MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
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SCIENCE SYSTEM ADVISORY GROUP

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TITLE	Refocussing and consolidating CRIs – policy considerations		
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PURPOSE	To provide information to support your discussion of the future for Crown Research Institutes		

Refocussing and consolidating CRIs – policy considerations

PURPOSE

To provide information to support your discussion of the future for Crown Research Institutes

SUMMARY

The attached slide deck provides a discussion of the rationale and case for refocussing Crown Research Institutes, with some indicative options for consolidation. The material is provided in the following sections:

1) Public Research Organisations: what and why
2) NZ's Public Research Organisations: what we have and their challenges
3) New Zealand's Science, Innovation and Technology needs
4) Reflections from International Case Studies
5) Direction: Consolidation and Refocus
6) Options for Consolidation

You may wish to go deeper into some aspects which are presented at a high level in this document.

The focus is the role and orientation of Public Research Organisations, with less attention on other aspects of PRO and science system design, such as institutional form, funding and governance arrangements. We are able to provide further material on these areas as your thinking progresses.

The material provided includes some commercial information, so please do not share wider than the Science System Advisory Group.

Refocussing and consolidating CRIs – policy considerations

1) Public Research Organisations: what and why
2) NZ's Public Research Organisations: what we have and their challenges
3) New Zealand's Science, Innovation and Technology needs
4) Reflections from International Case Studies (summary)
5) Direction: Consolidation and Refocus
6) Options for Consolidation

Context – there is an appetite for changes to the CRI model

The CRI sector is ready for reform following the Te Ara Paerangi process and given current financial challenges.

Cabinet has given you a mandate to suggest changes to CRIs

Our public research system faces enduring structural challenges that get in the way of it delivering value to New Zealand. The system is fragmented, with poor visibility of the effectiveness of current investments, and suffers from duplication, inefficiency, and poor use of resources….

Cabinet paper

What are the appropriate functions, scopes and structures of Crown Research Institutes and other Crown-owned research organisations to ensure they are better placed to deliver impact for New Zealand? (ToR)

- What should be the future of govt research orgs (CRIs)?
- Do they have distinct functions?
- What are their core purposes that justify separate organisational arrangements?
- Should they be rationalised sharing functions and avoiding duplication?
- Should CRIs remain as corporate entities?
- Are they too isolated from higher education?

There are three broad and related levers for institutional change.

- **Institutional design**: the scope, focus, and nature of the organisation, includes organisational form (Crown company, departmental agency….)
- **Funding**: how much, what for, who decides, accountabilities
- **Governance and Steering**: performance and reporting expectations, ownership responsibilities and accountabilities

No single lever can solve all the problems or achieve all aspects of the desired future state.

This presentation primarily focusses on aspects of institutional design

1) Public Research Organisations

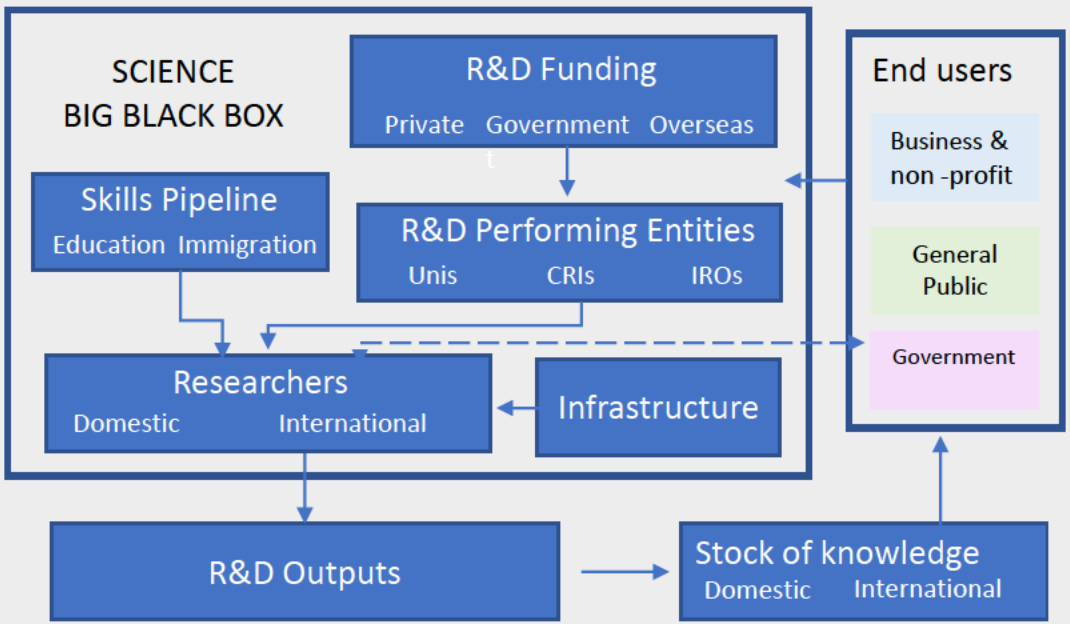
What and Why: The Theory

A Public Research Organisation (PRO) is an organisation that primarily performs research and innovation activities, and is controlled by government, usually through government ownership and with some degree of government funding.

PROs differ from universities as they undertake little or no teaching (post graduate only), and are generally not subject to academic freedom and autonomy protections.

Governments invest in research because it delivers positive impacts for New Zealand

A model of science impact



- Publications, Books
- Patents, trademarks
- Copyright, plant variety
- Manuals, guides
- Datasets
- Exhibitions, other

Pathways to impact

- People movements
- Collaborations, sponsored research
- Adoption/Uptake of knowledge
- Innovation
- Commercialisation – Licencing and Spin offs (start-ups)
- …

- People movements
- Public attitudes to science
- Science literacy & awareness
- Social & Cultural Knowledge
- Mātauranga Māori
- …

- People movements
- Adoption/uptake of knowledge
- Input into Regulation and/or Policy
- International diplomacy, aid, development
- …

Impacts

- Sector, industry, business improvements in:
  - Productivity
  - Sustainability
  - Competitiveness
- New Products/Processes in the market
- Behaviour change
- Safety
- Health
- Skills & Capabilities
- Stronger communities
- Better understanding of environment & society
- Good policy/ regulation
- Efficiency/accessibility of public service
- Stronger international regions/relationships
- …..

So why do we need public research organisations?

The rationale for funding public research are to do with positive externalities (for the economy, society, environment) and because the private sector is likely to under-provide science/research - but why do we need PROs?

Why not something/somebody else? (eg universities, private providers)

The Rationale for an organisation :

Provider Market Failure

- **Thin or missing markets**, few alternate purchasers of science. Market only able to sustain a single provider efficiently.
- No markets = **lack of price discovery**, no price signals, no market discipline.
- Low fungibility across products makes **efficiency gains from competition unlikely**, and provides few incentives to attract new entrants.
- **High barriers to entry** – accumulated expertise, reputation & specialised capital stocks (eg labs, kit).
- **Benefits from scale** – means fragmented competition is undesirable.
- The market underinvests in future focussed stuff or is unaware of it. **Over-the-horizon research.**

Stewardship/Missions

- Firms often have a high discount rate, or narrow set of objectives = key reasons for **Government stewardship**.
- Building industries takes time, involves investing in **uncertain** things & specialised (expensive) infrastructure/kit.
- An **enduring organisation** can provide **more stability.**
- **Vertically integrated**: there is benefit in having long-term research linked with applied science.
- Unencumbered with teaching obligation.

Science Services for Govt

- Direct procurement from the private sector can be hard (transaction and coordination failures).
- Science services are **an input into a public good**: central funding & contracting can result in efficiency, and consistent procurement principles.
- Single source of truth and independence is most appropriate for e.g. regulatory functions (eg Reference Laboratories).

