



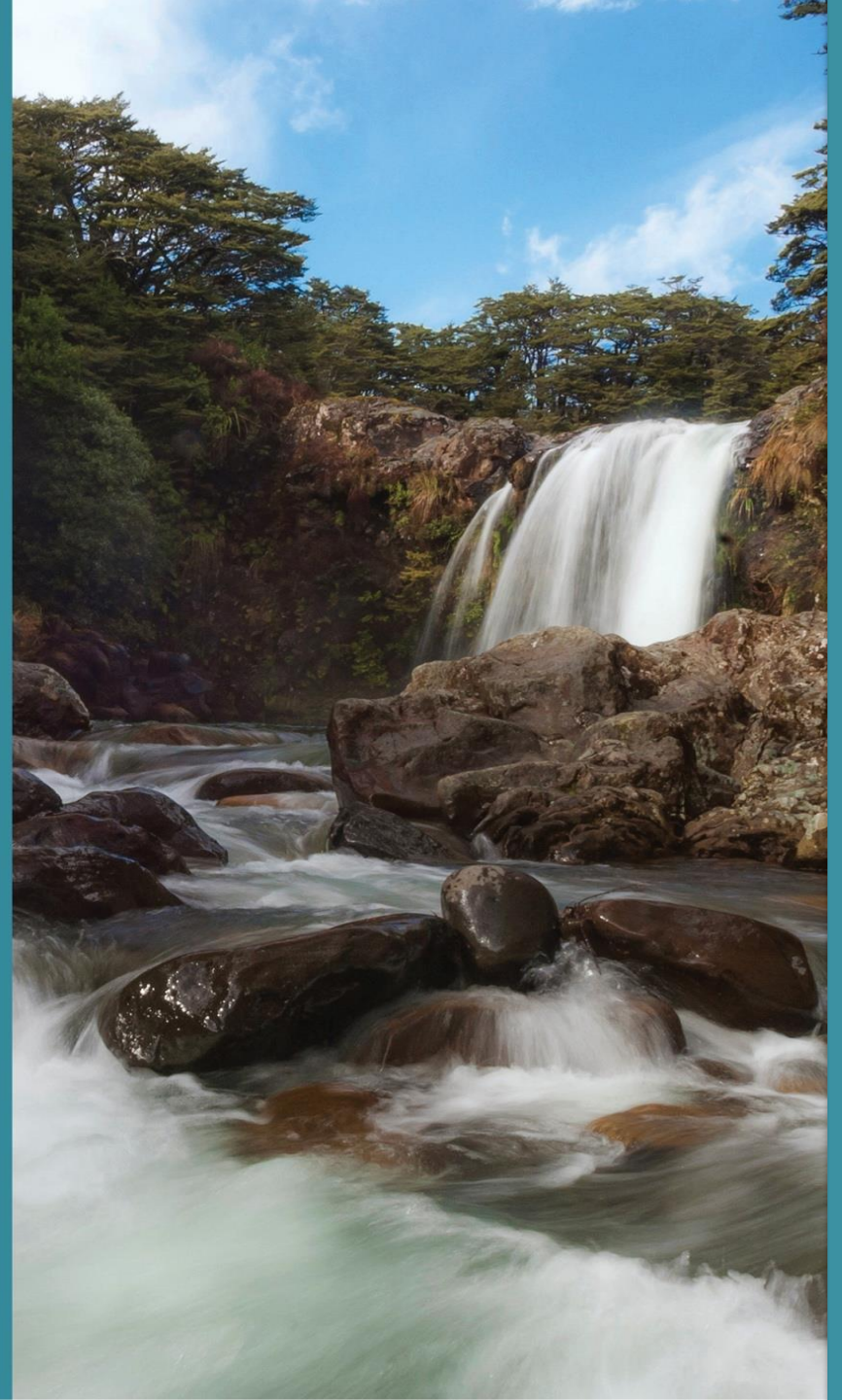
Our Land and Water National Science Challenge: Driving innovation and science to underpin new mitigation measures in New Zealand

Ken Taylor

National Water Event 2019
Galway
29-30 May

Contents

- Some NZ context
- Why NSCs?
- Why OLW?
 - Farming
 - The environment
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- How we are working
- Some things we are finding out



“...for future generations”

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Ireland beat the All Blacks in Dublin thriller

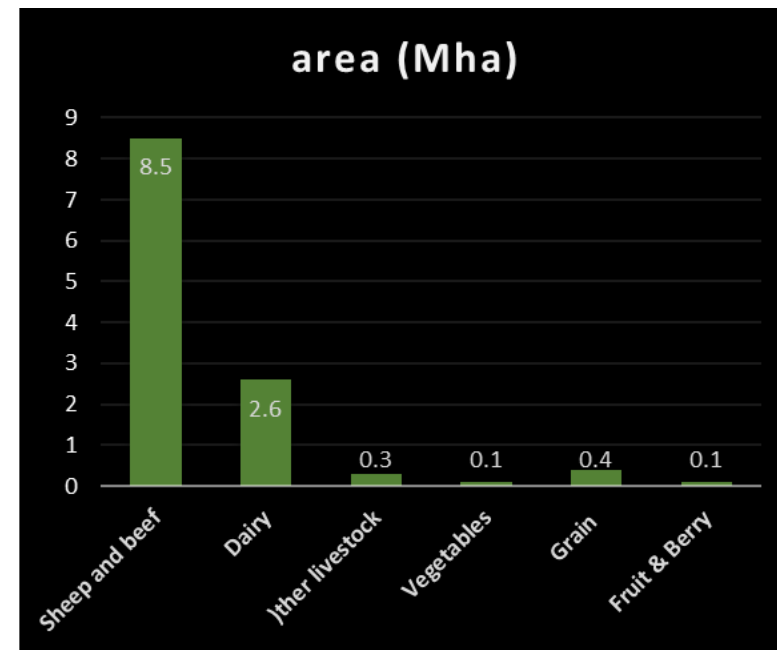
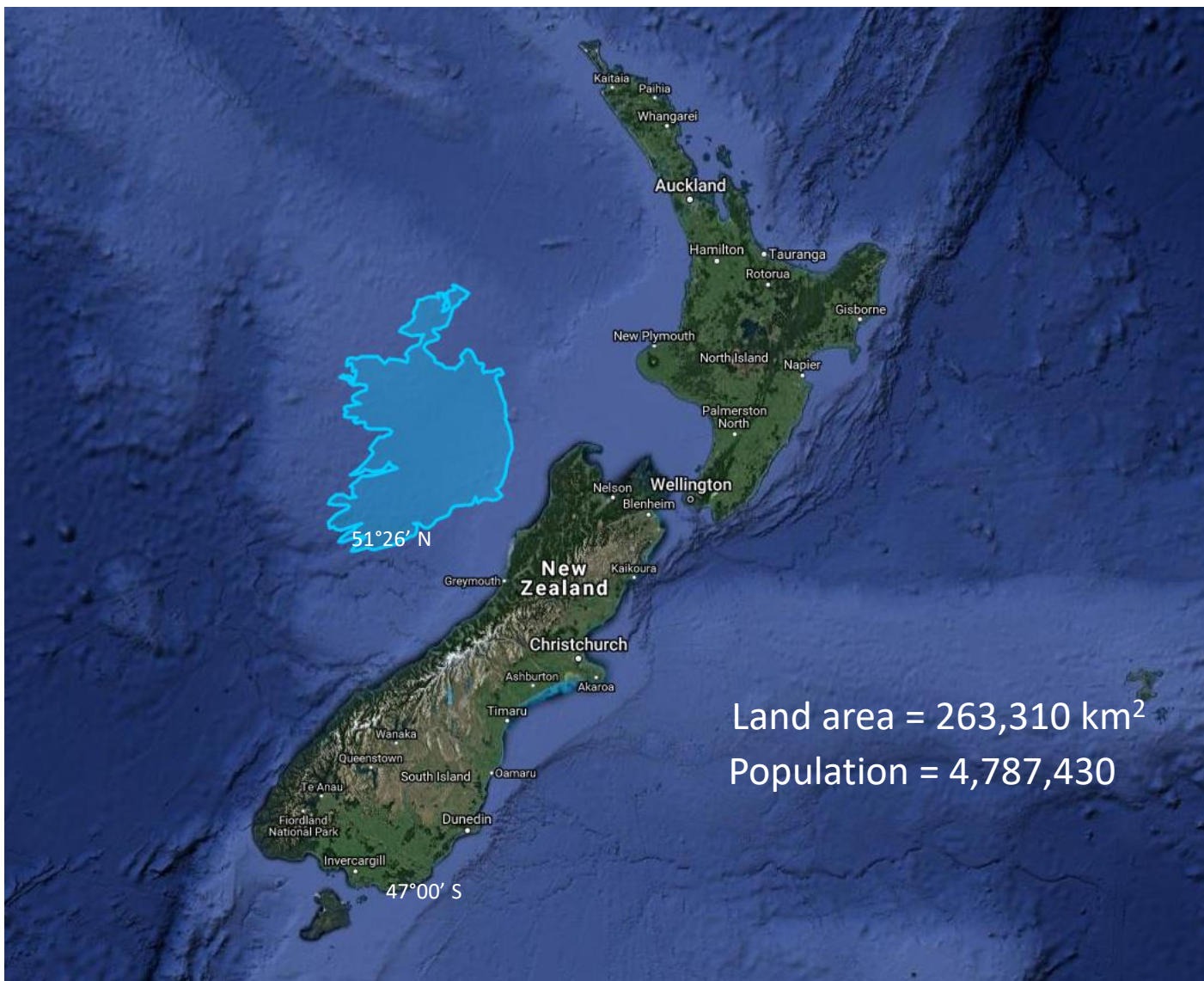
17th November 2018



