New Zealand Association of Scientists

Submission to the Crown Research Institute Taskforce

Summary

The New Zealand Association of Scientists is pleased that a review of Crown-owned Research Institutes (CRIs) is being undertaken but has strong reservations about its scope and time frame.

The scope of the review is far too narrow. The issues that afflict CRIs cannot be addressed simply by starting with the questions posed in the letter from the Chair of the CRI Taskforce. A comprehensive review of the way the whole science system is operating and the assumptions that underpin it, is required before particular CRI issues are addressed. In particular a robust analysis is needed of what the science endeavour is, what is required of it, and hence what its institutional needs are. We recommend that such a review be carried out before any attempts are made to reform CRIs. Otherwise there is a risk of superficial patch-up solutions that do not address the underlying problems and that simply create new malaises in the science system.

Even in its current form, the time frame for the review, and for commentaries on it, is grossly inadequate. We believe that there should be proper analysis of the ways in which CRIs operate and of the constraints they are working under before any changes are made and have indicated areas for analysis in our responses to questions below. We are deeply concerned that the Taskforce appears to be poised to make recommendations without allowing any time for this analytical work.

In the event that the Government's timetable requires prompt action in preparation for the 2010 budget, we urge that any changes made this year do not close off possibilities for more substantive analysis and improvements to the science system in 2010.

Specific points related to the questions in the letter from the Chair of the Taskforce follow.

1. Purposes of CRIs

We recommend that the CRI Taskforce reviews 'the CRI model' as a whole to determine where it is working and where it is failing before it makes recommendations on the roles of individual CRIs, on the need for new directional statements or on reconfiguring CRIs.

2. Governance and accountability

We believe that perceived difficulties with the accountability of CRIs and with the effectiveness of CRI boards arise largely because of poor policies and settings for the science system as a whole. We therefore recommend that the CRI Taskforce analyses the effectiveness of governance and accountability arrangements across the whole of the system before it attempts to focus on new arrangements or new review structures for CRIs.

3. Performance measures

Financial viability is required of all types of organisations and financial performance measures (and not any single measure as suggested) and will always be required for CRIs. The critical issue is that CRIs are operating under a commercial model that does not fit with their purpose – working for the benefit of New Zealand. We think that the CRI Taskforce should focus its attention on finding a more appropriate financial model (or models) for CRIs. CRIs should then be expected to develop and maintain analyses of performance based on the sector outcomes that have been made possible through the networks of knowledge and technology they have produced over decades.

4. Funding

We recommend that the CRI Taskforce should first address a set of questions: What are 'capabilities' and what is 'short-term dynamism'? What sort of capabilities are of concern in the science system and in relation to CRIs? Who is maintaining or blocking the development of these capabilities? What makes development of long-term capabilities of all types insufficiently dynamic at present? What does proper dynamism (or stability) look like? Appropriate methods for funding 'capability' and 'dynamism' cannot be determined without this analysis.

5. Alignment

We recommend that the CRI Taskforce looks at the evidence for the belief that CRIs are poor at collaboration and don't have adequate international linkages. If any or all their interactions are sub-standard, the question then becomes – to what degree is this the natural outcome of the commercial settings under which the CRIs operate? We anticipate that the Taskforce will find that CRIs are behaving rationally under the settings they are currently given. If the Taskforce is unhappy with this, we recommend that it addresses ways to alter settings to make it easier for CRIs to work with others rather than simply loading on new expectations, constraints and directives.

Background

The New Zealand Association of Scientists

The New Zealand Association of Scientists is an independent organisation that has existed for over 60 years, and acts as a champion for science and scientists in New Zealand. Its membership includes physical, natural, mathematical and social scientists, and it welcomes anyone with interests in science policy, science education or the social impacts of science and technology.

The Association publishes the *New Zealand Science Review* to provide a forum for all who are interested in the discussion of science policy, the impact of science and technology on society and the environment, science education, science planning and issues over the freedom of information. The Association organises annual awards for excellence in science and science communication, and runs occasional conferences on current issues where science and society intersect.