Poor Reasons

- **Generating income** to cross-subsidise science (unless demonstrating feasibility, crowding in investment).
- **Legacy or Inertia:** we have this capability (for good or bad) through legacy and evolution – and trying to redesign is too hard/costly.
- **Regional development:** CRIs can be located in the under-developed regions.
- **Prestige or 'cool stuff'.**

Sovereign knowledge/capability

- **Private companies** might come and go – or be sold off-shore?
- **SIT from offshore providers**: we want to develop domestic solutions, domestic talent (spillovers), competitive advantage.

The strength of the intervention case for PROs varies, and there are pitfalls to be wary of.

Intervention logic

We will only have surety of allocative efficiency if an organisations runs on a single unified intervention logic. More than one logic risks lack of transparency of resource allocation.

Absolute market failure

Organisation as a subsidy

- An organisation with a particular focus provides research subsidised at a non-generic rate – e.g. Fraunhofer (Germany), Catapults (UK).

Proactive investment

- Can build markets over time, or course correct local or national economies.
- Also commonly seen in 'matters of obvious national importance' – defence and energy

Research as an input to public good

- Where research is a private good but with Government as the only consumer – climate change research could be an example.

Club good

- Where research benefits are shared, but by a clearly circumscribed group of users.
- An institutionalised version of an industry R&D levy – redundant

Key Microeconomic considerations

- Monopolies, or uncompetitive markets are typically **regulated**. **Asymmetric information**, and a lack of **price discovery**, are key issues with regulated industries.
- The regulator typically must deploy a range of techniques to benchmark costs (with similar locally and globally), but still provide for an adequate revenue to allow compensation of employees (retain/build capability), the provision of services (at a desired quality) and a **sufficient** return on investment (eg weighted average cost of capital) to enable re-investment in equipment/infrastructure (cover depreciation plus invest in new facilities/equipment).
- There is no regulator here – but there is a central funder and ownership Ministry, plus contracts, expert panels and an annual cycle of interaction with MBIE (and possibly other agencies) – which reduce asymmetry.

Strategy and Focus

Focus and Success

Focus is often critical to success; enables organisations to direct their energy and activity. (and measure it)

Breadth vs Focus

Breadth provides stability and adaptability, but we lose transparency and (ceteris paribus) the ability to direct. Focus provides transparency, clarity but also path dependency, advocacy and fragility (to change)

Trade-offs

Organisations are bounded areas of trade-offs – so we should be careful not putting functions together in an organisation that we are uncomfortable being traded-off against each other

Umbrella Organisations

Some countries have addressed the breadth vs focus trade-off through umbrella organisations (A*Star, CSIRO). But Government might still lose the ability to direct the trade-offs.

Treasury Framework on Form and Ownership / Proximity to Ministers

Public Policy context

Instability in policy preferences and high degree of value judgement suggest organisations should be close to Ministers. Government can exit when the policy becomes stable

Commercial context

As the organisation focuses increasingly on commercial returns rather than public service delivery, Government should seek to exit.

Risk to the Crown

Higher level of revenue from taxpayer means more scrutiny and accountability

Independence and Government control

The fiduciary duty of a company director (under the Companies Act) is to act in good faith to, and the best interests of, the company not the shareholders. This can conflict with the Government objectives.

- Presumably an implied rationale behind the CRIs Act of 1992 and the establishment of competitive funding was ideologically designed to assist the price discovery function
- The 2010 expert panel looked to change the commercial focus

2) New Zealand PROs

What we have and their challenges

CRIs remain a critical part of the science system

Crown Research Institutes are ***vertically integrated, sector facing research organisations***, that provide:

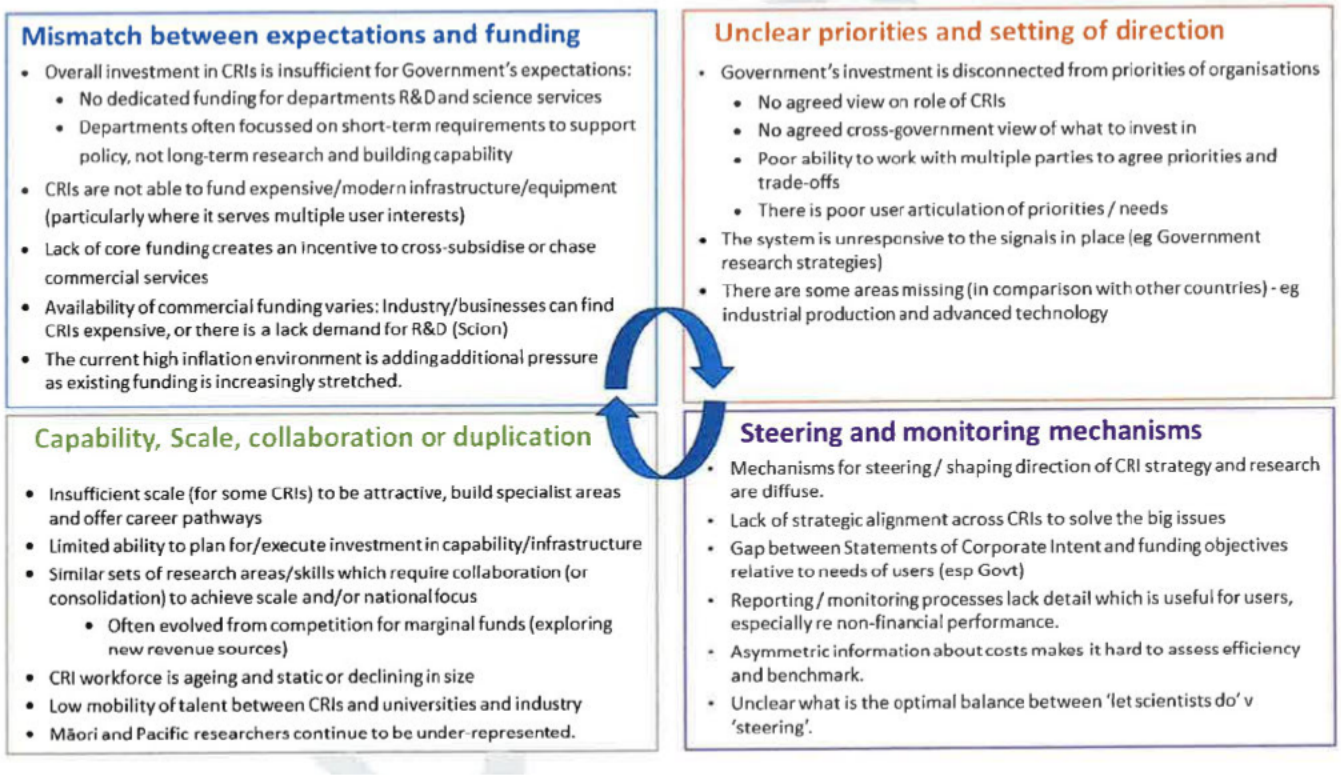
- Science services for Government and Industry, including databases, models, advice, and use of infrastructure
- Long-term and over the horizon research that users may not yet anticipate or be positioned to fund, including the development of new intellectual property (IP)
- Applied research and associated commercialisation activities, in partnership with business and industry.

The balance between these activities varies between CRIs.

CRIs are building meaningful Māori engagement and partnerships

- A Crown entity format (and a regional presence) gives Government more opportunity to direct these organisations to partner with Māori to meet Te Tiriti obligations.
- CRIs are also custodians of important data and collections, which can be taonga to Māori.
- The level of Māori interests and stakeholders differs between CRI sectors, while the maturity of individual CRIs' Māori engagement also varies. For example, Scion has a long history of engagement with iwi and hapū through its work in the forestry sector, while the history of engagement for ESR is relatively recent.
- There has been a positive move to increase and improve engagement with Māori by CRIs over the years. Each CRI has a Māori Strategy, a Māori General Manager on the Leadership Team, and Māori engagement team.