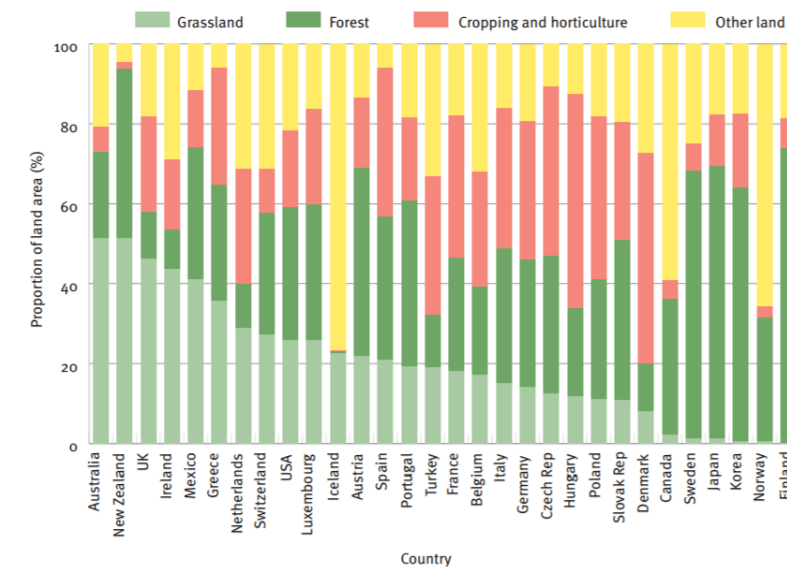
Jacob Stockdale scores the only try of the match for Ireland (Niall Carson/PA Wire)

[Skip to bottom of page to watch match highlights](#)

Jacob Stockdale's 12th try in 14 Tests put Ireland on top of the world in everything but the rankings as Joe Schmidt's men defeated New Zealand 16-9 in Dublin.



LAND USES IN OECD COUNTRIES, LATEST AVAILABLE YEAR^{12 16}



Why do we have science Challenges in NZ?



