I have participated in several of the Green Paper workshops and contributed to the Cawthron Institute submission in my role as senior aquaculture scientist and research strategy advisor. The submission below represents *my personal reflections and opinions* based on my marine and aquaculture research experience within the NZ RSI system over the last 20 years and within the private sector (pip-fruit and forestry industries) prior to that. During my 20 years at Cawthron, I have led or co-led a succession of MBIE programmes, transitioning from competitive funding through the IRO capability fund and now to SSIF platform funding. These programmes have enabled transformational change in NZ's aquaculture sector.

I am a strong believer in mission-led impact-focussed research, executed within a unique and diverse fit-for-purpose research ecosystem that values the contributions of western science, Mātauranga Māori, industry experience, stakeholder imperative, and hands-on pragmatism.

Key Recommendations

- If we are going to embrace Ti Titiriti partnership, then it needs to form the foundation of the system. It cannot be an add-on.
- Real-world national priorities (needs and opportunities) framed within western and Te Ao Māori values should inform the overall direction, capability, and system infrastructure needs. These priorities should be set by the relevant stakeholders, communities of interest, representatives and not by researchers alone.
- A mechanism similar to SSIF could provide a means to operationalise priorities but needs more incentivisation for cross-institute collaboration and formalised, transparent processes for platform creation and retirement. We need to retain a balance of competitive funding especially for the impact areas and types where it is most appropriate.
- Messaging, process, and culture around 'science excellence' (vs knowledge generation and application or impact generation) needs to be carefully considered. The current system culture is driving behaviour that maximises science excellence but doesn't necessarily achieve optimal outcomes for NZ.
- Institutional culture and purpose are key drivers for collaboration success.
- Workforce diversity should include greater focus on non-academic experience. We need more applied innovators within the research sector just as we need more excellent scientists within the broader innovation space.

Te Tiriti

We should advance from our present 'waka ama' model where VM is an add-on or sits *within* the 'main' RSI system, to a more symmetrical 'waka hourua' configuration where Te Tiriti partnership forms the *fundamental structure* of the system. This transdisciplinary structure should pervade the system:

- from the **dual values sets** (western and Te Ao Māori) that should frame and inform the national priorities;
- to the **definition of impact areas** (e.g. the dual concepts of environment *and* Te Taiao rather than simply Te Taiao considered as the Te Reo translation of 'environment');
- the **balance and relationships among impact areas**, visualised within a four pou, whare tapa whā, or similar visual representation (e.g. balancing economic growth with environmental impact);
- and the **elevation of Mātauranga Māori** to sit alongside western science as dual knowledge systems.

The western concept of industry peak bodies or a hierarchical 'single point of contact' does not align well with whānau/hapū/iwi multi-level representation. We need to find more effective ways to collectively represent Māori within the RSI system. Regional research hubs may provide part of a solution for the 'gathering of voices' that is needed for national-scale priority setting.

Priorities

My vision is for a future RSI system that clearly and transparently identifies long-term national priorities and aspirations but also provides space for new ideas. Some priorities will be no-brainers (e.g. we need to protect ourselves from risks such as future pandemics, natural disasters, biosecurity incursion). Others can be informed by the many sector strategies, road maps etc that have been developed by government, industry, NGOs etc. We should of course focus on areas where NZ-unique research, approaches, or application are appropriate or needed.

Impact type could be one dimension or portfolio-set to consider for setting priorities. Our current 'transform' vs 'add value and protect' could be extended to a spectrum:

- Restore & Rejuvenate: Where the value of something we have lost is clear and tangible, we know there is a high likelihood we can undo the damage or loss. Environmental degradation or social inequity would fit within this impact type. Specific priorities may be quite clear at this end of the spectrum.
- Protect: Where we know the current value of something we want to protect, and there is risk of losing that value. Biosecurity management is an example, where we are protecting our environment or primary sector against incursion risk. Again priorities may be quite clear but there is uncertainty around the level of risk and the need to acknowledge risks we aren't currently aware of yet. Therefore some flexibility is important.
- Add-value: Where we can make an existing industry, community, situation better than it is currently. The potential gain is less clearly defined than the previous impact types, and similarly the likelihood of delivering impact. Therefore there is greater risk and scope for trialling multiple ideas and approaches. Broad priorities may apply here such as 'grow the primary sector'. Competitive funding based on researcher or end-user inspired ideas may account for a greater share of this impact type.
- Transform: Where we can create something entirely new (e.g. a NZ space industry), it's hard to predict the potential gain and there are significant technical and delivery risks. A single broad priority could possibly cover this high-risk high-gain impact type.