But aspects of the current system are not working well



CRIs research activities reflect their sectoral focus

Heatmap of organisational specialisation based on publication data (2018 to 2023)

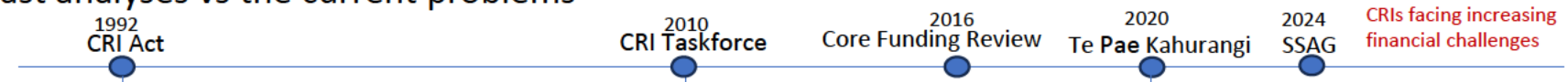
FoR Group	AgResearch	ESR	GNS Science	Landcare Research	NIWA	Plant & Food Research	Scion	CRIs (combined)	UoA	AUT	University of Waikato	Massey University	VUW	University of Canterbury	Lincoln University	University of Otago	Universities (combined)	New Zealand (total)
Agricultural, Veterinary and Food Sciences	6.95	1.04	0.43	1.93	0.70	6.46	3.57	3.31	0.44	0.39	0.44	3.11	0.19	0.41	5.48	0.51	0.87	1
Biological Sciences	2.87	3.23	0.52	4.36	3.07	3.87	3.48	3.03	0.81	0.34	0.92	1.23	0.81	0.94	2.00	1.13	0.92	1
Biomedical and Clinical Sciences	0.53	1.00	0.00	0.08	0.04	0.26	0.03	0.24	1.18	0.59	0.29	0.47	0.30	0.24	0.19	1.58	0.87	1
Built Environment and Design	0.28	0.00	0.27	0.39	0.22	0.23	0.60	0.27	1.05	1.77	1.00	1.65	1.42	1.11	0.91	0.41	1.07	1
Chemical Sciences	1.03	1.96	0.80	0.43	0.22	1.14	1.59	0.87	1.37	0.38	0.72	0.86	1.96	1.43	0.38	0.83	1.06	1
Commerce, Management, Tourism and Services	0.16	0.19	0.10	0.17	0.06	0.41	0.24	0.17	0.64	2.31	1.99	1.69	1.22	1.21	1.77	0.75	1.16	1
Creative Arts and Writing	0.04	0.16	0.05	0.00	0.04	0.10	0.00	0.05	0.88	2.50	1.33	1.14	1.44	0.78	0.22	0.42	1.09	1
Earth Sciences	0.44	1.05	14.01	1.79	8.72	0.40	0.65	4.37	0.64	0.21	1.36	0.69	1.61	1.34	0.91	0.84	0.85	1
Economics	0.30	0.00	0.03	1.15	0.33	0.10	1.06	0.42	0.60	1.27	2.41	1.25	1.52	0.83	3.05	0.72	1.12	1
Education	0.05	0.05	0.03	0.13	0.06	0.00	0.09	0.06	1.16	1.32	2.15	0.91	1.24	1.22	0.15	0.75	1.12	1
Engineering	0.48	0.66	1.25	0.21	0.61	0.49	2.00	0.72	1.32	1.32	1.25	0.78	0.99	1.98	0.59	0.33	1.08	1
Environmental Sciences	2.67	2.65	0.69	6.80	5.40	2.72	5.48	3.61	0.70	0.40	1.30	0.93	0.84	1.32	3.49	0.59	0.86	1
Health Sciences	0.11	0.72	0.01	0.06	0.05	0.11	0.05	0.10	1.13	1.99	0.73	0.85	0.50	0.45	0.16	1.60	1.04	1
History, Heritage and Archaeology	0.13	1.17	0.23	0.53	0.19	0.11	0.00	0.25	0.77	0.45	1.18	0.79	1.39	0.91	0.61	1.59	1.09	1
Human Society	0.19	0.88	0.32	0.66	0.20	0.10	0.49	0.32	0.86	1.02	1.67	1.46	1.73	1.22	1.17	0.96	1.14	1
Information and Computing Sciences	0.15	0.58	0.11	0.29	0.18	0.19	0.21	0.21	1.08	1.98	1.17	0.81	1.91	1.16	0.37	0.41	1.13	1
Language, Communication and Culture	0.04	0.00	0.07	0.10	0.02	0.09	0.05	0.05	0.91	1.41	1.58	1.36	2.14	1.28	0.22	0.52	1.17	1
Law and Legal Studies	0.08	3.03	0.11	0.28	0.75	0.10	0.21	0.44	0.84	0.79	1.38	0.73	1.94	1.28	0.23	0.73	1.01	1
Mathematical Sciences	0.08	1.61	0.34	0.25	0.22	0.03	0.27	0.27	1.43	0.54	0.69	1.04	1.94	1.93	0.14	0.62	1.17	1
Philosophy and Religious Studies	0.07	0.26	0.04	0.23	0.14	0.00	0.09	0.10	0.70	1.17	1.63	0.79	1.35	1.06	0.21	1.44	1.08	1
Physical Sciences	0.12	0.42	1.12	0.15	0.17	0.10	0.36	0.34	1.36	0.54	0.46	0.67	1.94	4.07	0.22	0.60	1.10	1
Psychology	0.06	0.28	0.00	0.03	0.03	0.05	0.00	0.05	1.10	1.20	1.50	0.84	1.55	1.11	0.09	1.40	1.18	1

- An Relative Comparative Advantage (RCA) of greater than 1 indicates that an organisation has published more papers in a particular field relative to New Zealand.
- The background colour of each cell represents the size of the number.
  - Dark red for high values which indicates a greater than expected focus in that field.
  - White for low values which indicates a lower-than-expected focus in that field

CRIs have a more focussed approach to research having few fields with high RCAs compared to NZ universities.

Collaboration and sustainability challenges persist

Past analyses vs the current problems



Part of New Public Management reforms of the 1980s and 90s.

Eight CRIs were formed from existing Crown research bodies, the largest of which was the DSIR (est. 1926).

Capability of each new CRI was consolidated around aspects of then economic, social and environmental requirements.

"We believe… that through greater collaboration CRIs can perform much better…. our science funding system has pushed competition as far as it can go as a means of driving efficiency"

- Ownership arrangements placed undue emphasis on CRIs revenue and balance sheets, rather than on research for New Zealand.

- CRIs dependent on competitive contracts, thus difficult for CRIs to operate strategically

- Funding and governance arrangements for CRIs inhibit collaboration. Governance and institutional arrangements can be considerably simplified so that CRIs have a stronger sense of purpose and direction.

"Government must be more explicit about what it wants each CRI to achieve and must fund the CRIs accordingly, so that they can deliver more for the national benefit."

- ➢ Implement streamlined funding processes, strengthened governance structures and clarity of goals for each CRI.
- ➢ Retain the company model to support "efficient management" but no need to reduce the number of CRIs.

A partial success: Funding changes were not fully implemented – SSIF is not sufficient to allow CRIs to deliver to core purpose, science services funding is patchy. While most of the other recommedations were implemented, issues of competition and focus on company health over public good outcomes persist. Te Pae Kahurangi (2020) has a similar problem list, but slightly different interventions.

"…. fragmentation, overlapping activities and missed opportunities for sharing resources, as well as aspects of public funding that sometimes incentivise unproductive competition and distort choices on ways to achieve impact from new knowledge"

THE FUTURE WILL REQUIRE AN APPROACH THAT IS MORE INTEGRATED

➢ …across strategy setting, customer engagements, partnership with Māori, talent development, use of resources, and operating models, supported by more stable funding streams. More support for merging, and a recommendation to move away from the company model.