2012 – a fresh look at our science

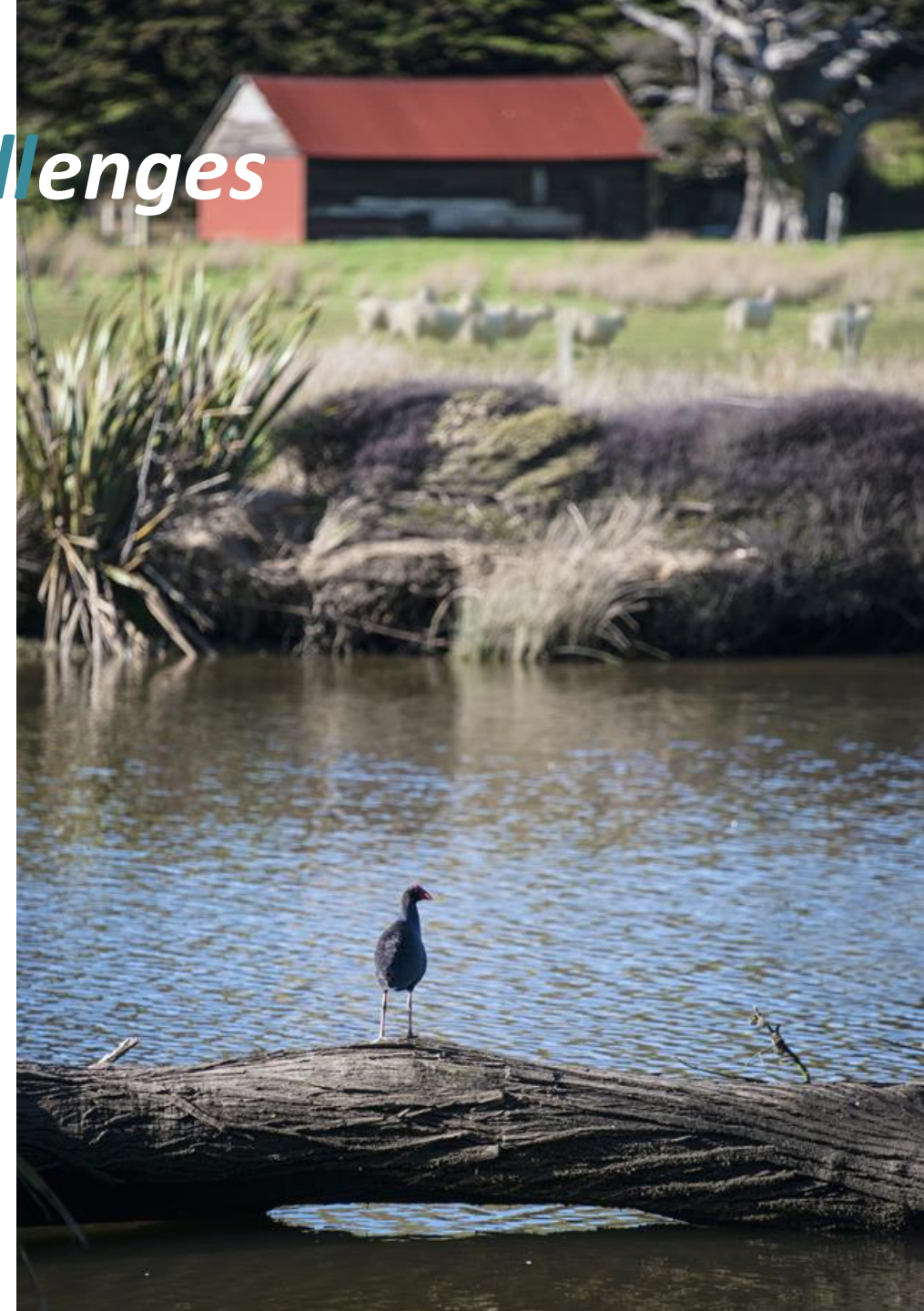


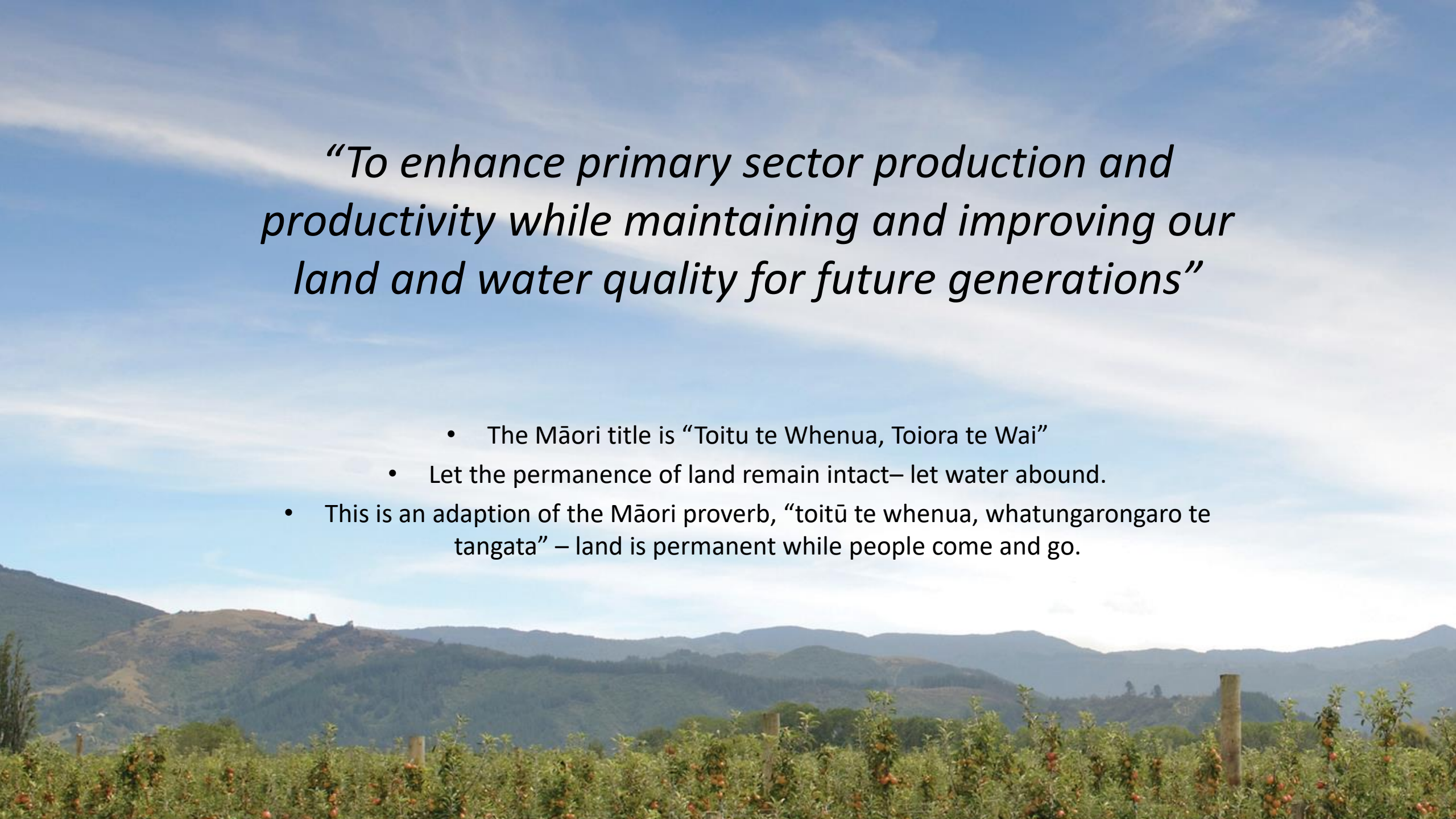
The National Science Challenges

A Better Start E Tipu e Rea Launched 19 February 2016	Ageing Well Kia eke kairangi ki te taikaumātuatanga Launched 4 March 2015	Building Better Homes, Towns and Cities Ko ngā wā kāinga hei whakamāhorahora Launched 5 May 2016
Healthier Lives He Oranga Hauora Launched 1 December 2015	High-Value Nutrition Ko Ngā Kai Whai Painga Launched 1 April 2014	New Zealand's Biological Heritage Ngā Koiora Tuku Iho Launched 29 August 2014
Our Land and Water Toitū te Whenua, Toiora te Wai Launched 26 January 2016	Resilience to Nature's Challenges Kia mānawaroa - Ngā Ākina o Te Ao Tūroa Launched 10 June 2015	Science for Technological Innovation Kia kotahi mai - Te Ao Pūtaiao me Te Ao Hangarau Launched 16 September 2015
Sustainable Seas Ko ngā moana whakauka Launched 4 September 2014	The Deep South Te Kōmata o Te Tonga Launched 5 August 2014	

The National Science Challenges

- ***Mission led** - to address issues that matter to all New Zealanders*
- ***Impact** - biggest science-based challenges New Zealand has*
- ***Science quality** – using cross-disciplinary approaches -*
- ***Best teams** - an opportunity for collaboration*
- ***Coherence** - sustainable and long-term research investments*



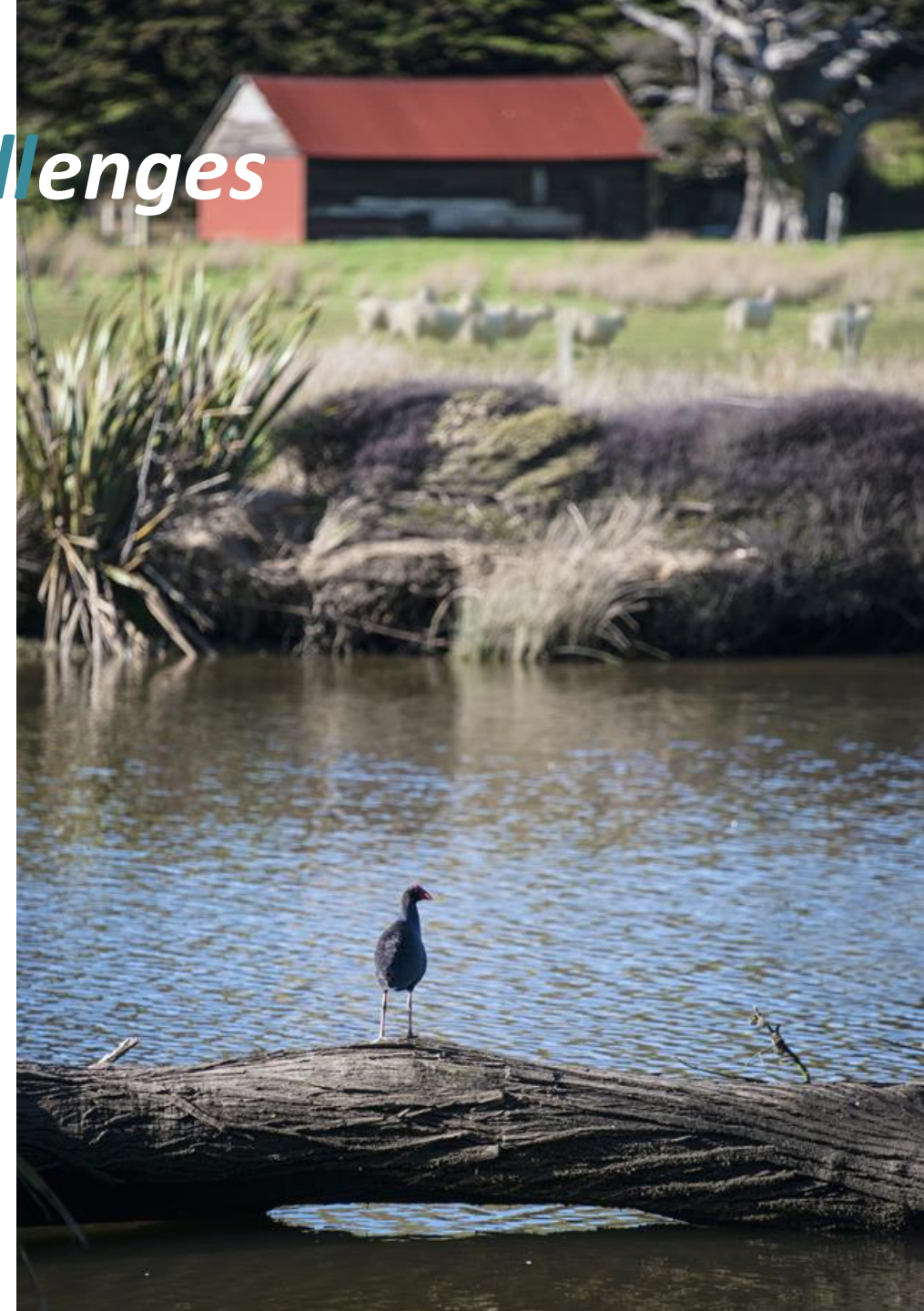


“To enhance primary sector production and productivity while maintaining and improving our land and water quality for future generations”

- The Māori title is “Toitu te Whenua, Toiora te Wai”
- Let the permanence of land remain intact– let water abound.
- This is an adaption of the Māori proverb, “toitū te whenua, whatungarongaro te tangata” – land is permanent while people come and go.