These impact types could provide the first cut of how we allocate resources (i.e. prioritize) to the areas we consider of national significance. Are there areas where we need to fix previous damage, protect what we risk losing etc *prior* to aspiring for growth and opportunity?

Impact area (e.g. economy, environment, health, society etc) could be a second portfolio cut or dimension, framed within a whare tapa whā or four pou model to acknowledge interdependence among impact areas and the need for balance and equity.

The impact types could build the individual tapa or pou. Restore & Rejuvenate could be considered the foundation or base, while transform would sit at the top *building on the layers below*. So for instance there may be more work to do at the restore & rejuvenate level for environmental priorities while economic priorities could focus on protect, add-value, and transform. See cartoon example below.

Tip of the pou: opportunity, visionary, uncertain outcomes, flexible/competitive funding, researcher/idea/vision driven

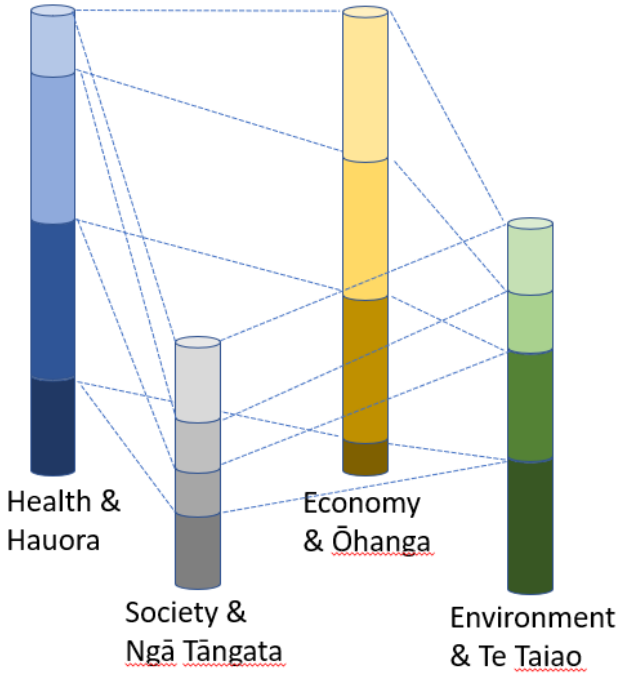
Create & Transform (vision)

Grow & Improve (opportunity)

Protect (risk)

Rejuvenate & Restore (need)

Base of the pou: need, urgency, certainty of outcomes, funding security, policy/strategy driven



Priorities should be impact-focussed and articulated/curated by the entities, communities, sectors, representatives, and stakeholders they benefit. Noting that not all of these groups have a strong voice within the current system. I don't believe researchers should set the high-level priorities but should inform them (e.g. what is achievable through research and innovation) and how they are best approached and operationalised. Priorities will likely span horizons and need to provide some stability while also responding to change and immediate crises. 'Maintain a flexible, diverse, high-performing, and well-resourced research ecosystem that is equipped to address NZ's current and future needs and opportunities' could be an overarching priority that resources (some) base capability and infrastructure. Similarly 'stimulate the generation of new ideas and innovative impacts' could be an overarching priority that resources competitive funding opportunities.

The shellfish breeding and hatchery research I helped lead was part of a long-term researcher-initiated mission to enable these technologies for the NZ industry, spanning multiple MBIE, SIL, TBG, PGF, and industry direct-funded initiatives. There is currently a (perceived) need for research to 'fit' within a 5 year (or less) contract horizon rather than aspire to longer time horizons and greater magnitude of impact. We need mechanisms that don't create (perceived) barriers to long-term thinking in our research community - 'good things take time'.

One of the perverse outcomes of the current Endeavour approach (i.e. science excellence assessment and cull followed by impact assessment) is the frequent perception that the process is *all about science excellence* (because that is the *first* assessment hurdle). Even the proposal format now places science excellence before impact which encourages proposal writers to think about science *first* rather than the need or opportunity they are addressing. This culture leads to proposals seeking to maximise their science excellence by packing in the latest technologies and approaches, even when these are not necessarily cost-effective or provide an optimal path to greatest impact. It

also means researchers shy away from topics where significant impact could be generated through applied research because they are concerned the science 'will not be excellent enough'.