For further information:
CRI Taskforce (2010);
CRI Core Funding review (2016),
Te Pae Kahurangi Report 2020

Finding the right balance between focus and breadth

Collaboration is important

Solutions often require science from across disciplines.
Collaboration connects research to broader purpose/core.
Reduce some transaction/dissemination barriers.

V

Fragmentation is bad

Overlap in capability, not identical but related.
Sub-scale units, sub-scale funding, small projects, low impact.
No shared infrastructure, shared services.
Low attractiveness (for specialist capability and partnerships).

Current CRI coordination and collaboration happens in the context of, and when it suits, organisational priorities and choices (ie along the horizontal below), and is not guided by an overarching government strategy or priorities (the vertical).

A 2021 report from the CRIs shows how much they collaborate, and jointly offer a variety of solutions across key themes

	Emergency Response	Biosecurity and public health	Biodiversity	Water Resources	Climate Change	Energy	Food & Fibre Manufacturing	Land Use
Core Aspects	• Natural and environmental threats • Public health emergencies • Security and Justice sector	• Public health • Detection and identification • Response and eradication • Monitoring and control	• Identification and characterisation • Management and conservation	• Freshwater • Groundwater • Wastewater • Coast and oceans	• Understanding change • Assessing risk • Supporting adaptation • Reducing emissions • Clean Energy	• Energy storage • Energy resources and production • Energy utilisation	• Pastoral Horticulture • Seafood, fisheries, aquaculture • Food and beverage • Bio-based products • Forestry • Advanced manufacturing • Packaging	• Land health • Land management • Land use prioritisation
FTE	GNS 180 ESR 265 NIWA 50 Scion 12	AgResearch 90 Scion 59 MWLC 68 PFR 40 ESR 11 NIWA 18	MWLC 83 NIWA 30	NIWA 120 ESR 33 GNS 40	NIWA 172 AgResearch 52 Scion 75 MWLC 70 GNS 85	GNS 60 Scion 12 NIWA 35	AgResearch 190 Scion 83 PFR 575 NIWA 133	MWLC 81 Scion 33 Agresearch 64 PFR 55 NIWA 32
	Total 327	**Total 286**	**Total 113**	**Total 153**	**Total 454**	**Total 47**	**Total 848**	**Total 265**

There are inevitable and sometimes fruitful overlaps and synergies across capability areas, and not necessarily one “right’ way to link and connect capabilities, or balance breadth and focus, to drive innovation.

CRIs have a mixed funding model

Commercial Information

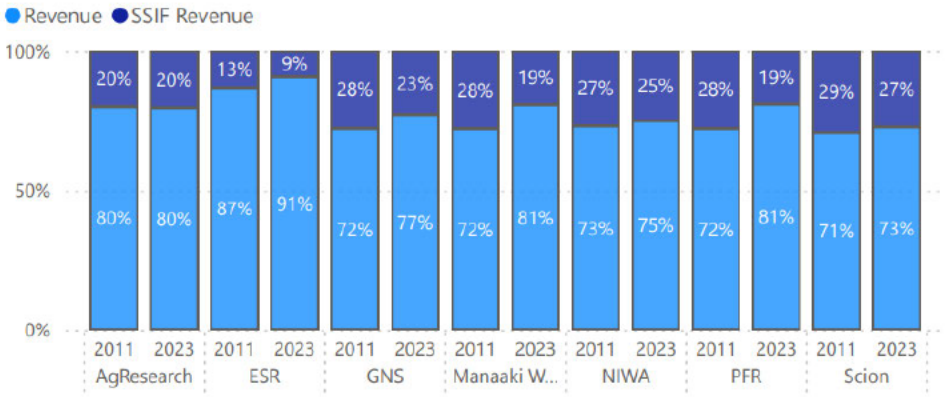
There is no direct measure of –

- public good/industry good,
- collaboration and partnership,
- uptake of research outputs, or
- tech transfer.

Joint publications with industry

BIBLIOMETRICS Organisation	2019-2023 Total Publications	Company Co-authorship (number and percent)	
AgResearch	1975	87	4.41
GNS Science	1484	49	3.30
ESR	549	34	6.19
Manaaki Whenua	1460	35	2.40
NIWA	1934	108	5.58
Plant & Food Research	1575	37	2.35
Scion	757	20	2.64

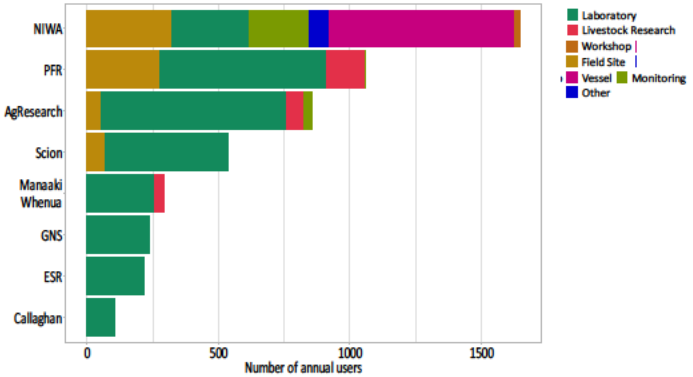
SSIF proportion of revenue 2011 and 2023



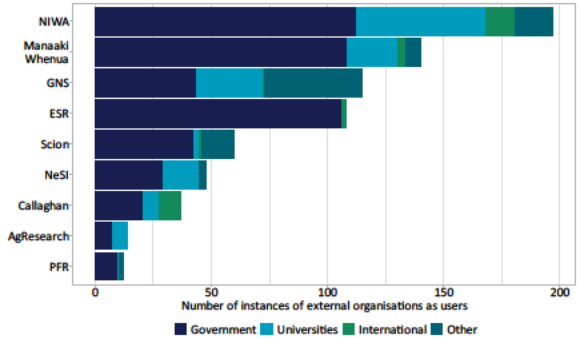
CRIs collectively provide important infrastructure

For further information see MBIE's Kitmap Report

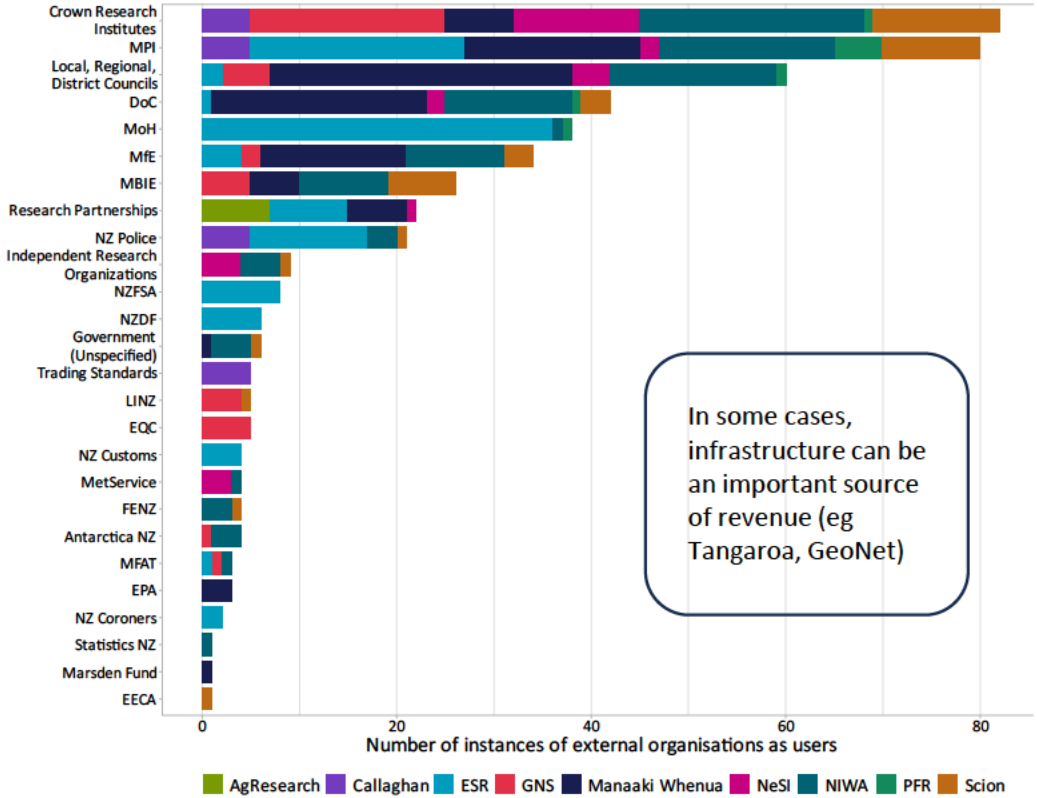
*External users of CRI Infrastructure by type of infrastructure**