Surveys of scientists

Recently, the New Zealand Association of Scientists (Inc) (NZAS) was the principal sponsor of a Survey of Scientists, undertaken in 2008 by independent analyst Professor Emeritus Jack Sommer (University of North Carolina at Charlotte, USA). The survey was third in a series which profiles the workforce, the concerns of scientists, their values relating to science and society, and their opinions on the performance of the RS&T system. The survey results include factual information as well as opinion. The results of the Survey will be published in the first issue of *NZ Science Review* in 2010. A pre-publication copy will be made available to the CRI Taskforce on request.

Although there are several positive aspects to the survey results, the overall impression is of a professional science workforce increasingly disillusioned with management of the RS&T system across all institutions. Disillusionment was evident in the first NZAS Survey of Scientists in 1994 (Sissons *et al*. 1995) and this sentiment was reinforced in a subsequent survey (Sommer & Sommer 1997). Several pre-publication results from the 2008 Survey that contrast CRIs with university researchers are highlighted here:

1. CRI scientists are generally younger than their university counterparts. The proportion of staff under 35 years is four times more numerous in the CRIs than in the universities and the over 55 year old age group in CRIs are two thirds the size of this group in universities. This difference is intriguing and deserves closer inspection.
2. Scientists are very concerned about "interruptions to research funding" and "bureaucratic accountability", among other issues, and this concern has intensified between 1996 and 2008. Interruptions to funding is particularly acute among agricultural and soil, physical and biological scientists. CRI scientists (49%) were twice as likely to cite interruptions as university scientists (24%) in 2008 and this concern has gone up since 1996 (24% and 18%, respectively). 38% of University scientists reported spending more than 30% of their work time with compliance and were less burdened than CRI scientists (46%).
3. Scientists in general have sceptical attitudes towards the Government's role in setting science agendas. There is a large gap between CRI and university scientists in their negative opinion of Governments' setting research agendas: in 2008 68.5% of university scientists disagree "that Government's should set the broad research agenda" whereas among CRI scientists, only 37.3% disagree indicating a greater acceptance of the Government's role. This level of disagreement in both institutions has increased since 1996.
4. Only 41.2% of scientists would recommend research as a career to New Zealand youth. CRI scientists are the more negative with only 26% agreeing with the statement "The way things are going with scientific and engineering careers in New Zealand today, I would recommend such careers to New Zealand youth." University scientists are most positive with 44% feeling they could recommend science as a career.
5. 73% of CRI scientists agreed with the statement "I have access to equipment and other scientific supplies sufficient to do my research" compared with 66% of university researchers who agreed.
6. In 1996, 70.7% of scientists in CRIs agreed with the statement "I am able freely to submit my research results for publication", but by 2008, agreement had dropped precipitously to 28%, albeit with the added phrase "without prior approval from my employer". In contrast, scientists in universities continued to agree strongly with the statement (by 92-93%).
7. Only 13.6% of New Zealand scientists thought that Government science strategy development was open and inclusive of a large segment of New Zealand scientists, with little difference between CRI and university scientists.
8. Only 8.6% of scientists thought that the management systems in New Zealand were appropriate for the effective advancement of science. CRI scientists were more negative than university scientists.
9. 26.3% of New Zealand scientists thought that science in New Zealand is headed in the right direction with CRI scientists being less agreeable (23.2%) than university scientists (30.9%).

The structure of this submission

The findings outlined above illustrate the discontent that pervades the operational ('lab-bench') end of New Zealand's science system. The persistence of this discontent over many years is symptomatic of fundamental flaws in the way in which the science system has been set up and is being run.

We see little evidence that these flaws are being addressed through the CRI Taskforce or through the proposed restructur-

ing of Vote RS&T. In both cases, policy makers appear to be attempting to 'fine-tune' the existing system without willingness to address the real problems that are crippling it.

Our responses to the questions posed in the letter from the CRI Taskforce have been structured with this in mind. In the sections that follow, we highlight larger issues that need to be addressed rather than attempting to provide specific answers. We have taken this approach because we are convinced that it is pointless to jump to solutions without proper analysis of the wider issues.

The submission concludes with a section that indicates starting points for making changes that would genuinely improve the effectiveness of the science system. This discussion throws light on the poverty of current thinking and on the consequential inability of policy makers to make effective changes in the science system. We recommend that the Taskforce specifically takes into account modern concepts of research leadership and public sector management.