The National Science Challenges

- **Mission led** - to address issues that matter to all New Zealanders
- **Impact** - biggest science-based challenges New Zealand has
- **Science quality** – using cross-disciplinary approaches
- **Best teams** - an opportunity for collaboration
- **Coherence** - sustainable and long-term research investments
- **Mātauranga** – harnessing the power of Māori knowledge systems



Research partnerships



Why do we have the Our Land and Water National Science Challenge?

Because we are underperforming in three key areas:

1. Environmental quality
2. Value from primary production
3. Science delivery

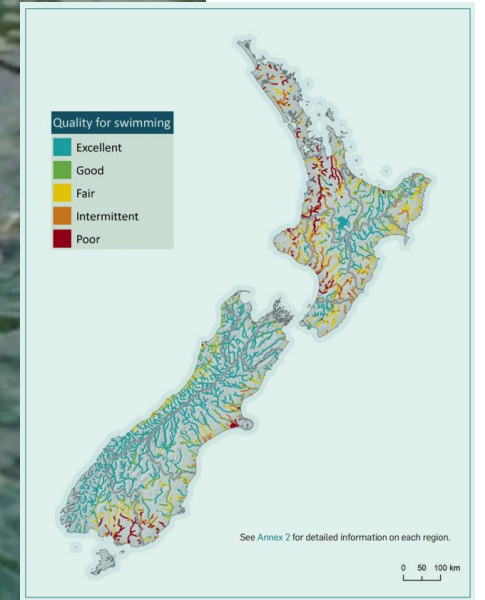


Environmental performance

NZ has >45000 km of rivers large enough for swimming

- Currently 43% meet “swimmability” criteria

- Government target:
 - 80% by 2030
 - 90% by 2040



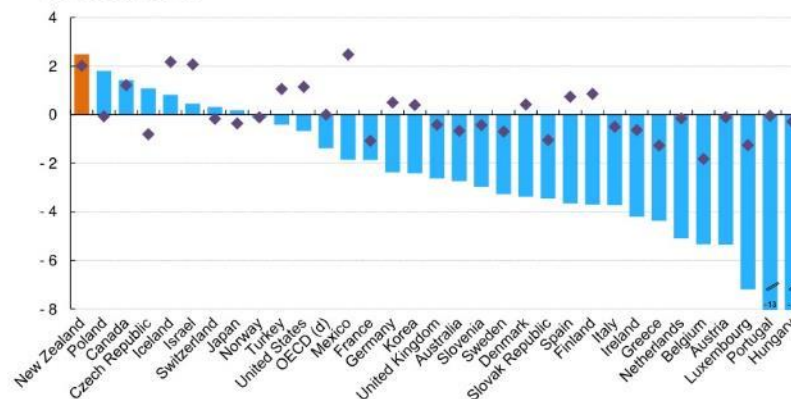
OECD environmental performance review

“...New Zealand’s growth model is approaching its environmental limits...Pollution of freshwater is spreading over a wider area. And the country’s biodiversity is under threat.”

“Nitrogen surplus has increased in step with the growth of dairy herds. Half of monitored river sites have enough nitrogen to trigger algal blooms”

Nitrogen balance has worsened more than in any other OECD country

Changes in nitrogen balance (bars) and agricultural production (dots), 1998-2000 to 2007-09



Agricultural production: based on the sum of price weighted quantities of different agricultural commodities produced after deductions of quantities used as seed and feed weighted in a similar manner. Index 2004-05=100. The OECD total excludes Chile, Estonia, Israel and Latvia. Source: OECD (2013), OECD Compendium of Agri-environmental Indicators.

Opinion
Farming

Clean, green New Zealand is a lie - and a warning for Britain's countryside

Patrick Barkham



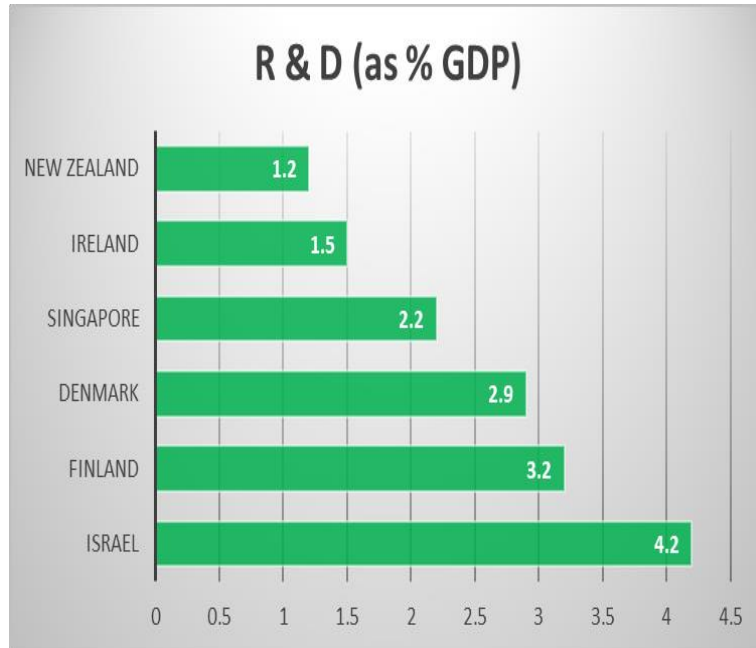
Michael Gove plans to cut farmers' subsidies while enhancing the environment post-Brexit. New Zealand's cattle-wrecked land shows the folly of his thinking

Value from primary production





Science delivery

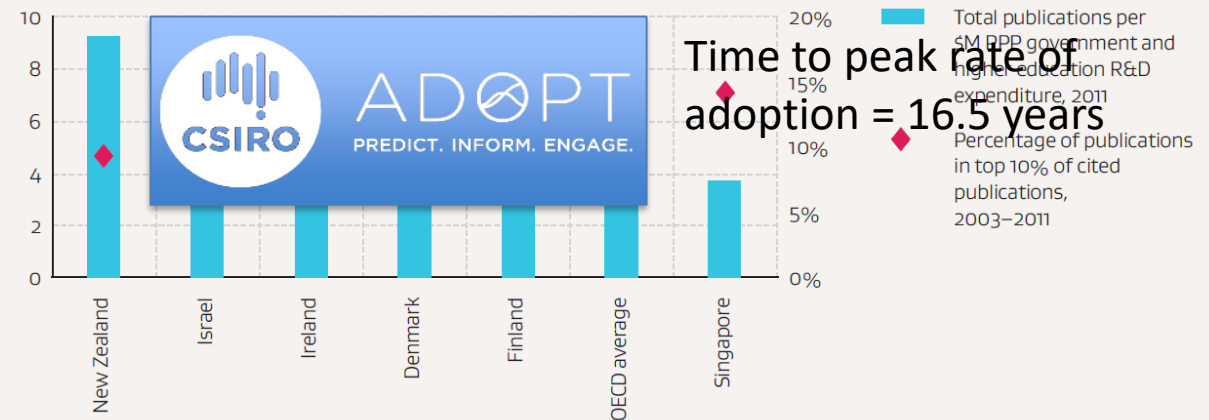


<http://uis.unesco.org/apps/visualisations/research-and-development-spending/>

The implementation lag

PUBLICATIONS PER \$M PPP FOR 2011, AND PERCENTAGE OF PUBLICATIONS IN THE TOP 10 PER CENT OF CITATIONS WORLDWIDE 2003-2011⁸

[chart 8]



Science delivery

Scientists 'misrepresent' state of Waikato

Freshwater Sciences Society President Dr Marc Schallenberg disputes comments by two scientists about the condition of the Waikato River.