External users by sector



Government sector users of CRI Infrastructure



In some cases, infrastructure can be an important source of revenue (eg Tangaroa, GeoNet)

Some infrastructures are for internal use only.

* excludes infrastructures with (comparatively) unlimited capacity (computing, sample and digital collections)

CRIs are crown companies with range of commercial revenue, but they face trade-offs which can limit benefit, or incentivise unwanted focus

The Hypothesis

- Should we assume that all commercial revenue is good for the economy?
- Or that revenue from industry is favourable in a tight fiscal setting (self-sufficiency, less budget pressure), that it shows industry demand, or that competition drives efficiency?

The Reality?

- Crown company plus competitive/tight funding could (will) incentivise CRIs to chase revenue, shift effort towards contracts/fee for service, away from commercialising IP
- Short term incentives (ie. returns from IP is longer term, require patient capital ~ and long-term secure funding)

Revenue

commercial ← **Trade-Off #1** → **commercialisation**

Types of Revenue

Other	Fee for Service or use of infrastructure	Short term research contract	Licencing IP, models, user charges	Spin out Intellectual property
• Financial rev cross-holding shares (Fonterra) or Interest on cash balances • Farm produce	• Consultancy services, advice • Use of infrastructure, equip, labs vessels, HPC	• Contracts with industry/Ministry/EDAs. • Applied or experimental science	• Licencing IP to industry, Government & others	• A new venture, start-up or JV. • Interest from subsidiaries or the sale thereof

Selling time & resource (scientist/assets) Immediate but question on scarcity/best use

More likely H1/H2. Often key part of industry facing, but can also be mission services for Gov client

Not constrained to selling time/assets – revenue is not constrained by resource availability – but longer term

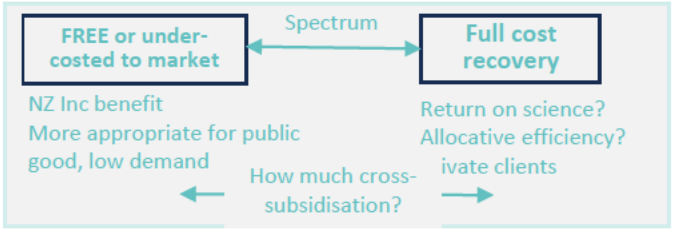
More likely from H3 – but also can be commercialisation of applied/experimental or models/data for 'services'.

Examples

- Lab work, sample testing, data collection, mapping
- Leasing land/buildings, equip
- Toitū
- Tangaroa
- Quarantine facility
- Qatar geological survey?
- Specific R&D projects
- Eg Geothermal Association
- Fisher-Paykel appliances insulation work
- Bio resource processing alliance
- Riskscape
- Red needle satellite MWLC fungi project
- HyperFarm
- The Future Orchard planting system
- Nitrogen fixation models
- Plant microbe tech
- Royalties from crop varieties
- Lumi Drug Scan, STRMIX
- Vital vegetables
- Rodenticide
- Bspkl (GNS)
- Biopolymer network
- Ecogas (Scion)
- Halter, ZeaKal (AgResearch)

Trade-Off #2

- Within each rev category there are also choices/trade-offs between earning more commercial revenue and getting more take-up, NZ inc. or public benefit
- Taking too much equity in a spin-out curtails long term potential



- For public good (+ve externalities) we want to under charge.
- But we don't want to subsidise established industry at expense of future potential (opportunity cost) or not internalise negative externalities (eg research solutions to profiting polluters)

3) New Zealand's SIT needs

The current focus of our science system does not reflect current and future needs

We need to think about our evolving economy and needs

To keep up we need more science

- Climate change, ageing populations, rapidly evolving tech, increased geopolitical competition
- SIT has been identified by almost all developed countries as critical factors in national success.
- Science lifts the productivity of key industries and creates skills & knowledge for new ones

But we need our economy to transform

- NZ's economy needs to transform over the next 25 years to deliver sustainable prosperity
- Diversify exports, and grow sectors/jobs with lower emissions and higher productivity

We need at least as much SIT as our competitors

- Already we are falling behind in critical General Purpose Technologies (AI, quantum, robotics, synthetic biology) and we have no credible institutional or funding pathway to close the gap.
- Most of our competitors invest between 2.5-4% of GDP in R&D, we do half that

Public research will still be key

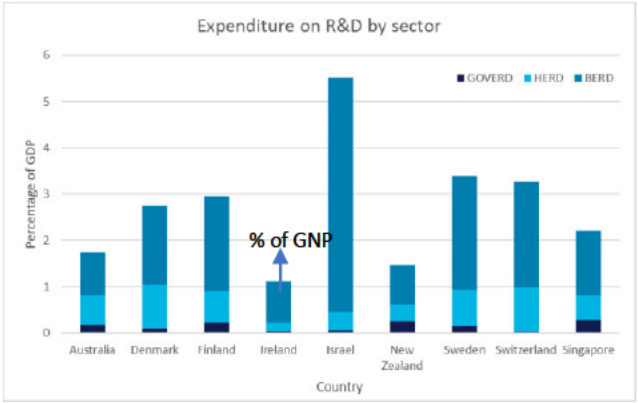
- Government can fund long term and basic research – whereas industry usually cannot afford to do that. And new knowledge where there is no industry yet

Successful SAEs have clear strategies that they execute for years

- Small advanced economies (SAEs) have clear selective economic strategies, often integrating chosen science & innovation systems with start-ups, scales ups – from end to end – and they invest in them for many years, even when there is no immediate demand (commercial revenue)

We need to go beyond the Primary sector and the environment

- Much of NZ's R&D is focused on maintaining its current sources of advantage in existing areas of strength.
- Large industry is also clustered – and not in areas of that are traditionally large users of research (explains low BERD)

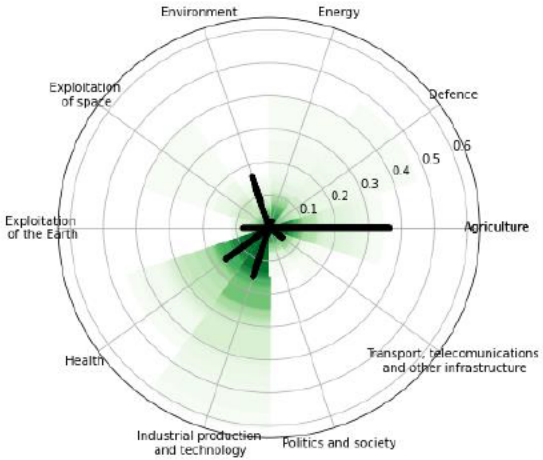


But it will be hard and take time to overcome path dependency

- For new areas - we need to develop and attract skills and create "believable" long term programmes &/or institutions. We cannot gain a reputation as a bad place to have a career.
- Lack of large tech/industry firms mean co-funding for an ATO will take longer (commercial crown company model for ATO seems inappropriate)
- Immediate demand for economic impact is likely to perpetuate majority research in existing areas with proven impact pathways (existing companies/skills distribution channels) like the primary sector

