

16 May 2024

SUBMISSION: SCIENCE SYSTEM ADVISORY GROUP

Key points

- The National Energy Research Institute (NERI)¹ considers the public investment in Science, Innovation and Technology (SI&T) needs to be better aligned with the needs of research-intensive Sectors in New Zealand.
- We consider that current practices for much of NZ's current longer-term SI&T investments are weak, operate at too high a level, with limited formal input from the relevant Sectors.
- We propose two main changes to address this:
 - The mandating of "Sector SI&T Roadmaps" to identify the research-intensive Sectors' public SI&T investment needs, and to align these with national priorities.
 - Establishing a statutory agency to identify the research-intensive Sectors, develop SI&T Roadmaps with them, and make investments within Government-approved settings based on these.
- A similar approach with suitable adjustment be used to manage public investment in Technology/Capability Platforms.
- Some adjustment to SI&T providers' responsibilities, coverage and operations will be required to ensure the multi/transdisciplinary needs of Sectors/Platforms are met, while the benefits of agglomeration to building capability in the relevant disciplines are achieved.
- Greater emphasis be placed on innovation at the industry/Sector level rather than the current focus on start-ups based on particular innovations.

Context for this submission

NERI is relatively unique in the New Zealand science system being focused on a particular sector of the economy (Energy), with membership drawn from the main research providers (Universities and CRIs), and Energy related business organisations (including high energy use sectors like transport and tourism).

Our effort in recent years has been on improving medium-term research investments in the Energy Sector by promoting more systematic priority setting, resource allocation, and accountability. This as an area requiring significant improvement, and not just in Energy.

To that end we have produced two Energy Sector research Roadmaps in conjunction with our membership and Government agencies². We also comment on Government papers and

¹ The National Energy Research Institute (NERI) is a NZ Charitable Trust. Its primary purpose is to enhance NZ's sustainability and to benefit the NZ community by stimulating, promoting, co-ordinating and supporting high-quality energy research and education within NZ. Its research members are GNS Science, Scion, University of Canterbury, and University of Otago, and its industry association members are the Bioenergy Association of NZ, BusinessNZ Energy Council, the Carbon and Energy Professionals New Zealand, Energy Resources Aotearoa, Gas NZ, the New Zealand Geothermal Association, the New Zealand Wind Energy Association, la Ara Aotearoa Transporting New Zealand, and Tourism Industry Aotearoa.

² The Roadmaps were primarily sector funded.

initiatives on energy and research-related policy matters³. In particular our submission on the Green Paper process⁴ provides further context for this submission.

Our Energy Roadmaps focus on identifying the main, uniquely NZ, research questions. Our first Roadmap focused on achieving NZ's broad goals for the energy sector (affordable, sustainable, reliable energy)⁵, and our second narrowed in on NZ energy sector's GHGs⁶.

Our objective has been to provide an Energy Sector-developed, top-down framework for investment in medium-term RS&T. This is at a level of detail below the current NZ science sector investment signals⁷, but still sufficiently broad to allow suitable input into programme development and investments from specific researchers and users.

The Roadmaps provide the rationale for the outcomes, their context, and criteria to help inform and evaluate any investments in addressing them.

Comment

Formal mechanisms to align public investment in SI&T and the various needs and goals of NZ's research-intensive Sectors is a basic requirement for an effective national SI&T System. We consider that these processes are weak and operate at too high a level for most of NZ's current longer-term SI&T investments. Addressing this should be a key outcome from the SSAG's and the University Advisory Group's work.

Among other things the ownership of these investments by the target Sectors needs to be increased. Our view is that Sector SI&T Roadmaps offer the basis for achieving this alignment, and in this way the SI&T System and the public's investment in it could be making a much better contribution to meeting national needs.

We would note the important distinction between Sector and Technology Roadmaps. The latter are regularly used by the SI&T sector to inform technology developments, while the former are focused on a Sector's development needs. Roadmaps for technology and SI&T capability development may follow the former, but in that context.

There are areas where the opportunity for NZ lies in a local globally novel technology/capability platform⁸. Our comments still apply, but modified to the extent that the "Sector" will at least initially be defined by those in NZ with the world class technology/capability.

In what follows we offer thoughts from our experience on how such as system might operate. The main focus is on dealing with **Question set 1 - the SI&T system** and **Question set 4 – Contestable Research** and makes a brief comment on **Question set 5 – Government Research Needs**. We then make comments on the implications for **Question sets 2 & 3**.

The SI&T system doesn't exist in isolation

A key observation is the SI&T Sector doesn't exist in isolation.

In virtually all cases the publicly funded SI&T Sector relies upon other Sectors to help align its functions/priorities/goals, work programmes, performance etc. This is perhaps obvious, but it needs reiterating because if lost sight of there is a risk the SI&T Sector becomes self-serving, particularly if, as here, it is being reviewed in its own right⁹.

³ www.neri.org.nz/submissions-and-papers-by-neri

⁴ <https://www.neri.org.nz/resource/Files/Submissions/Submission%20on%20Green%20Paper.pdf>

⁵ *NZ's Energy Research Strategy (2017)* www.neri.org.nz/strategy

⁶ *From Fossil Fuels to Local Renewables (2023)* www.neri.org.nz/GHGs

⁷ E.g. *Endeavour Fund Investment Plan 2022-24 (2021)* MBIE

⁸ In Energy inductive power transfer and high temperature superconductors would be a couple of examples. There is a need for investigator-led contestable seed funding to ensure a healthy pipeline of these platforms, coupled with follow on growth funding.

⁹ The linking of the SSAG and the UAG should ensure the interface with the Tertiary Sector is addressed.