The purposes of CRIs

Do we need to clarify the purpose of individual CRIs, and if so, how can this be best done? How would this contribute to better performance?

Roles of CRIs

Before the Taskforce jumps to questions about the purposes of individual CRIs, we think it should consider larger issues. The following points deserve attention:

- The purpose of CRIs and their roles are defined in s5 of the Crown Research Institutes Act 1992
- CRI roles have been analysed in numerous government documents over the past 17 years
- Shareholding ministers approve statements of corporate intent for individual CRIs each year
- Despite all this attention, the roles of CRIs are still thought to be unclear and there is widespread dissatisfaction with the way they are operating.

This suggests that 'the CRI model', mentioned in the terms of reference for the Taskforce is fundamentally flawed.

As we understand it, the key elements of the CRI model are:

- Best results from public research will come when scientists work for companies called CRIs rather than the public-research organisations used in other countries. This structure provides them with the right incentives – winning funds through aggressive competition and a focus on the bottom line – rather than the wrong incentives – aspiring to do quality research that will benefit New Zealand over the short, medium and long term.
- CRIs cannot be trusted to work in the national interest in the way ministries and other Crown agencies do. CRIs must be constrained from pursuing their own self interests through purchase-provider splits. Purchase agents such as FRST don't suffer from self interest.
- FRST is best placed to work with end users, including government, and to decide what research New Zealand needs. CRIs and CRI scientists do not need to be centrally involved. They simply provide research services. Their expertise is not needed to aid policy development.
- Although science is inherently competitive at the level of individuals and teams, competition for public funding needs to be built in at an organisational level so that CRIs are focussed on outcomes and stagnation does not set in.
- FRST is best placed to determine what the national outcomes should be and to identify where and when stagnation is occurring.
- Although R&D groups in private-sector firms and public research organisations elsewhere are not expected to be profit centres, CRIs are expected to operate this way. They have to make surpluses so that shareholding Ministers can determine if their funds might not be better pulled out of CRIs and deployed elsewhere.
- CRIs are risky businesses. For this reason, shareholding Ministers expect them to achieve higher rates of return on shareholder funds than those achieved in most NZ businesses.
- Although the CRI Act 1992 defines national-benefit principals for CRIs, financial performance is pre-eminent. For this reason, CCMAU hasn't, for 17 years, worked out how financial performance measures should be balanced against non-financial performance measures.
- CRIs are expected to transfer information and technologies to end users like several other Crown entities (e.g. NZ Trade and Enterprise). However, CRIs should not be funded to make these transfers as these agencies are. In the case of research, users need to pay to ensure uptake.
- CRIs are expected to commercialise the results of their research but earning income from research services that transfer knowledge and technologies is not as important as income from patents and spin-outs. Because CRIs don't produce large numbers of patents and spin-outs they are poor at commercialisation.
- CRIs are businesses and should be run by managers from business and business-oriented boards. Leadership by scientists isn't appropriate because scientists don't understand business. Modern methods of leading "knowledge workers" have no place in CRIs.
- All taxpayers are well acquainted with the separate names of each CRI, understand what the term CRI means and stands for, and after 17 years of marketing can clearly articulate how the government organises the scientific research that it purchases using taxpayer funds. Experienced taxi-drivers, however, are resisting this trend and ironically some still recognise DSIR ahead of CRI.

We believe that the CRI Taskforce needs to review these settings and determine if they are still appropriate before it considers the roles of individual CRIs.

Statements of direction for CRIs

The CRI Act requires CRIs write statements of corporate intent each year. These must include statements about:

- Objectives (i.e. purpose)
- Nature and scope of activities (i.e. specific role)
- Accounting and dividend policies (i.e. responsibilities)
- Performance targets and measures (i.e. how performance expectations in delivering national benefit will be met).