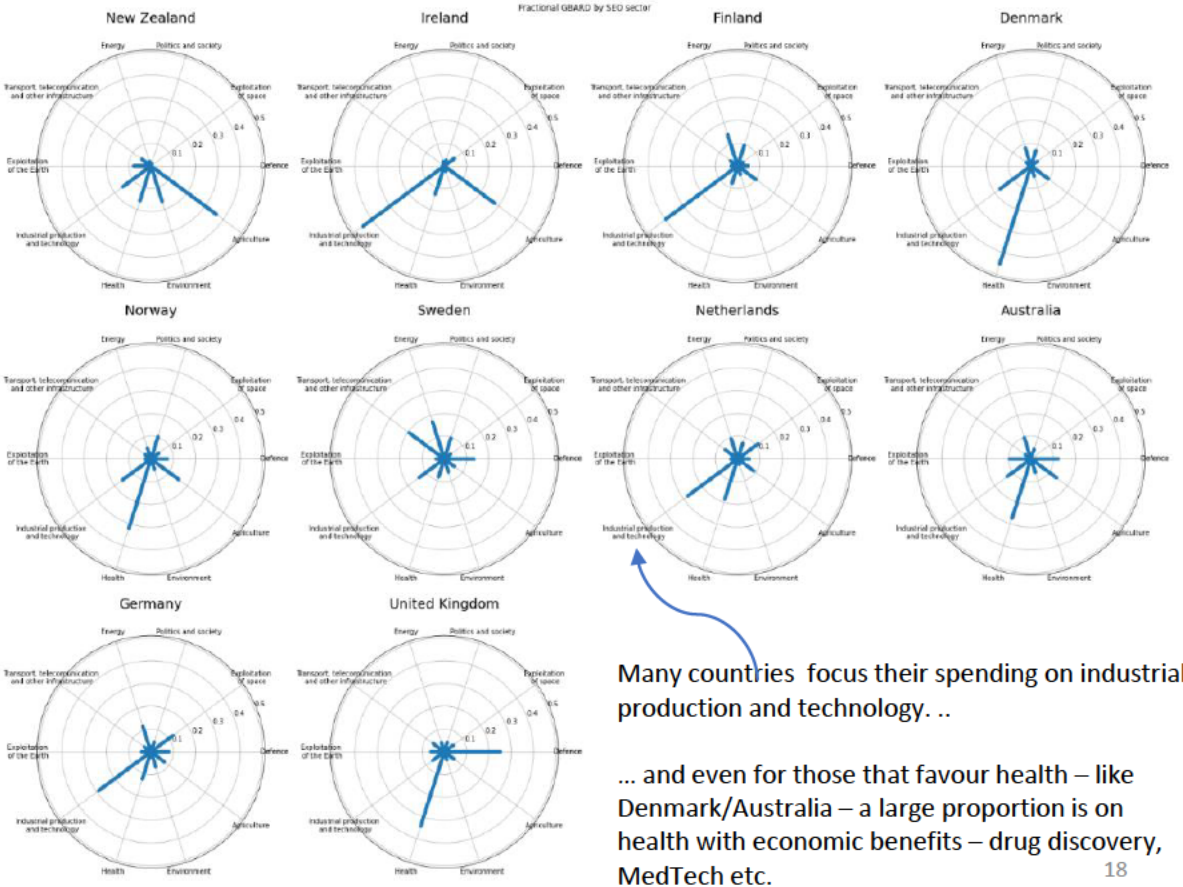
NZ's RSI sector is more focussed on existing industries

Our economic history has had a high focus on the environment & primary industries. This is reflected in how we invest, what sectors our institutional landscape directly supports, and the research outputs our RSI system delivers.



Fractional government budgeted appropriations on R&D by socio-economic objective 2012-2016 (OECD). Black lines represent New Zealand's proportion of expenditure; green shading shows the proportion of other countries which reach particular proportions of expenditure.

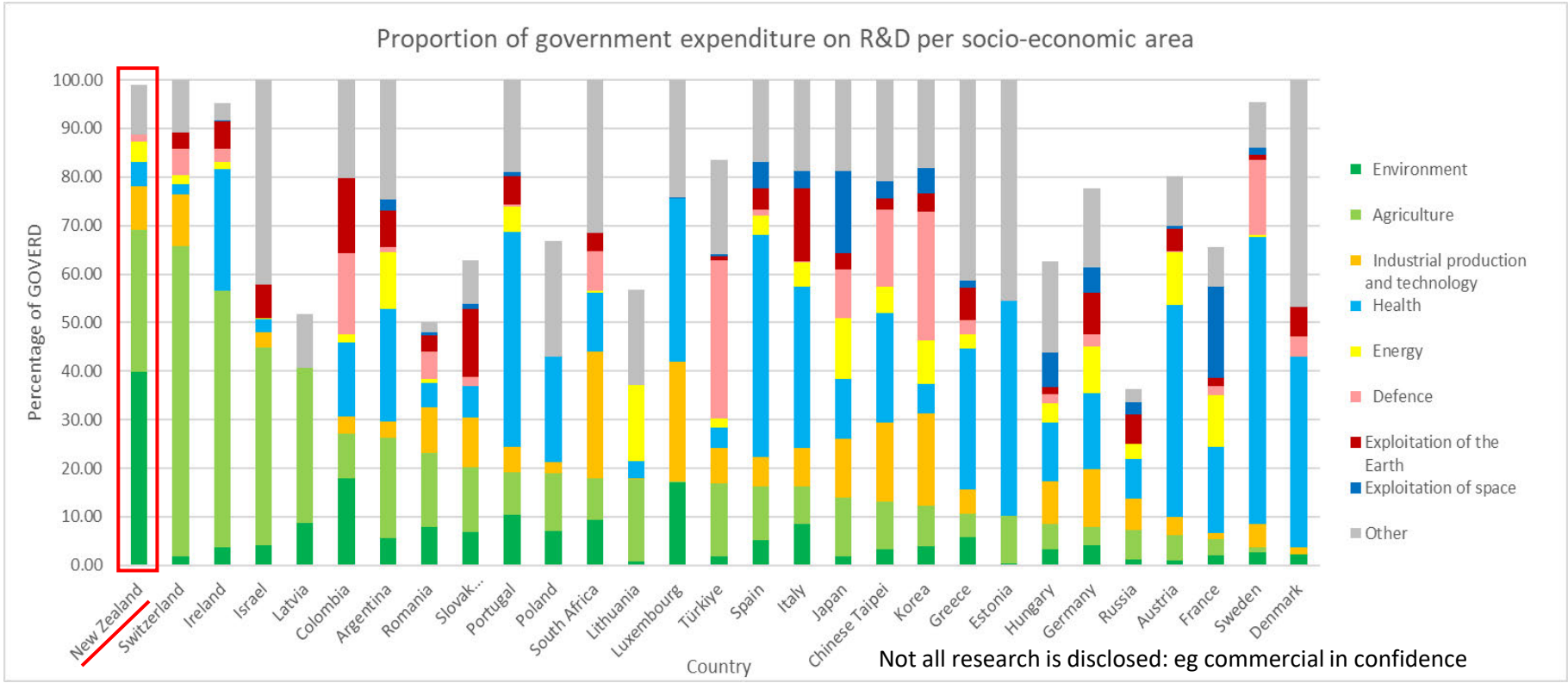
Some comparator countries



Many countries focus their spending on industrial production and technology. ..