In this regard the SI&T Sector has significant relationships with the wider public sector; the various NZ research-intensive Sectors; individual organisations within those Sectors; international governments, agencies, researchers etc.

Medium-term but adaptive¹⁰ alignment processes are needed on these interfaces that facilitate critical information flows across them. Sector SI&T Roadmaps fit this need well.

In particular, good mechanisms for delegation and accountability are needed within the SI&T system so decisions get made by those with the best available information.¹¹ This requires alignment between the levels in the SI&T Sector. For example, SI&T investment decisions at the national level need good information on other competing public sector priorities; the various Sectors' SI&T priorities; the existing investments and their performance, etc. Comprehensive Sector SI&T Roadmapping should provide this information.

Government will no doubt hold to itself decisions about the risk profile it will take in its SI&T investment portfolio (e.g. purposeful/investigator-led; developmental/research-based; time horizon). Further it will want to make decisions about which Sectors to invest in (at least in aggregate) and its priorities within those¹².

Beyond that the responsibility for developing more detailed Sector plans and priorities within the Government's investment parameters must formally involve the Sectors. The lack of this kind of close integration at the Sector level is a major weakness in the existing system. Sector Roadmaps provide the means to integrate the longer-term plans of government, the research-intensive Sectors (or technology/capability platforms if appropriate), and relevant providers.

Finally, there are arguments for these processes and their administration having some statutory independence from the government of the day to allow it to still influence priorities and medium-term investments while respecting the need for stability in those investments.

The above approach has implications for issues raised in **Question set 4**. It will be easier to achieve if the public investment in SI&T is bought together into a fund administered by an independent statutory agency responsible for:

- identifying SI&T intensive Sectors/Platforms;
- developing SI&T Roadmaps, along the lines discussed above, with the Sectors/Platforms;
- developing multi-year investment programmes based on those, and when approved,
- procuring the relevant investments to give effect to the programmes.

The Government may hold back some classes of investment for administration elsewhere within the SI&T Sector (e.g. Marsden). Decisions about the use of contestable investments versus delegated bulk allocations would be determined on the basis of the programmes.

Having these processes systematically in place across the Government's SI&T investment portfolio should not only just make for better investment decisions aligned with national needs, but also provide Government with better information from the Sector to improve accountability.

We would note that this approach is suggestive of departmental R&D needs being funded out of their Votes in competition with their other priorities, rather than being covered by the main Science Vote (**Question set 5**). Similarly, the purchase of research services by the private/voluntary sectors will be matters for them (with or without any Government assistance). However, with Sectors having more formal input into plans and investments, willingness to co-invest and co-fund should hopefully increase.

¹⁰ E.g. support derisking and options analysis.

¹¹ We would note that SSAG's primary role is not to determine the detailed content of the priorities, but to ensure the necessary institutions and systems are in place to establish and maintain them.

¹² In some ways this will be analogous to the National Science Challenge process although more systematic in its coverage.

Matching SI&T capability and Sector needs

SI&T benefits by sharing common specialist infrastructure and relationships, and science in particular, benefits from critical mass and peer engagement, e.g. CoREs are in part specifically designed to achieve this.

On the other hand, the issues faced by research intensive Sectors are multidisciplinary, if not transdisciplinary. These Sectors seek critical mass and world class capability, but in their areas of need and sources of competitive advantage¹³. As often as not this involves innovation throughout their value chains. Strong local value chains encourage stickiness in NZ for the companies in them, helping to build scale in research intensive NZ industry¹⁴.

An important role for the SI&T Sector is to ensure its capability is available and organised to meet NZ's needs (for both public and private SI&T investments). This function needs to be more explicitly and systematically addressed and responsibility assigned to agencies closely associated with the investment activities¹⁵. Again, aspects may be delegated agencies with strengths in particular disciplines.

Remaining Questions sets 2 & 3

Based on the above we would briefly answer these Question sets as follows:

Question set 2 – Public Research Organisations.

Our comments primarily address the processes used to set priorities etc for the SI&T Sector in a comprehensive way. This issue of alignment is already partially recognised in the current system, and no doubt sits behind the design of the various funding mechanisms and SI&T organisations e.g. NSCs, university-led research centres, independent research organisations including research associations, but has not been adopted as a systematic response.

CRIs with their alignment with productive sectors/natural resources are natural candidates to undertake aspects of these processes, and some already do. Their weakness is their incomplete coverage of NZ's research-intensive Sectors¹⁶. Obvious gaps are the Welfare, Health, Communications/Digital/AI, Energy, Construction/Infrastructure, Engineering and Manufacturing, and Transport sectors¹⁷.

So, a starting point to getting better alignment would therefore be to identify NZ's key research-intensive Sectors/Platforms and who should have particular responsibility for them.

Question set 2 also raises whether “Advanced Technology” should be a specific focus for a government applied research organisation. This issue should be addressed in conjunction with reviewing the gaps in the CRI coverage.

Question set 3 – The Innovation System

Our main comment is the need to put more emphasis on innovation at the industry/value chain level as opposed to the current focus predominantly being on developing IP/innovations and creating businesses to carry them forward. Transferring technologies into existing businesses is much less risky and more likely to be sticky in NZ than using start-ups.

¹³ These comments apply particularly to investments for economic outcomes but can also be applied to other Sectors with appropriate adjustment.

¹⁴ The need for scale and stickiness are often cited as problems within our innovation system. Despite this, outside the primary industries, individual organisations tend to be the predominant focus for current SI&T economic investment, not industries/value chains.

¹⁵ This is simply the classic matrix organisation, but between organisations.

¹⁶ More formal links with university-led research centres could facilitate this.

¹⁷ Two new CRIs could cover these areas, or if CRIs are consolidated appropriate divisions could be created within it.