “Nexus”, which performs a central integrating function. This arrangement is described diagrammatically in Figure 2.

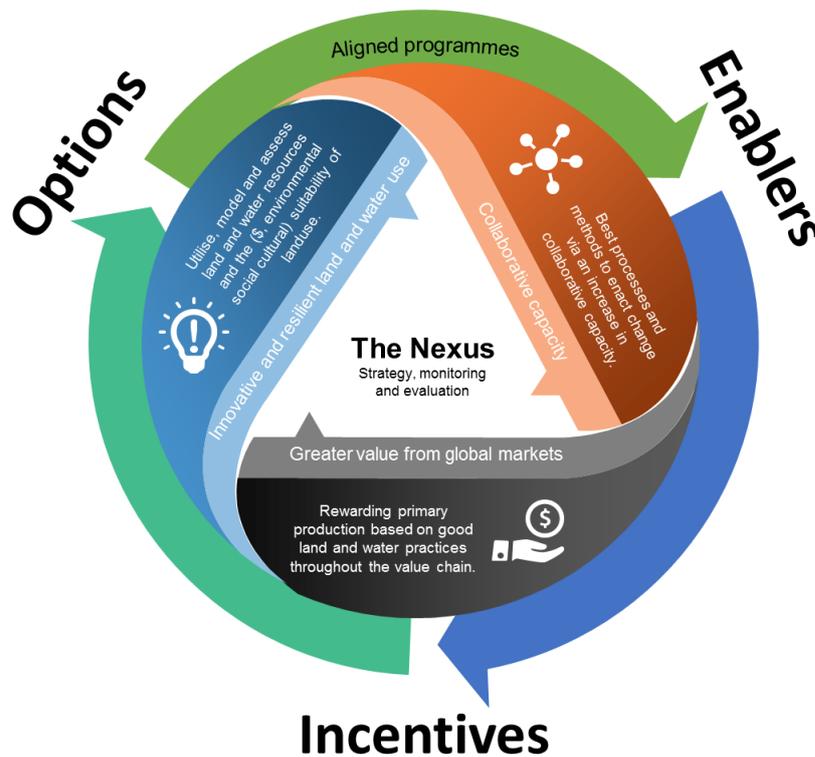


Figure 2. Integration of Challenge themes with the Nexus and aligned programmes.

The three themes are:

- Greater value from global markets;
- Innovative and resilient land and water use; and
- Building collaborative capacity.

Together, these themes explore specific research questions targeting the way value for New Zealand is created or enhanced from primary production when environmental, social, cultural and economic considerations inform new land use opportunities, which are identified and explored through collaborative processes which emphasise co-innovation and shared learning. Within each theme, there are one or more research programmes which address these questions.

Research programmes

A number of the programmes have been the subject of presentations at the workshop and are included elsewhere in the proceedings. The process of contracting programmes is continuing and we expect to have about 20 of these funded by the challenge by the end of 2017. Major programmes, identified by research theme, are shown in figure 3.



Figure 3. Research programmes proposed or underway as of February 2017

Research under the theme 1 *aegis* is relevant to the incentivising part of behaviour change. We know that the New Zealand farming sector already performs really well in terms of a number of market drivers but if we are going to achieve the challenge mission we will have to either improve or change practice and do different things. We know consumers and customers are willing to pay for that – we know because it already happens in some industries or parts of industries. Currently there is a lot of value in the market that we are not realising or it is being captured by others. For example, New Zealand produces agri-foods with an export value that is one seventh of their retail value⁵. Programmes in this theme are looking at ways of capturing some of that value. Work in Theme 1 will provide the data, metrics and indicators to translate attributes that consumers are willing to pay for into (measurable) sustainable land use practices.