The Challenge Objective

- as we choose to see it...

“To maintain and improve our land and water quality for future generations, while enhancing the value of the primary sector to New Zealand”

This framing:

- 1. implies “big” change*
- 2. drives our theory of change...*

Transformation: fundamentals

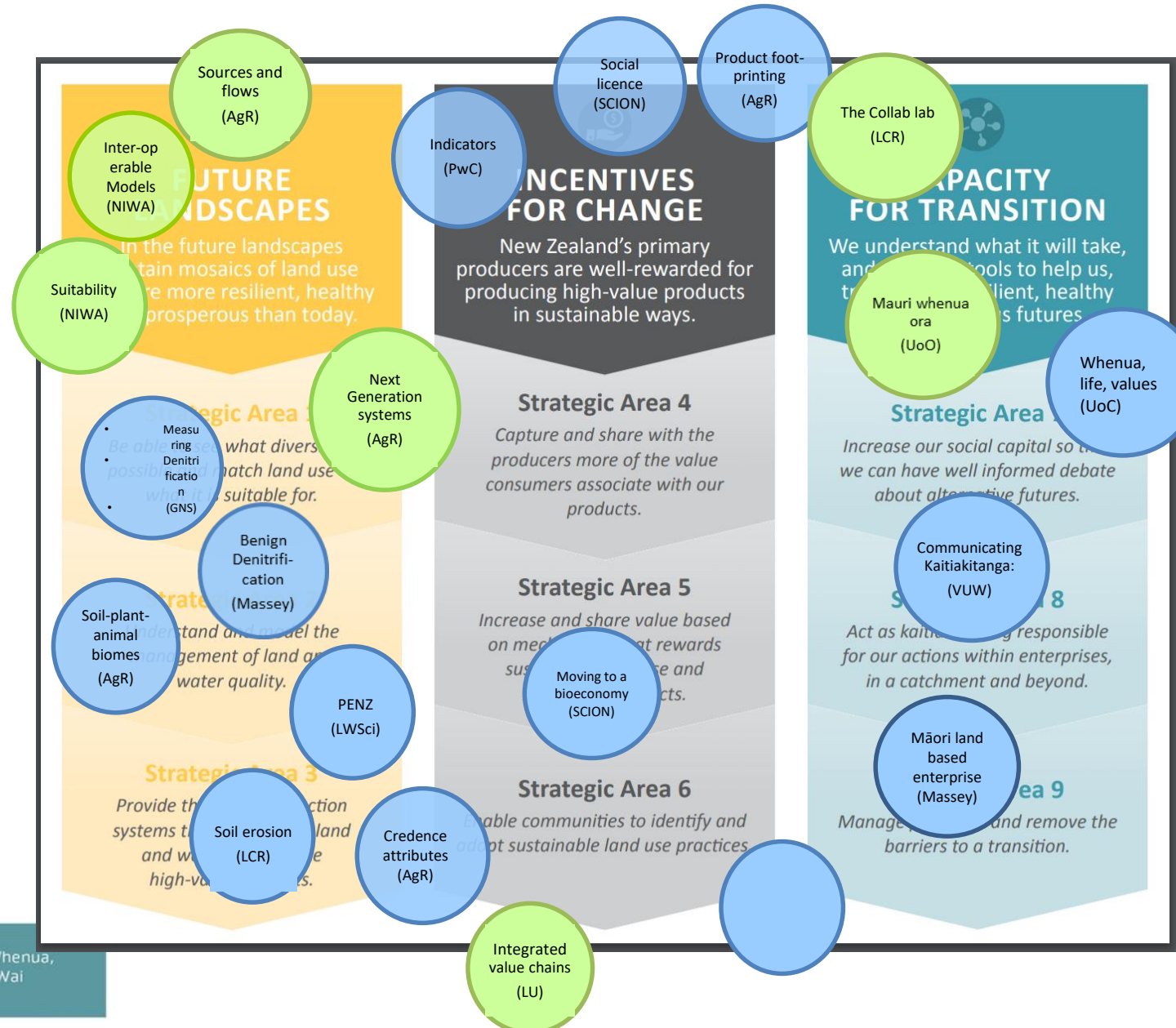
Incentives:
Why do I
want/need to
change?

Options:
What choices do I have? (and
how does our understanding
help us recognise/ use new
opportunities?)

Enablers:
What processes and tools
do I need to make it happen?



Three interconnected research themes



Future landscapes

Aim: In the future landscapes contain mosaics of land use that are more resilient healthy and prosperous than today.

1. How might we envision our future opportunities, and realise the benefits of multifunctional landscapes?

2. How can we better match land use to the landscape to maximise well-beings?

3. What do we need to know about the transport and flow of contaminants so that we can manage land and water quality better?

4. What can we gain by targeting our interventions, and adopting precision technologies?

5. What are the next generation production systems that generate high-value products with a low environmental footprint?

Outcomes:

We will have determined if a diverse mosaic of land uses can deliver better economic, environmental, social and cultural results than the current mix of land uses.

Individuals and communities have the understanding and tools they need to achieve good land and water quality.

New Zealand farmers produce a diversity of food and non-food products that they, their community and consumers value.

Incentives for change

Aim: New Zealand's primary producers are well-rewarded for producing high-value products in sustainable ways.

How do we create and capture more of the value consumers associate with our products ?

How do we increase and share the value associated with sustainable methods of production so that producers are rewarded accordingly?

How do we help our producer communities to identify and adopt sustainable land use practices?

How do we restore the social licence to operate?

Outcomes:

New Zealand is producing high-value products across all sectors that capture and share more value from consumers to producers

Agribusiness plays a key role in improving New Zealand's social, cultural and environmental footprint

Sustainable practices are the norm in primary production

Capacity for transition

How do we increase the primary sector's social capital so that as communities we can have well informed debate about alternative futures?

What is the role of collaboration in transforming land and water management practice and impact?

How might kaitiaki concepts and practices promote collective responsibility in responding to our challenges at enterprise, catchment and wider scales?

How can we identify, understand, manage, and remove the barriers to transition?

How might a Mātauranga centred framework aid land and water use & community innovation? How are land use choices influenced by cultural and social imperatives?

Outcomes:

An increased number of urban and rural people understand how land and water issues can be addressed.

There is more evidence of kaitiakitanga leading to improved outcomes.

New Zealand primary enterprises are able to manage pressures collectively and better than their international competitors.

The way we want to work

The Te Ao Māori “lens” - combines cultural and commercial imperatives by acknowledging the intrinsic values of land, the interconnectedness of all living things and the responsibilities we have for environment and community

Co-innovation - a systemic approach to helping to change practice when addressing complex challenges in which science is involved in multi-participant partnerships

Transdisciplinary research – experts contribute their own specialised knowledge but also work outside their discipline, striving to understand the complexities of the whole project, rather than one part of it

Best teams – Each Challenge collaboration will bring together NZ’s best team to address the Challenge