Given that these documents exist and are approved annually by shareholding ministers, we think that CRI Taskforce needs to consider the following:

- What are the deficiencies of existing statements of corporate intent?
- Why does the process of approving these statements not afford shareholding ministers adequate opportunities to ensure that CRIs are fulfilling their purposes and meeting responsibilities?
- What would be the point of retaining CRIs boards if Government intends to fill their roles by providing stronger and more specific directional statements than those already supplied under the existing system?
- How will Government direct other agencies, most notably the Foundation, to tailor its activities so that CRIs are able to meet the expectations set out in directional statements?

Reconfiguring CRIs

We do not think that it is possible to think about reconfiguring CRIs without frameworks for thinking about the science, or RS&T or national innovation systems in toto. We do not know what frameworks policy makers use or even if they have them.

As a first step, we therefore recommend that the Taskforce provides a coherent description of the whole national research and innovation system in New Zealand and of the positions that each CRI has in this. If this cannot be provided, the Taskforce could recommend that Government does not embark upon reforms related to CRIs before an appropriate framework has been developed.

Once this larger framework is in place, various questions can be posed:

- What are the distinctive roles of CRIs, universities, other Tertiary Education Institutions, Research Associations, other private, but publicly funded, research organisations, Centres of Research Excellence, research consortia, other public-private partnerships and consortia, and the platforms funded by FRST?
- Should distinctive roles be defined to promote effective system operation? If so, what settings are required to ensure that organisations with different roles can work effectively together?
- Is the current configuration for CRIs, dating as it does largely from arrangements in place in the 1980s, still appropriate? For example, why don't we have public health, medical, social science and service-sector CRIs?
- Is the company model the right basis for all CRIs?
- Are the roles and configuration of funding agents still appropriate?

Without answers to these and similar questions there is no point in considering legislative change or matters of timing.

Governance and accountability

How can Government invest in CRIs in a way that holds them accountable, is simple, clear and ensures decisions are made at the right level?

Investment and accountability

We think the Taskforce should start by asking why the Government faces greater accountability problems when it 'invests' in CRIs than it does for 'investments' in other government agencies. Here, the Taskforce could consider the fact that the Government 'invests' in and appears to obtain acceptable accountability from other agencies using more direct funding mechanisms (e.g. FRST is input funded, universities are bulk funded).

The Taskforce has been asked to provide advice on strengthening the accountability of CRIs for delivery. We think that such advice needs to include explanations of the following:

- Why existing accountability mechanisms under the CRI Act, the Crown Entities Act and the Public Finance Act are inadequate
- What 'increased accountability for delivery' means
- How constraints that block CRIs' ability to deliver will be removed in parallel with any requirements for increased accountability.

We note that most public-sector organisations are funded directly and have considerable strategic control over what they do. In contrast (and with the exception of CRI capability funding), CRIs are publicly funded on the basis of individual pieces of work. This means that FRST provides strategic control of a significant part of CRI activities rather than the management and boards of the CRIs. The Taskforce will need to consider what impacts this has on their overall ability to deliver and be accountable for results.

Appropriate governance

We think that the Taskforce needs to address the following wider governance issues before it attempts to address CRI governance specifically:

- The Taskforce's terms of reference (#10) talks of an 'RS&T system'. What is this system and where does its governance reside?
- How does decision making currently take place in this system? Is this configuration appropriate?
- What roles should the boards of CRIs play as part of the overall system of governance? Do they have these roles at present?

- Are the current and projected governance roles played by shareholding ministers and other organisations such as CCMAU and FRST in relation to CRIs appropriate? If not, why not?

With answers to these questions it then becomes possible to consider how effective CRI boards are at present and how proposed changes will affect this effectiveness. We are concerned that greater use of platforms by FRST will make it harder for CRIs to control their own strategies. As we understand it, FRST will be involved in the Platform Management Group for the Hazards Platform and will maintain an oversight role. Will this enhance or dilute the role of CRI boards?

Organisational reviews

The Taskforce has been asked to consider both how to introduce 'periodic whole-of-organisation review of both financial and non-financial performance measures' and how to strengthen the roles of CRI boards. Before it provides advice on these matters, we think the Taskforce will need to consider:

- Why periodic whole-of-organisation review isn't a role of CRI boards
- How external reviews of financial and non-financial performance will help to strengthen the roles of CRI boards
- Where the capability for carrying out these reviews will reside externally (in CCMAU?, FRST?, MoRST? elsewhere?) and how the creation of this capability will alter the decision making in the science system.