⁵ <https://home.kpmg.com/nz/en/home/media/press-releases/2016/11/agribusiness-agenda-2016-volume2-foresight-to-the-future.html>

Theme two concentrates on how we provide options or choices for land users. This includes the need to better understand the links between what we do on the land and how our water and soils respond. We also need to shift our thinking from what the land is capable of producing to what it is most suited to producing, taking into account environmental, cultural, economic and social outcomes.

We will need to identify and explore future technologies and land use systems that will give us choices in optimising resource use. In doing so the challenge recognises that the vision for this, as a general rule, does not sit with scientists but with our rural entrepreneurs and some of the very best practices and emerging systems. We do know that business as usual won't be enough. The challenge needs to work with these people to identify the stretch options which are feasible and practical in the eyes of the rural community

Theme 3 focuses on the enablers of change. Making better decisions about how we use the land, and making the change, depends on: recognising social and cultural needs, connecting science with people on the ground, and finding better ways to harness community knowledge. Theme 3 programmes are exploring elements of this. "*Mauri whenua ora*", which is directly addressing the way Māori agribusiness gets the best out of land in a social and cultural context will tell us how a Mātauranga framework can benefit all New Zealanders. The collaboration laboratory will test, amongst other things, the hypothesis that collaborative decision-making is the best way to embed solutions that are embraced and enduring.

Co-innovation and co-design

The transformation asked of the Challenge in terms of land use requires fundamental shifts in the attitude and behaviours of land users, informed by a menu of new options. Beyond that, however, knowledge transfer and implementation will depend on the accessibility and relevance of the research. Consequently, co-design and collaborative ways of working are underpinning Challenge concepts. Land and water interventions have historically been conceived as end points in a linear process from science findings through to policy. Consequences attributed to this model have included adversarial and ineffective allocation processes and lengthy delays in research translation and uptake.

The Challenge premise is that co-design, in which stakeholders, and next and end users are actively involved in the framing of research questions, study design, and in a number of cases, in the research programmes themselves, will help the research to be accessible, relevant and applicable. Where stakeholders have ownership of the work and its findings then transfer, uptake and implementation should be more effective and enduring. Challenge programme leaders have described implementation pathways for each of their programmes, with an emphasis on stakeholder engagement throughout the life of the programme, and the embedding of partners and practitioners within the research activity, as mechanisms to facilitate uptake.

This also means that the knowledge dissemination process is a central part of the operation of the challenge. Our Land and Water is emphasising the development and implementation of various public channels within which engagement and communication can occur.

New ways of working

Central to the science challenge approach are a number of research characteristics that may well test practitioners invested in more traditional ways of operating. As discussed above, not only must scientists collaborate with each other, but they must also establish a meaningful discourse with their communities. That also requires shifting from a multi-disciplinary

research perspective to a cross-disciplinary one, in which the complexities of the whole programme are embraced by researchers.

In addition to developing collaborative relationships at multiple levels, researchers are also being asked to operate in a “fast fail” environment in which unfruitful lines of inquiry are identified early and pre-prepared “plan B” options can be implemented quickly. This kind of agility is also encouraged in the context of managed risk-taking in the definition of research questions and the methodological approaches required for their resolution.

Conclusions

The national science challenges are positioned firmly within the New Zealand science system as “mission led”. They exist for the express purpose of addressing “complex, long-term, national scale issues for New Zealand”. For the our land and water mission, this means substantial change in farming behaviours and practices.

We know that transformative impact is rare, and it requires fundamental systems shifts. These are large scale, and operate not just across production systems but include major social and institutional buy in. It also requires fundamentally different ways knowledge is acquired and exchanged among and between scientists and end users.

The complex interaction between knowledge and outcome is reflected in the Challenge architecture. This comprises three interdependent themes, which explore the way value from primary production is enhanced when land use opportunities are informed by the full range of community values, and our land and water futures are examined and understandings shared through engagement processes centred on partnerships.

The challenge is attempting to embed cross-institutional and cross-disciplinary perspectives into research practice, and emphasising co-innovation and co-design.