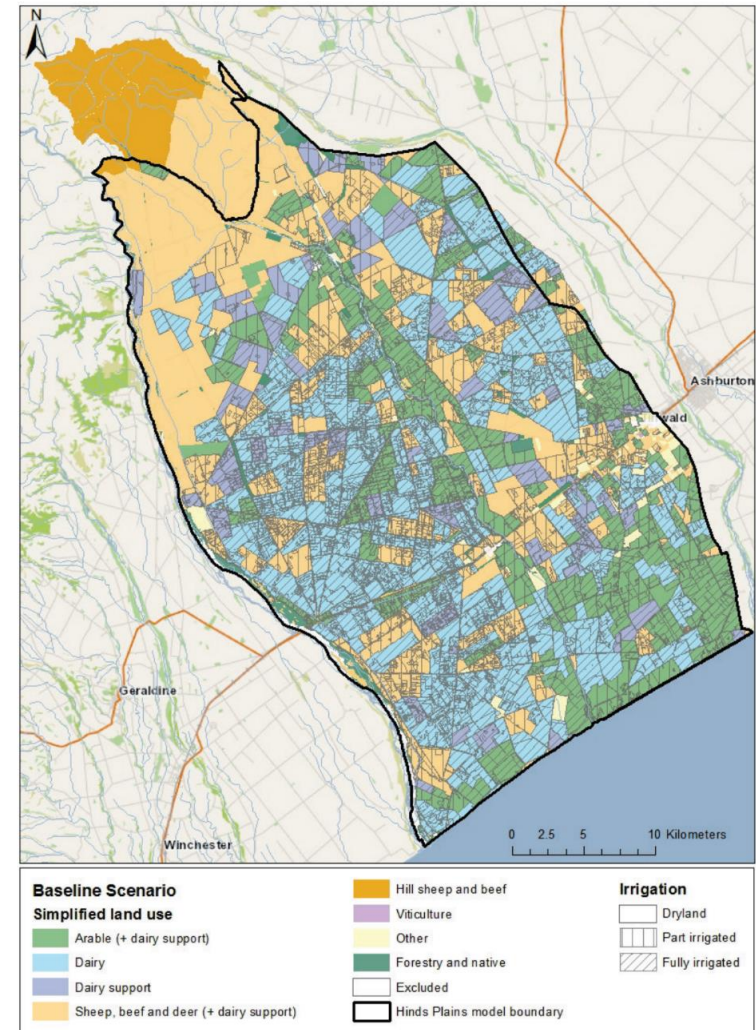
OLW leadership - a different approach to programme oversight, review & “course corrections”

Impact

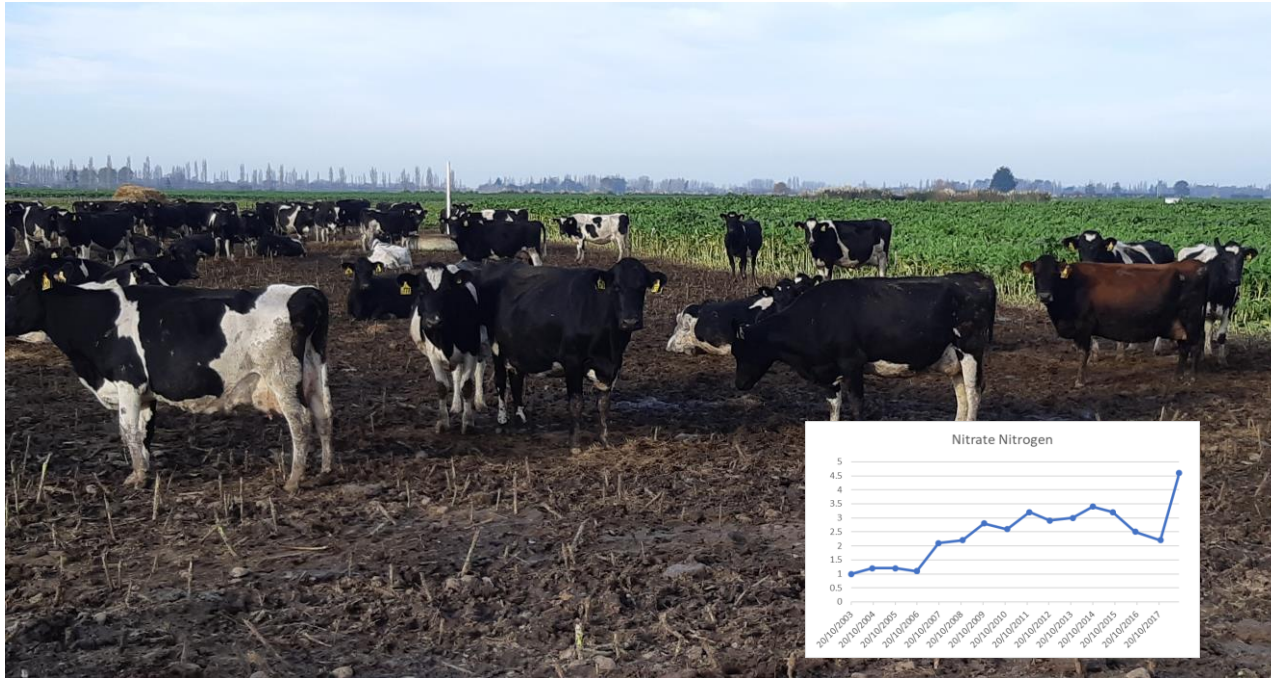
Land use suitability - the right enterprise in the right place



Land use suitability - the right enterprise in the right place

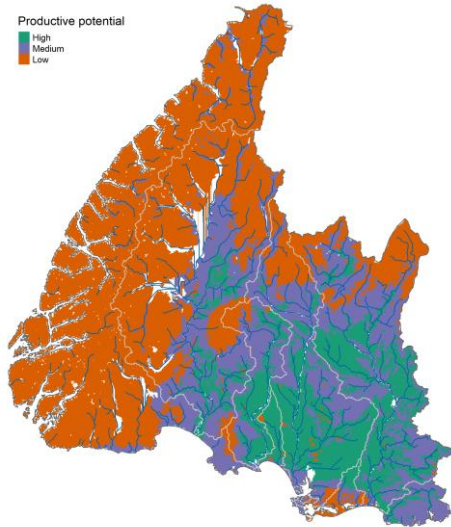


LUC v LUS



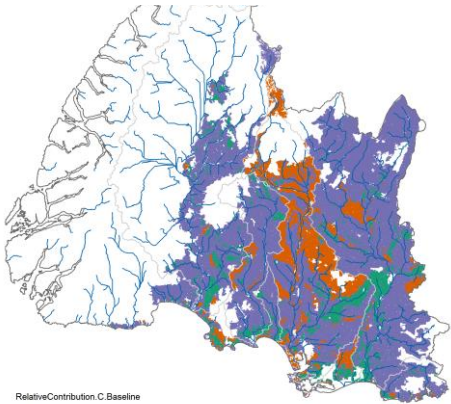
Land use suitability

Productive potential
High
Medium
Low



Productive Potential
the inherent productive and economic potential of land parcels

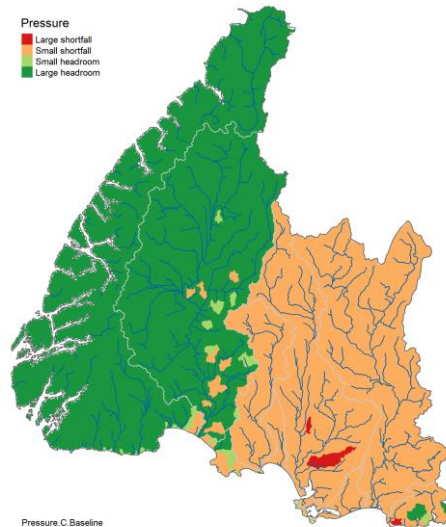
Relative contribution
High
Medium
Low



RelativeContribution.C.Baseline

Relative contribution
the potential of a land parcel to contribute contaminants to downstream receiving environments.