Performance measures including use of financial performance measures

What is your view on the use of a financial performance measure for CRIs? What other performance measures could government use? How would this change behaviour within a CRI?

Financial performance measures

We think that financial viability and, therefore, financial performance measures are required for all types of organisations. Various forms of financial performance measures are already used by CRIs and CCMAU (and some are mandated in the CRI Act). It is therefore not obvious to us why the Taskforce has an interest in a single financial performance measure.

The key issue here is not a different financial performance measure but alternative financial models that match to the roles Government wants for CRIs. Alternatives do exist (e.g. partial bulk funding, not-for-profit) and are used for other government agencies. However, we recognise that CRIs are now so heavily dependent on non-RS&T funding (public and private) that development of alternative financial models is complicated. However, we recommend that alternatives be investigated before there is any consideration of financial performance measures.

Other performance measures

CCMAU has had a system of measure for non-financial performance in place for many years. As we understand it, CRIs are expected to explain what their targets are for these measures and how they will meet them in statements of corporate intent and have to report against the measures quarterly and annually. The first question for the Taskforce is therefore why aren't these other performance measures useful?

Our answer to this question is that existing non-financial performance measures are focused on a narrow set of outputs and are almost totally inadequate as the basis for assessing CRI performance. A very different approach is required. CRIs should be expected to develop and maintain analyses of the sector outcomes that have been (or are being) made possible through the networks of the knowledge and technology they produce over decades. These effects cannot be assessed through simple output measures.

The outcome-based approach we are advocating will require research in its own right so CRIs must be resourced to do it. This should be part of a system-wide effort to provide thorough and on-going assessments of the value of research. This effort is required to give substance to the waffle word 'investment'.

Funding

How can we best fund long-term capability needs without stifling short-term dynamism?

Capability needs and dynamism

It is not clear to us what is meant by the words 'capability' and 'dynamism'. We recommend that the Taskforce should define these words before it attempts to provide recommendations related to the question above. At issue here is a further set of questions:

- What sorts of capabilities are of concern (e.g. particular disciplines of research, abilities to make syntheses of results, technology transfer, end-user uptake, the ability of end users to take long-term views, strategy and governance capabilities)?
- Who is responsible for any or all of these capabilities and what is blocking their development and maintenance at present?
- What makes the development of long-term capabilities of all sorts insufficiently dynamic at present?
- What does proper dynamism (or stability) looks like?

Principles governing core funding

We seem to have got to the position where core funding is perceived as something related to research capabilities since these are what are at risk under the fragmented contracting undertaken by the Foundation as it searches for its version of 'dynamism'. We think this is far too narrow a starting point for thinking about core funding. We recommend that the Taskforce develop an analysis of the requirements, or principles, for core funding that involves the sequence:

- What roles does Government want from CRIs?
- What financial models support these roles?
- How should decision making be devolved to support the roles?
- What funding principles will support the roles, enable the financial model and enable the decision making?

Alignment

How important is collaboration to CRI performance? How can we achieve greater collaboration between CRIs, the private sector, other research providers and international research organisations?

The importance of collaboration and working relationships

The idea that CRIs are poor at collaboration has been promoted by the Foundation and by non-CRI research organisations for many years. The idea that CRIs have poor working relationships with business and sector groups and do not serve their stakeholders well has been promoted by business groups, by some operational government agencies, by some policy makers and, on occasions by the Foundation. The Foundation also thinks that greater collaboration is required so that it can invest in 'best teams'.

Before providing advice to Government on this topic, we recommend that the Taskforce looks at the evidence for these beliefs. In so doing, it should ask the following questions:

- How have CRIs managed to develop as businesses if they have not been good at working with sector and business groups? What is the evidence for poor working relationships?
- Is collaboration something to do with research only or does it extend to all the other interactions CRIs have with stakeholders?
- Critics often cite difficulties with sub-contracts from Foundation investments in CRIs as evidence for poor collaboration. What are the levels of inwards and outwards subcontracting from these investments by CRIs and by other types of research organisations?
- CRIs are large, multi-disciplinary organisations and must foster collaboration internally to survive. This point appears to be ignored by critics of CRIs. Why should inter-organisational collaboration be more important than intra-organisational collaboration?
- Individual scientists have finite capacities to collaborate. Beyond certain levels, increased collaboration simply dilutes individuals' abilities to carry out effective research. What are the optimal levels of collaboration by individuals and teams?
- If all or any of the interactions above are sub-optimal, to what degree are they the natural outcomes of the commercial settings under which CRIs operate? If they are natural outcomes, how will the Taskforce recommend that settings should be altered to making it easier for CRIs to work with others?