We need national priorities, process, and culture that will inspire and motivate researchers to *generate impacts that deliver the greatest benefit*.

Funding

Where our (Cawthron) organisation has been able to transition to SSIF funding, this has provided increased confidence to invest in capability and infrastructure development (compared to e.g. Endeavour). We have effectively leveraged competitive funding (e.g. Endeavour) to initiate new research and see value in a formal and transparent mechanism to transition from competitive to more stable funding (e.g. under the SSIF model) where nationally significant capability has been established and there is an opportunity for it to create significant long-term impact in areas aligning with national priorities. The current nomination or identification of SSIF 'priorities' appears ad-hoc and non-transparent.

A system and processes that enabled transition (in either direction) along a spectrum from stable to competitive funding would provide researchers and their institutions with greater confidence to invest and embark and on long-term research extending along the implementation pathway and increasing the likelihood of impact being achieved.

Institutions and Infrastructure

I tend to view Cawthron as an evolving capability hub that seeks to maximise the benefit it can deliver in areas broadly aligned with its capability. While our capability-mix and impact areas have changed over time, the constant has been the concept of an independent regional hub focussed on delivering benefit for the region and the nation. Note this approach places no hard limits on our potential impact areas. Our stakeholder partnerships strongly inform our impact areas and priorities.

I would consider a model that *focuses institutions around capability* and *stakeholder groupings or communities of interest,* while *focussing system priorities* (not the institutions) *around impact areas*; more like a matrix model. SSIF is a good move in the direction of focussing institutions toward system priorities but needs more incentivisation toward leveraging complementary capability *across* institutions (i.e. collaboration). Capability should include workforce and (associated) infrastructure. The national priorities should primarily inform what capability is needed now and in the foreseeable future. Of course these needs are likely to change over time and require the creation of new capability (hubs) and reconfiguration or repurposing of legacy capability.

Our collaborations with CRIs have worked best where our organisational impact areas are non-overlapping (i.e. non-competitive) but we leverage each-other's complementary capability sets. The key point with collaboration is that it needs to be mutually beneficial and 'easy' from a relationship perspective. For instance universities tend to be good collaboration partners as they are often looking for a connection to stakeholders (and therefore implementation pathway and impact) that we can provide. Collaborations do not work well where one partner wants too much or is simply hard to get on with. My experience is that organisational culture is one of the best predictors of whether a collaboration will be mutually beneficial.

Some level of funding stability is crucial for institutions to invest in their workforce and infrastructure.

Workforce

After graduating in 1987, I worked in the private sector for 13 years before attempting to re-enter the RSI system as a researcher in 2000. I was attracted to the Cawthron Institute's pragmatic impact-focussed approach. Without a PhD and relying on my diverse experience outside of the research system, I badgered for over a year before securing a scientist role. I doubt this strategy would work today, partly given the increased emphasis on science excellence which trickles down to organisational recruitment policy. My experience in the practical application of research solutions to real-world problems was probably more of a factor in my hiring than my academic experience.

I am often asked by international shellfish researchers how we were able to successfully implement our shellfish industry breeding programmes where many other countries have found this challenging or impossible. Having researchers with experience in multiple (e.g. industry and research) environments is one enabler for the success of our research and the outcomes that have followed.

Another enabler is that *we see our industry partners as a critical component of the research ecosystem*, as well as *considering ourselves part of the industry value chain*. This not only increases the impact-focus of our research but creates a strong implementation partnership. Our industry stakeholders often apologise for not being 'real scientists' even though they are the experts at application, scaling and putting theory into practice. They add value to fundamental research by providing context and identifying/addressing implementation bottlenecks as research progresses. They should feel part of the RSI system just as we should feel part of their industry.

We should incentivise collaboration beyond simply researcher-to-researcher collaboration to enrich our research ecosystems. We should nurture increased diversity of experience (i.e. not purely academic) within our workforce to maintain the unique pragmatism and fit-for-purpose of Aotearoa New Zealand's RSI system.

The views expressed in this Te Ara Paerangi submission are my own and do not necessarily represent those of my employer, the Cawthron Institute.

Nick King

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