... and even for those that favour health – like Denmark/Australia – a large proportion is on health with economic benefits – drug discovery, MedTech etc.

Environment and agriculture is 70% of NZ's PROs R&D



Not all research is disclosed: eg commercial in confidence

NB: while industrial production and technology dominates general government project allocation on R&D (GBARD), the activity undertaken by PROs is more focused on environment, health, energy, geological, defence

Source: OECD Main Science & technology indicators

4) Reflections from international case studies

Compared with New Zealand, other countries generally have PROs in key ‘public good’ areas plus an RTO. Different functions are housed in different types of organisations with different funding models, ownership structures and governance mechanisms.

5) Direction: Consolidation and Refocus

Reform of the CRIs is an opportunity to address institutional issues, and to consider NZ's future science needs

Differentiated institutions

Underpinning our current policy settings is the idea of institutional neutrality

- Government can purchase science and innovation from any provider in an undifferentiated way. This has some advantages but also many disadvantages.

Functional differentiation between organisations can provide greater transparency over level of subsidy provided and more effective incentives

- Differentiating more clearly between some functions e.g. Government service provision entities, and industry-facing co-funded entities, can provide greater transparency of resource allocations and clarity of mission, less opportunity for cross-subsidisation, and more effective incentives.
- Greater transparency of the different rates of subsidy provided to industry.

In NZ …

- Vertically integrated public research organisations that have similar operating models but with different sectoral focuses.
- Each institution carries out a similarly wide range of different functions (eg. public good research, science services, applied research, commercialisation activities, capability and human capital development etc.) focused around functional areas and purpose of the organisation.
- Differentiated funding mechanisms/purchase instruments (to an extent) for different functions but occur within the boundaries of one institution.

Internationally…

- It is much more common to house different functions in different types of organisations with different funding models, ownership structures and governance mechanisms.
- Intermediary and co-funded entities are more prominent/prolific in the institutional landscape
- Small Advanced Economies tend to lean on universities, particularly for public good research. They tend to use RTOs (VTT in Finland, ASTAR) for industry focussed research.
- Larger economies often have industry focussed RTOs, and a larger number of PROs

What this could this look like in NZ – the future state

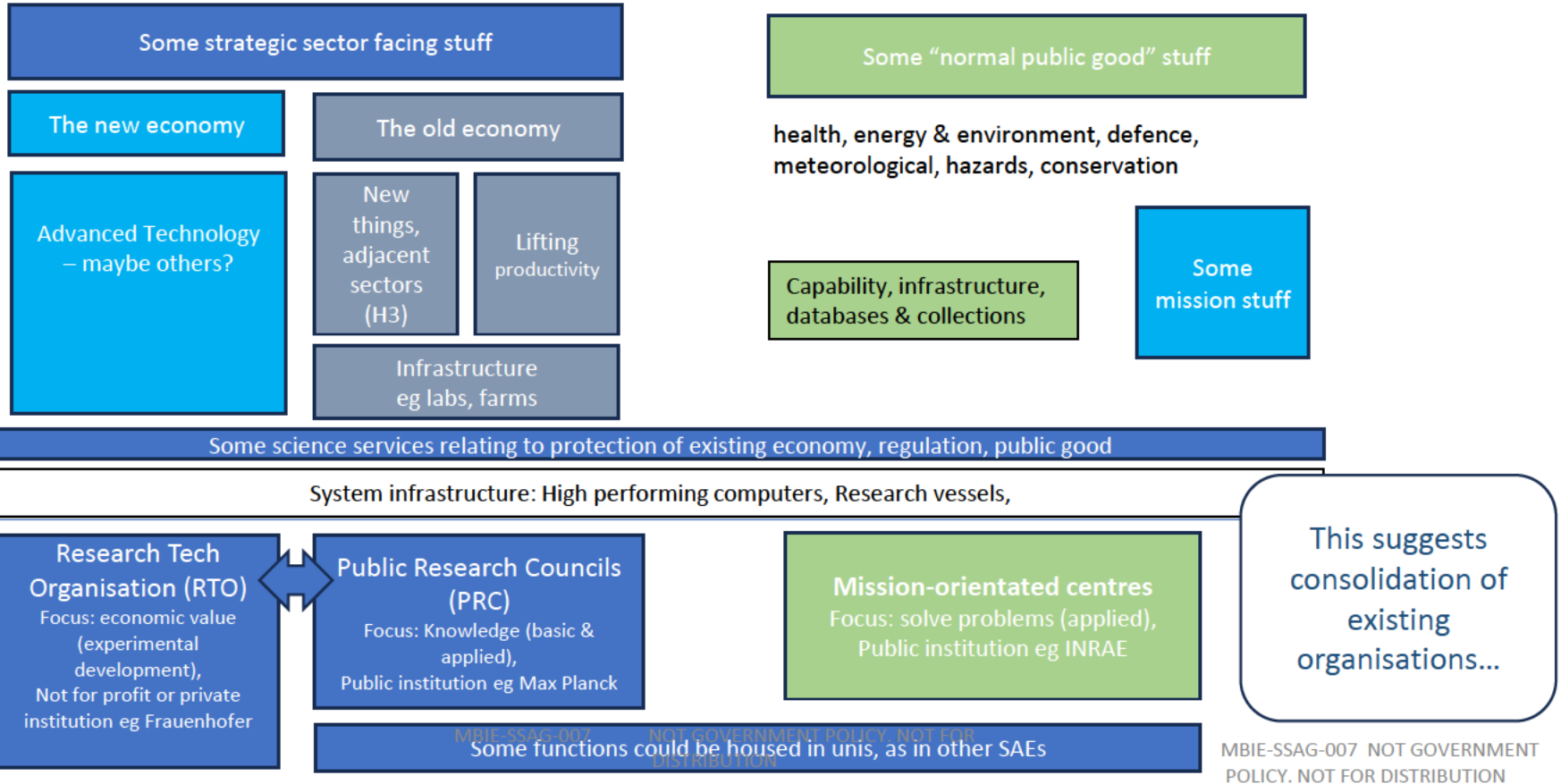
Different organisation types and funding models for:

- PROs that interface with industry, including knowledge and technology transfer organisations (we would expect co-funding for these industry facing institutions); and
- PROs that primarily deliver services for government (these will have a different funding regime to industry facing PROs).

These would need to be designed to enable greater transparency of investment and rates of subsidy for industry.

Rebalance, differentiate and simplify

Fewer organisations with clear focus, broadly differentiated by mission, outcomes, and clients



MBIE-SSAG-007 NOT GOVERNMENT POLICY. NOT FOR DISTRIBUTION

Why consolidate? Does consolidation meet framework conditions?

Solve as many issues (from the bottom up) and meet as many expectations (from the top down) as possible, subject to a 'reality' constraint.