International linkages

We also think that the Taskforce needs to assemble evidence related to the international connections that each CRI has now before it gives Government advice in this area. This evidence should cover:

- Whether or not the existing international connections CRIs are effective,
- If they are ineffective (as implied) why existing combinations of commercial pressures, researcher field of expertise, shareholder expectations and Foundation funding mechanisms do not provide adequate incentives.

Starting in a different place

We are constantly disappointed that the high level rigour of intellectual input expected of the RS&T workforce is not also expected of those framing and setting policies for the RS&T system.

The RS&T sector is being managed on the basis of ideas drawn mainly from public choice and agency theory. The sections above indicate how these philosophies, in conjunction with a lack of careful definition of terms and rigorous thinking and analysis, simply throws up more questions than it provides as answers. We think that continued use of this approach will simply lead to further fiddling at the edges and many unintended consequences without addressing the fundamental problems of the science system. A different approach is required.

A starting point for this approach can be found in the literature on the research leadership and management in public sectors. There is a growing body of evidence that 'knowledge workers' and their output cannot be managed effectively using conventional notions of management from business. For example, Prof. Robert Austin of the Harvard Business School, (Austin 2006) notes that 'best practice calls for emphasis on relationships, collaboration and professionalism and for de-emphasis of formal performance measures.' These considerations probably have greatest relevance at the organisational level (i.e. within CRIs and universities) but we believe they are also relevant to system design at higher levels since it is this design that creates many of the settings that, as the survey cited above shows, leads to the low morale and lowered productivity of scientists.

Collaboration is what scientists do naturally. They are usually enthusiastic about their work, want to do it well, share the results with others and, in most cases, like to work collaboratively. We think that Ministers, the Ministry and the Foundation need to think carefully about the ways in which the settings they provide are creating perverse incentives that undermine the natural way in which scientists like to work. For example, the current separation of Meteorological Service and meteorological and climate research in NIWA has led to inefficiencies, duplication, and a lack of trust between organisations that should naturally be working together. This is a direct result of systems settings that are more focussed on competition than collaboration.

There would be nothing more liberating to scientists than the prospect that they and their stakeholders should come to the table each with their own resources and collaborate to create outcomes that would benefit New Zealand. This happened before the science reforms of the 1990s. There has been endless tweaking since then in attempts to recreate that situation but all are rendered ineffective by fundamental settings predicated

on the need for competition, separated roles and commercial modes of operation.

Recent thinking about the impact of fragmented leadership in the New Zealand public sector is also relevant. Cook and Hughes (2009) suggest that it is this that is holding back improved value for money in the public sector. Although their article focuses on issues relating to the health sector (medical workforce training and purchasing of drugs) their conclusions and suggestions for a way forward ring true for the RS&T sector. In particular, they point out that the policy-operations split has caused 'a massive loss of information and increase in ignorance about the nature, direction and ongoing operation of our major public sector value chains.' There was a 'failure to identify, anywhere, the increased significance of **effective value chain leadership** in capitalising on the rise of global and national services and infrastructure.' We think these findings apply equally to the RS&T sector.

The terms of reference of the CRI Taskforce and the recent document on New Zealand's RS&T priorities do not begin to address the issues of perverse incentives, fragmentation, poor leadership and low morale that are inhibiting science in New Zealand. We think that the time for a total rethinking of system settings and structures is long past. Our overall recommendation is that there should be a comprehensive review of the way the whole science system is operating. We recommend that this review should be carried out before any attempts are made to reform CRIs. Otherwise there is a risk of superficial patch-up solutions that do not address the underlying problems and that simply create new problems in the science system.

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