Pressure
Large shortfall
Small shortfall
Small headroom
Large headroom



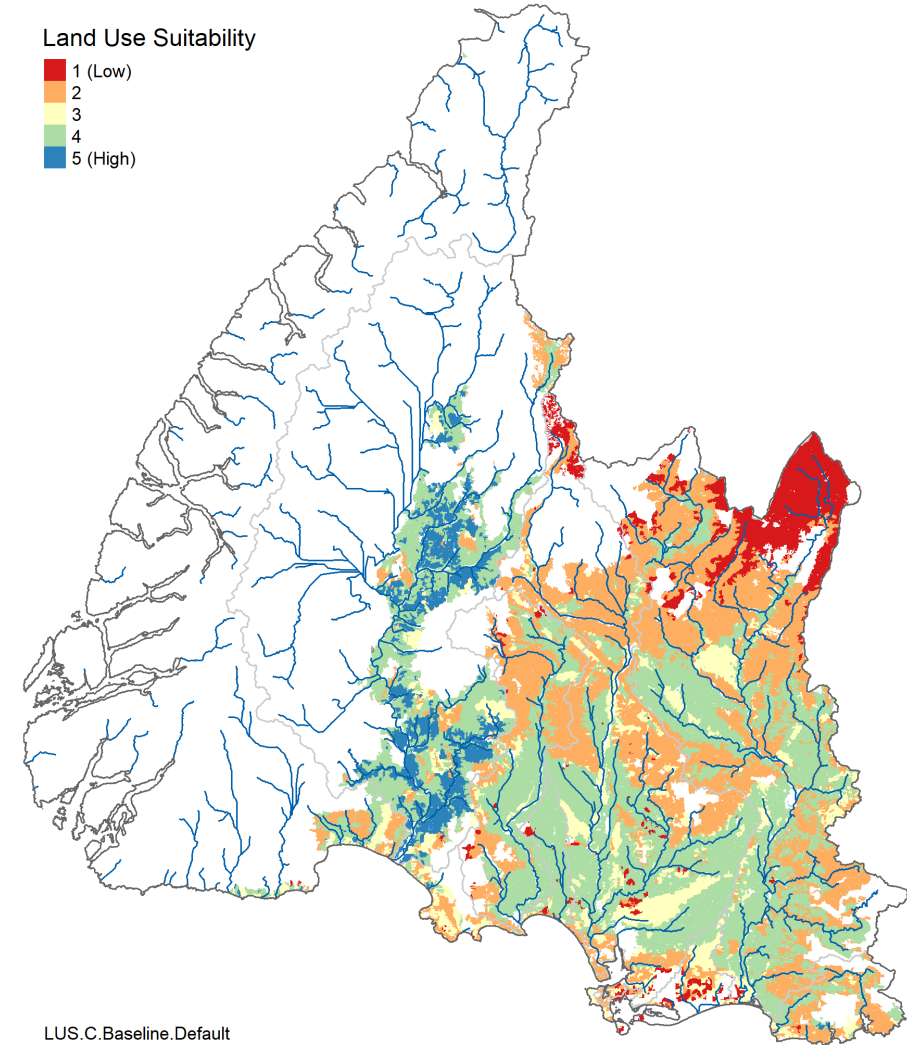
Pressure.C.Baseline

Pressure
potential contribution of contaminants to downstream receiving environments.



Land Use Suitability

1 (Low)
2
3
4
5 (High)

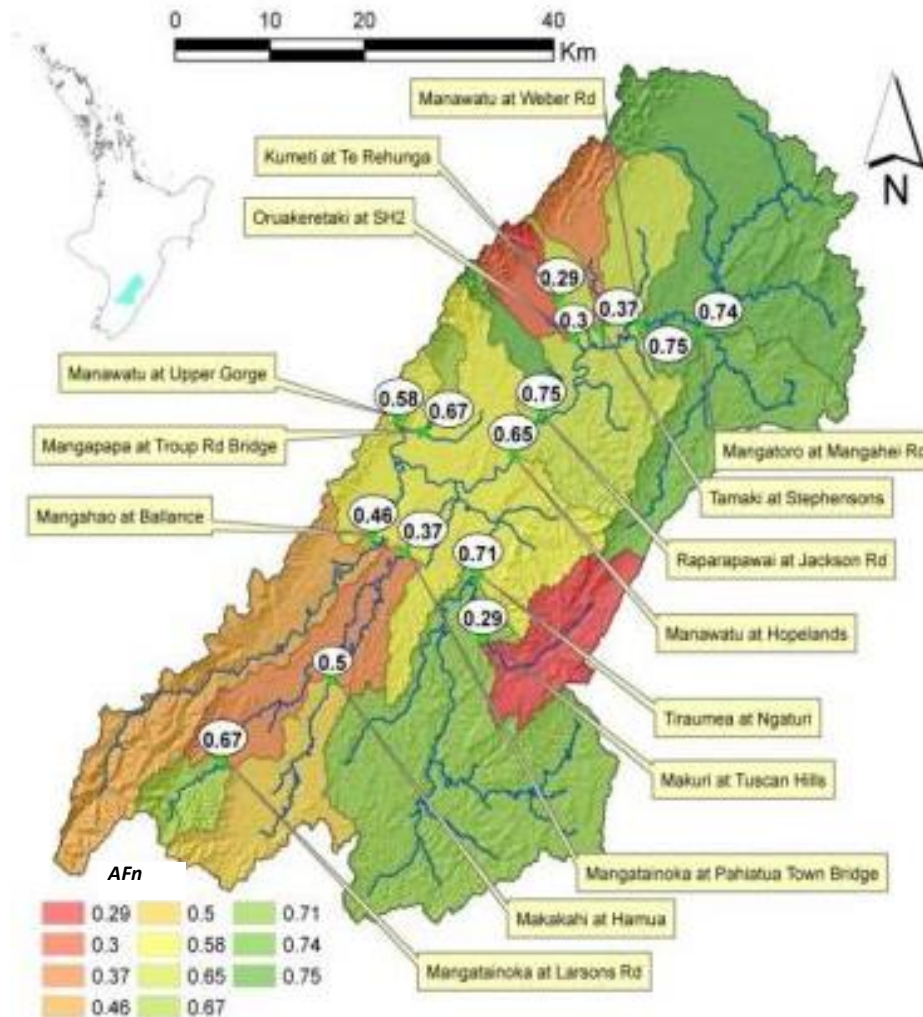


LUS.C.Baseline.Default

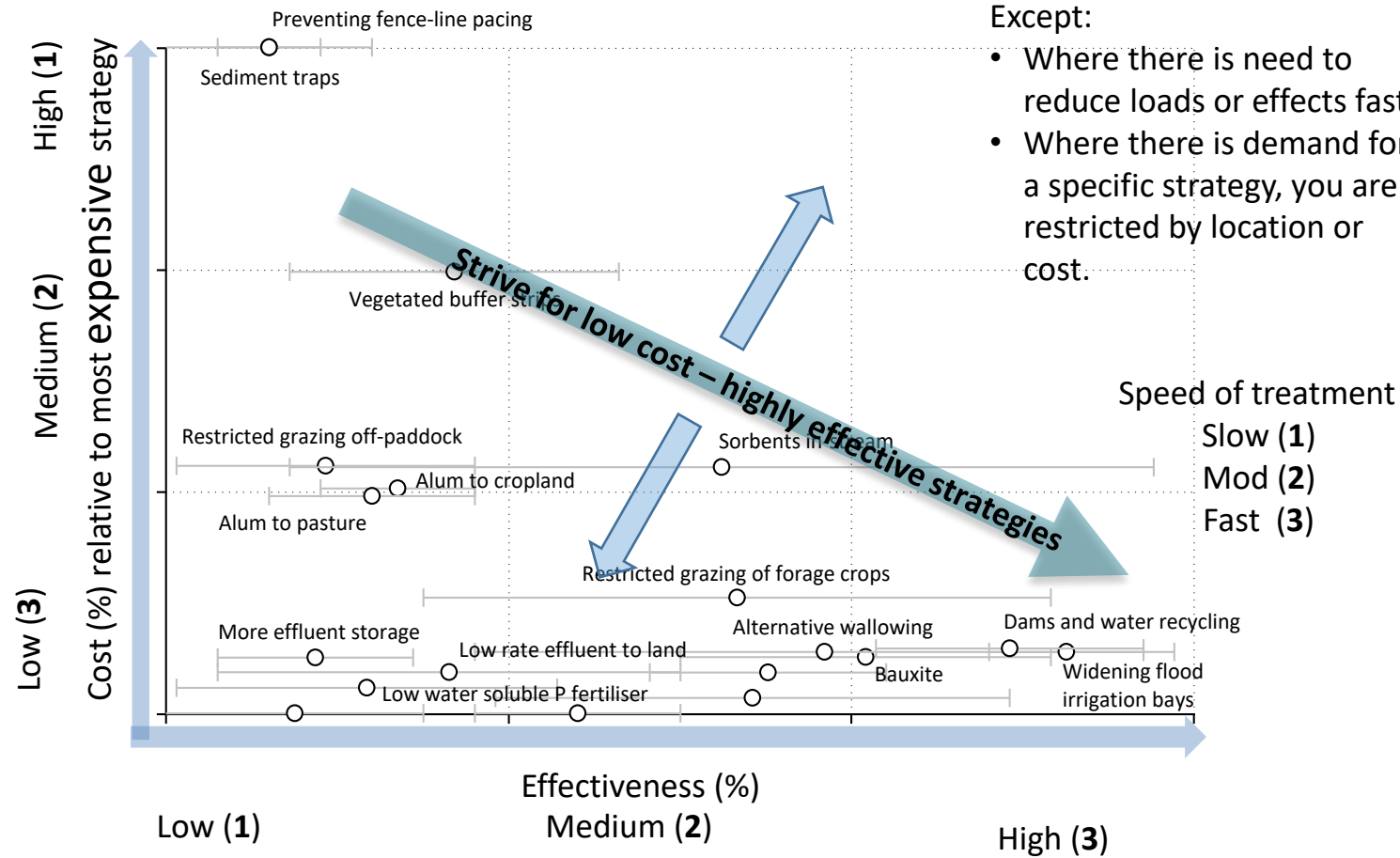
The right enterprise in the right place...