Framework conditions	Yes/No	Pros	Cons
• **Financial resilience** sufficient funding and income to allow CRIs to meet agreed expectations, invest in facilities, and attract talent and partners, in the context of cuts to government funding	Yes. Middling. And some possible cons. Depends on option for commercial coordination. Dependent on SIT and govt funding	More commercial avenues, better targeted, single front door. Potential for shared premises. Maybe better prospects/access to external funds	Could result in prioritisation, sell off of assets/IP deemed not core – to fund other gaps.
• **Direction setting, policy coherence & clarity of purpose** agreed public good and commercialisation/impact expectations	Maybe. Coherence Depends on design – and on company structure, other levers.	Fewer institutions for Ministries to interact with. Maybe easier to understand	Could mean sectoral silos, or more line Ministries per CRI & more expectations, more confusion. Or deprioritised issues for some.
• **Scale and focus, leading to alignment and concentration** – CRIs have sufficient focus & flexibility to manage resources to deliver quality science for NZ.	Yes. This is the strongest argument for consolidation	Scale should enable the ability to attract top talent, prioritise & secure NB infrastructure. Concentration of resources more likely to result in	Focus likely to involve trade-offs, prioritisation, concentration - but the loss of some areas. More hierarchy? Harder for new innovative things?
• **Accountability and transparency** – CRIs and user agencies are able to manage the trade-offs and delivery within available funding; governance and funding decisions are made where they are most effective	Maybe. Depends on option/design/transition period.	Maybe easier to understand. Simplify.	Prioritisation, without other levers, may not meet Government expectations
• **Efficiency:** shared services (back office, governance costs etc) greater value for money, limit transaction costs	Maybe savings with a shared back office model	Some shared services and facilities, maybe less admin to researchers?	
• **Excellence, Impact & connectivity**	Maybe – pros and cons	Greater impact from bigger projects, greater concentration; single front door	Less widespread reach, fewer areas of research
• **Capability to meet expectations/science needs at functional level**	No, dependent on funding not organisational change		Lose some capabilities as a result of change and new organisational trade-offs

6) Options for Consolidation

Schematic, indicative options

SPECTRUM OF OPTIONS for institutional consolidation

Status quo, many PROs

Minor (as needed)

This is about merging only those that are in financial stress or with clear overlaps, with an organisation that can readily absorb them.

This is about as little disruption to the current system as possible.

An example might be:
- *Scion with Plant & Food (PFR)*
- *MetService with NIWA*

Outside of CRIs there may be a number of needed mergers
- *NeSI with REANNZ*

Or there may be parts of R&D or infrastructure that could be moved from one CRI to another – without a full merger.

Merge Similar

This is merging entire or near entire CRIs entities in clusters or groups to create scale, share resources, buildings and infrastructure.

There are several models possible in this scenario

One possible option:
- *Met Service/NIWA & GNS*
- *PFR & Scion*
- *AgResearch with Manaaki Whenua (MW)*
- *ESR on their own.*

Full Remix

*3 or 4 CRIs based on their science **outcomes**, or **clients**, splitting parts of each CRI. Starts from the ground up, full redesign of the system, few or no overlaps.*

For example – outcomes based:
- *Climate & Hazards (MetService, parts of NIWA, & GNS)*
- *Land & environment-based (parts of MW, AgR, Scion, PFR, Niwa)*
- *Food & Biological products (parts of PFR, Scion, ESR)*
- *Public health (ESR, other)*
- *Advanced Tech/manufacturing (parts of GNS, plus Callaghan, RDS – maybe Nesi/REANNZ)*

A client-based/demand-led design lens – might consider the degree of overlap of clients.

One Organisation

This option creates one large organisation to bind them all.

*Could be based on the CSIRO or A*STAR model, with an over- arching organisation bringing together a set of focussed capabilities.*

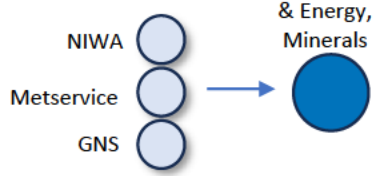
Shut down, sell off CRIs, fewer PROs

Merging similar could be the first step to a full remix, to deliver a more coherent system

Merge with Universities

Entire CRIs could be merged with Unis where there are synergies, such as PFR and Scion with Massey.
A full redesign could include moving parts of existing CRIs into universities…

Merging entire CRIs into clusters *Indicative only*



Climate, Hazards & Energy, Minerals

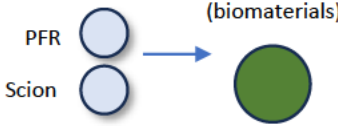
Description
- Geologically-based energy & minerals
- Nuclear science
- Resilience to natural hazards
- Geology and earth-systems
- Climate and the atmosphere,
- Aquatic resources
- Oceans
- Groundwater

Alignment (Ministries & Unis)
- MFE
- MBIE
- NEMA
- (MoT, DoC, others)
- VuW and UoO, ...

Ownership
- MBIE

Preferred Type
- "Public Good"
- Mission orientated Centre
- Crown Entity
- Not for profit

	Starting FTE (estimate)	Revenue ($ millions)
GNS	484	120
NIWA	704	187
Combined	1188	307



Food & Fibre (biomaterials)

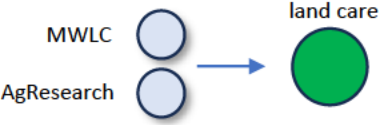
- Horticulture
- Arable sector
- Seafood
- Food and beverage Industries
- Forestry,
- Biomaterial sectors

- MPI
- (MFE)
- Massey (Food HQ), Lincoln, UoA (seafood), ...

- MPI

- Industry facing
- (either RTO and/or Public research centre)
- Crown company?

	Starting FTE (estimate)	Revenue ($ millions)
Scion	329	64.321
Plant & Food	926	185.944
Combined	1255	250.265



Environment, land care

- Pastoral
- Agri-food
- Agri-technology
- Terrestrial biodiversity
- Land use, including freshwater

- MPI
- MFE
- DoC
- Lincoln, Massey, Waikato, UoA, ...

- ? (MBIE)

- "Public Good"
- Mission orientated centre
- Crown Entity
- Not for Profit

	Starting FTE (estimate)	Revenue ($ millions)
Manaaki Whenua	372	115
AgResearch	666	178
Combined	1038	273

Health & Forensics

- Public health,
- Food safety
- Water safety
- Forensics
- Genomics

- Health
- Police
- UoO, UoA, ...

- ? (MBIE or Health)

- "Public Good"
- Mission orientated centre
- Crown Entity
- Not for Profit

	Starting FTE (estimate)	Revenue ($ millions)
ESR	562	123

Advanced Technology

- MBIE

- MBIE

- Industry facing
- RTO
- Crown Entity
- Not for Profit (for now!)

Uni alignment is suggestive only; noting universities each have a range of connections with CRI capabilities.

Full remix *Indicative only*

		Description	Alignment (Ministries and Unis)	Ownership	Preferred Type
NIWA Metservice GNS	Climate & Hazards	• Resilience to natural hazards • Geology and earth-systems • Climate and the atmosphere, • Oceans • Weather	• MFE • MBIE • NEMA • (MoT, DoC, others) • VuW, UoO, ...	• MBIE	• "Public Good" • Mission orientated Centre • Crown Entity • Not for profit
PFR Scion AgR NiWA	Food & Fibre (incl aquaculture)	• Horticulture • Arable sector • Agri-food • Seafood • Aquatic resources • Food and beverage industries • Biomaterial sectors	• MPI • Massey, Lincoln, UoO, uoA (seafood)	• MPI	• Industry facing • (either RTO and/or Public research centre) • Crown company?
MWLC AgR Scion GNS NiWA	Environment, land care, **water**	• Pastoral • Terrestrial biodiversity • Land use • Freshwater • Forestry • Groundwater	• MFE • DoC • MPI • Lincoln, Massey, UC, Waikato, ...	• ? (MBIE) • MFE?	• "Public Good" • Mission orientated centre • Crown Entity • Not for Profit
ESR	Health & Forensics	• Public health, • Food safety • Water safety • Forensics • Genomics	• Health • Police • UoA, UoO	• ? (MBIE or Health)	• "Public Good" • Mission orientated centre • Crown Entity • Not for Profit
Callaghan RDS GNS	Advanced Technology	• ... • Geologically-based energy & minerals • Nuclear science • Agri-technology	• MBIE	• MBIE	• Industry facing • RTO • Crown Entity • Not for Profit (for now!)

Uni alignment is suggestive only; noting universities each have a range of connections with CRIs.

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