Attenuation 29-75%.

Intensifying land use in 83,000ha of high nitrate attenuation capacity areas, while de-intensifying land use over 10,000ha of low nitrate attenuation capacity areas, could decrease the nitrate load in the Rangitikei river by 6%



Targeting our mitigations

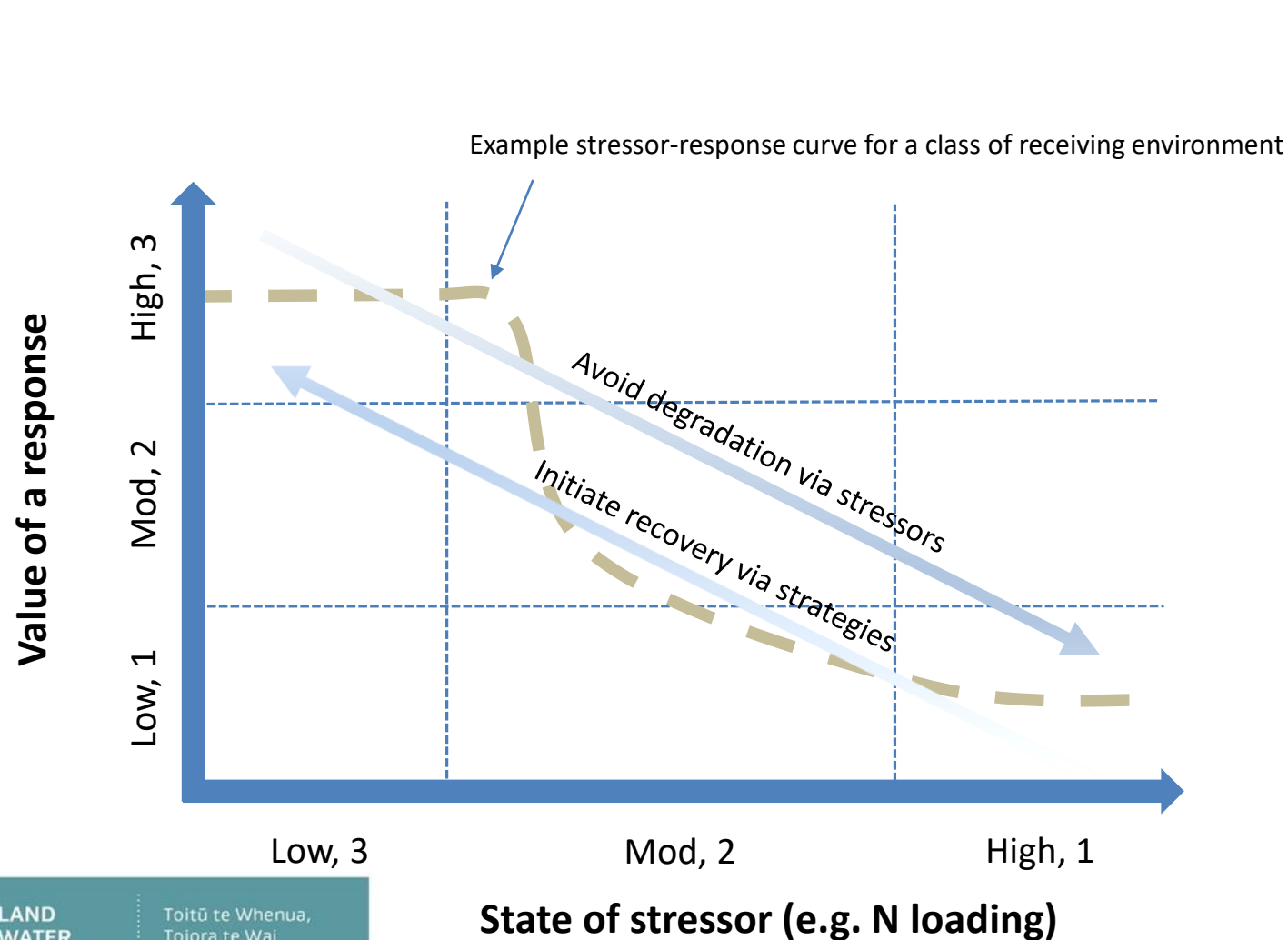


Except:

- Where there is need to reduce loads or effects fast
- Where there is demand for a specific strategy, you are restricted by location or cost.



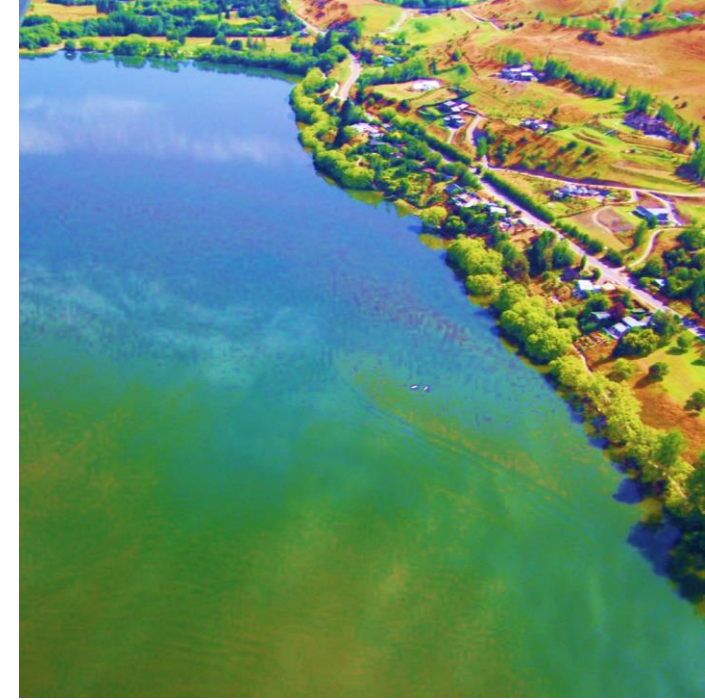
The receiving environment



Objective		
Sensitivity		
Avoid degradation	3	1
Initiate recovery	2	2
	1	3

The Benefit Quotient

Informs land managers, investors, regulators of the best actions to use to meet an objective



Aiming for as high a score
(max = 27) as possible

Score for management actions

Score for S-R curve in receiving environment

Avoid degradation
(best prospect = 27)

1



27

Initiate recovery
(best prospect = 1)



Conclusions

OLW is confronting issues of considerable technical and social complexity
Resolution requires new ways of working and thinking
And new ways of generating and sharing information
Transformational change will require resetting of institutional arrangements
Shifting the way we think about primary production – both the where and the how – is essential
Targetting (and precision ag) is key to minimising the impact of current land uses – but it won't be enough in some places
Some of our agricultural landscapes will need to be reconfigured

OUR LAND
AND WATER

Toitū te Whenua,
Toiora te Wai

Whakawhetai koe!

Toitū te whenua toiora te wai

www.Ourlandandwater.nz



“Transformational” change

- Innovation science
- Pre-conditions for transformation
- Major shifts in multiple parts of the system
- Fundamentally different approaches to the way knowledge is generated and shared
- The 3 fundamentals...

